Tervita Silverberry Landfill Amendment Application Project

Environmental Assessment Certificate Application for the Tervita Silverberry Landfill Amendment Application Project

Revision 1

December 2019

Tervita Corporation

Application Summary

Summary of Project

Project Description

Tervita Corporation (Tervita) is proposing to expand the depleted capacity of the Silverberry Secure Landfill (the existing landfill). The existing landfill, located on privately owned land at 8-88-20 W6M, approximately 50 kilometres (km) northwest of Fort St. John, British Columbia (BC), was originally constructed in 2003. The proposed Tervita Silverberry Landfill Amendment Application Project (the proposed Project expansion) will be located on land owned by Tervita, immediately east of the existing landfill, and will be approximately the same size as the existing landfill footprint (roughly 25 hectares [ha]). Landfill cells are constructed in a staged manner dependent on fill rate, typically with only one cell operational at a time. Associated infrastructure and facilities located on the existing Tervita property include access roads, drainage ditches, and groundwater monitoring wells, as well as the office and weigh scales. Infrastructure and associated facilities are in operation for the existing landfill and will continue to be used for the proposed Project expansion. In addition, stormwater and leachate management and monitoring systems are in place at the existing landfill, and will be expanded or upgraded, where appropriate, to account for stormwater retention and leachate generation associated with the proposed Project expansion.

Project Scope

Similar to the existing landfill, the proposed Project expansion will be developed as a series of cells. The future landfill development area has been conceptually designed to accommodate six cells of varying sizes. As additional cells are developed, the liner and leachate collection systems will be tied together to provide a continuous liner system under the entire proposed Project expansion footprint. This will allow final development of the area as one contiguous fill mass, rather than six individual pockets, as is standard landfill operating and construction practice. The location of the proposed Project expansion provides for a 50-metre (m) wide secure buffer zone on the property owned by Tervita, surrounding the active area of the existing landfill, as required under Section 25 (10) of the *Hazardous Waste Regulation*.

The type of waste accepted is not expected to change as a result of the proposed Project expansion, as the purpose of this Application is to replace depleted capacity. The types of waste that are currently accepted at the existing landfill include hydrocarbon-contaminated soils and sands, sulphur-contaminated soil, salt-contaminated soils, and other wastes associated with the oil and gas industry. Examples of other waste that may be accepted include construction and demolition materials such as cement, absorbents and desiccants, drill cuttings, and other sources of industrial waste.

The existing landfill consists of seven secure landfill cells, with one still to be developed under the existing approval, for a total of eight cells and an approved capacity of 3,933,000 cubic metres (m^3). It is anticipated that the final cell of the existing landfill will be constructed and filled to capacity by 2020. Tervita estimates that all amendments will be in place by spring 2020, with construction of the proposed Project expansion to commence in summer 2021. The landfill expansion area is located immediately east of the current landfill footprint. The expansion footprint will be approximately 25 ha (roughly the same size as the existing landfill footprint) and will be designed to handle approximately 5,275,000 m^3 of material. Similar to the existing landfill, the proposed Project expansion's landfill operation will be progressive in nature, with each cell being constructed and capped independently. These activities will be repeated approximately every 2 to 3 years thereafter as more cells are developed. At the end of its operational life, the proposed Project expansion will be decommissioned, and postclosure activities will commence. Any reclamation requirements will be determined at this time. Postclosure activities for the proposed Project expansion will be completed for a minimum of 25 years. The proposed Project expansion includes the following phases:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically [for example, every 2 or 3 years] during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading, and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap, and topsoil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed, and monitoring will occur (approximately 25 years – Years 26 to 51).

Tervita has an Operations Plan in place for the existing landfill that includes a number of management and monitoring plans that describe environmental protection measures, instructions for carrying out proposed Project activities, environmental permit and approval conditions, and other environmental commitments, as well as applicable environmental laws and regulations that will be implemented by Tervita and their contractors during construction, operations, and closure/reclamation. The Operations Plan will be expanded to reflect the addition of the proposed Project expansion. Additional plans may be created, or existing plans may be modified, should the need arise as part of the adaptive environmental management of the existing landfill and the proposed Project expansion. Outlines of existing and proposed management plans are provided in Section 13 of this Application.

Project Purpose

The landfill amendment is required to replace depleted capacity and is therefore required to continue to provide service to the local area. The existing landfill currently holds approval (PR 17150) from the BC Ministry of Environment and Climate Change Strategy (MECCS) and approval (Environmental Assessment Certificate [EAC] WD02-01) from the BC Environmental Assessment Office [EAO]. Tervita (then Canadian Crude Separators Inc. [CCS]) was incorporated in the Province of Alberta in November 2007, and is registered as an Extraprovincial Company in the Province of BC (Attachment 1). In 2012, CCS and 12 owned subsidiaries (including HAZCO, Prodrill, Concord, and others) came together under the new name of Tervita Corporation. There were no ownership changes to the company. On May 21, 2019, Tervita requested that the name on EAC WD02-01 be changed from CCS to Tervita Corporation (see Attachment 2).

Applicable Permits

Pursuant to Section 19 of the BC *Environmental Assessment Act* (*EA Act*), the proposed Project expansion is subjected to review by the BC EAO for amendment of the existing Project Approval Certificate (PAC) (WD02-01; now known as the EAC) and BC MECCS for amendment of Permit PR 17150.

Environmental and Social Benefits

The proposed Project expansion will allow Tervita to continue to provide timely, orderly, environmentally sound, and economical options for the disposal of oilfield waste in northeastern BC. The advantages of the proposed Project expansion over constructing and operating a landfill at a new site include:

- Minimizing potential adverse effects by limiting the overall physical disturbance necessary to construct and operate the proposed Project expansion to locations where Tervita holds the disposition rights to that land.
- Incorporating operational activities associated with new infrastructure into existing activities.
- Leveraging existing data to understand potential interactions of the existing landfill and the environment, with over a decade of results through routine monitoring of surface and groundwater quality, air quality, and soil quality.

- Keeping the proposed Project expansion away from residential areas.
- Avoiding the creation of new access corridors, which may result in adverse and unintended consequences on wildlife and wildlife habitat and interfere with surrounding land uses.
- Minimizing potential adverse effects on aesthetic value of the landscape, since the proposed Project expansion will be co-located with an existing landfill that has already altered the viewshed in the area.
- Reducing the likelihood that the proposed Project expansion will interact with previously unidentified heritage resources, since the land is previously disturbed and has low potential for heritage resources.
- Reducing costs consistent with prudent company management and long-term sustainability; expanding the existing landfill site is substantially more cost-effective than constructing and operating a landfill at a new site.

Employment

- Contracting and employment opportunities: The capital cost of the Project is estimated at $43.5 million to be spent during the entire expansion. Approximately $9 million will be spent to expand the landfill every 3 to 4 years. Project development (construction) is expected to provide direct employment for approximately 20 workers during the 4- to 5-month construction period for each cell, which is the equivalent of a total of 36 person-years for construction of all 6 proposed cells. Types of job requirements for landfill cell construction include an environmental and regulatory advisor, a landfill project manager, third-party landfill engineering firms, a construction crew, a liner crew, and an inspector. Most skills required for the Project exist within the local Fort St. John area; Tervita intends to hire locally, where possible.
- Increased revenue for local, regional, provincial, and federal governments: the construction of the Project will generate a demand for goods, services, and workers, which will contribute to the local and regional economy. There will be direct and indirect business income, and direct and indirect employment income. There will also be increased tax revenues during construction and operations as a result of sales tax and fuel tax, for example. The operations of the Project will also generate revenue in the form of property taxes.

Summary of Assessment Process

Provincial Environmental Assessment Process

This subsection provides information on the stages of the BC EAO process, including the Pre-Application stage and the EAC Amendment Application (the Application) Review stage.

Pre-Application Stage

The BC *EA Act* provides the legal framework for provincial environmental assessments of major projects that fall within thresholds defined under the *Reviewable Projects Regulation*, or which are otherwise determined to be reviewable under the *EA Act*. Pursuant to Section 19 of the *EA Act*, the proposed Project expansion is subject to review by the BC EAO for amendment of the existing PAC (WD02-01; now known as the EAC) and BC MECCS for amendment of Permit PR 17150. This Application has been developed pursuant to the BC EAO-approved Amendment Application Information Requirements (AAIR). The Pre-Application stage has concluded with the Tervita filing of the proposed Project expansion Application to the BC EAO.

Application Review Stage

Upon submission of this Application to the BC EAO, the Application will be reviewed against the information requirements specified in the AAIR for completeness. If the Application does not include all of the required information, the BC EAO may return the Application or request that the missing information be provided.

Once the Application is deemed complete and is accepted, the BC EAO will determine if the amendment is simple, typical, or complex. Review period timing varies depending on the complexity of the amendment, and ranges from less than 3 months for simple, 3 to 6 months for typical, and 6 months or more for complex amendments. The BC EAO will also determine the need for, and extent of, consultation and engagement with the public, Working Group members, and Aboriginal groups. Tervita may be required to take an active role in public and Aboriginal consultation and Working Group meetings to resolve outstanding issues.

The BC EAO will then prepare an Assessment Report of the Application, including revised or new conditions, as necessary. For typical and complex amendments, the report will also be reviewed by Tervita, relevant Working Group members, and Aboriginal groups. Upon completion of the review of the Assessment Report, documents will be finalized and referred to the BC EAO's Executive Director for a decision whether to issue the amendment.

Executive Director's Decision

The BC EAO will inform Tervita once a decision has been made either to amend the EAC or to refuse the amendment. The BC EAO will also notify the Working Group and Aboriginal groups of the decision. If approved, the amendment certificate and Assessment Report will be posted to the BC EAO's project information centre website.

Environmental Assessment Participants

Tervita initiated communication with key stakeholders, Aboriginal groups, local, provincial, and federal governments, local communities, and interested parties. Consultation is planned throughout the planning, construction, and operations phases. Additional information is provided in Part C – Aboriginal Consultation and Part D – Public Consultation.

During the Application Review period, Tervita will continue to work with the BC EAO, the Working Group, Aboriginal groups, local governments, local communities, and interested parties to share information on Project-related issues. Relevant federal, provincial, regional, and municipal elected officials and staff will be informed of the Application submission, and opportunities to review and comment on the Application will be available throughout the BC EAO process.

Working Group

The Working Group consists of representatives from provincial and federal government agencies, local and regional governments, and Aboriginal groups. For the purposes of this Application, the AAIR indicated continued consultation with the Working Group to provide advice and input on assessment evaluation criteria, proposed mitigation measures, and any other items related to the assessment of the proposed amendment, as requested by the BC EAO.

Consultation Approaches with Aboriginal Groups, the Public, and Government Agencies

Aboriginal Consultation

Details on the methodology and approach to Aboriginal consultation activities are provided in Tervita's Aboriginal Consultation Plan, as approved by the BC EAO.

The proposed Project expansion is within Treaty 8 boundaries and the asserted traditional territories of several Aboriginal groups and Métis organizations. Per a letter from BC EAO dated August 6, 2015, Tervita is required to consult with the following Aboriginal groups with asserted traditional territories overlapping the proposed Project expansion:

- Blueberry River First Nations (BRFN)
- Doig River First Nation (DRFN)

The proposed Project expansion is also located near the following Indian Reserves (IRs):

- Approximately 5 km south of the Blueberry River IR No. 205
- Approximately 20 km southeast of the Beaton River IR No. 204 (South Half)
- Approximately 40 km west-southwest of the Doig River IR No. 206
- Approximately 40 km northwest of the Halfway River IR No. 168

In accordance with the AAIR, Tervita has conducted consultation with BRFN and DRFN through Working Group meetings to: review documents and technical information, community meetings, and public open houses; and respond to written submissions, including comments and information requests pertaining to the Application. A detailed description of all consultation activities with BRFN and DRFN is provided in Part C of this Application.

Public Consultation

Details on the methodology and approach to public consultation activities are provided in Tervita's Public Consultation Plan, as approved by the BC EAO.

Tervita initiated public consultation on July 1, 2015. Residences, occupants, and landowners within 3,200 m of the Project were consulted in-person and by phone on September 9 and 10, 2015. Residences, occupants, and landowners within 5,000 m of the Project were notified by registered mail on September 10, 2015. An open house was held in the Community of Buick on February 16, 2016. An "Invitation to Comment" by the BC EAO was posted on the May 11, 2017, Alaska Highway News seeking public comments on the draft Valued Components (VCs). Details of occurred and planned public consultation activities for the Project are provided in Part D of this Application. Tervita will maintain continued communication and stakeholder engagement throughout the Application process and during the course of the Project.

Government Consultation

The government agencies that form the BC EAO Working Group include:

- Provincial agencies:
  - BC EAO
  - BC Ministry of Agriculture
  - BC MECCS
  - BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD)
  - BC Ministry of Health
  - BC Ministry of Natural Gas Development
  - Northern Health
- Municipal and regional agencies:
  - Peace River Regional District
  - City of Fort St. John

Tervita hosted a landfill site tour with the BC Oil and Gas Commission and BC MECCS staff on September 23, 2015. During the tour, the operation of the existing landfill and plans for the proposed expansion area were discussed. On January 27, 2016, Tervita met with the BC EAO Working Group for comments on the draft VCs. On March 22, 2018, Tervita met with the BC EAO Working Group for their review and comments on the draft AAIR. Details of comments and how they were, or continue to be, addressed are provided in Section 2 and Appendix 12 of this Application.

Key Issues Raised by Aboriginal Groups, the Public, and Government Agencies

Key Issues Raised by Aboriginal Groups that have been brought forward by BRFN include potential effects of the Project to:

- Aboriginal rights and Traditional Land Use (TLU) activities
- Impacts to culturally important wildlife
- Habitat loss and contamination
- Air quality and odour
- Noise and light pollution
- Groundwater and surface water quality
- Contribution to cumulative effects in the region

Concerns that have been identified by DRFN include potential effects of the Project to:

- Spatial boundaries
- Soil quality
- Air quality
- Acoustic environment
- Surface water and groundwater
- Terrestrial vegetation
- Wildlife
- Impacts on TLU activities
- Healthy watersheds
- Culturally important wildlife, fish, and plants

Additional details concerning issues raised by Aboriginal groups are provided in Part C of this Application.

Key Issues Raised by the Public

During the open house held in the Community of Buick on February 16, 2016, the following concerns were raised:

- Landfill material on public highway
- Dirt and mud on roadways
- Speed of trucks
- General concerns for residential or private property impacts
- Landfill reclamation

These raised concerns were responded to during the open house and are addressed in the Application. No concerns were raised by the public during other consultation activities occurred for the Project. Additional details on Tervita's public consultation are provided in Part D of this Application.

Key Issues Raised by Government Agencies

Key issues that have been raised by government agencies include:

- Rationale for selection of draft VCs and VC indicators, and details in the AAIR for terrain and soils, air quality, surface water, groundwater, terrestrial vegetation including plant species at risk, First Nation culturally important species, and invasive plant species, fish and fish habitat, community infrastructure, and human health
- Study methods for soil study and air study
- Inclusion of economic benefit information in the Application
- Inclusion of existing landfill in cumulative effects assessment
- Consultation

These issues have been addressed prior to the finalization of the AAIR, as indicated in the responses to the Working Group's comments (Appendix 12), or are addressed in this Application.

Assessment of Environmental, Economic, and Social Effects

This section provides information on the assessment process used to: identify potential adverse effects; characterize potential residual adverse effects and cumulative adverse effects; and evaluate for significance of these adverse effects related to the environmental, economic, and social VCs for the proposed Project expansion.

Terrain and Soils

The identification of the potential effects of the proposed Project expansion on the Terrain and Soils VC is based on the results of the soils assessment performed for the proposed Project expansion, inclusive of loss of surface soil material through wind or water erosion and reduction in soil productivity due to loss or mixing of topsoil and subsoil.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Terrain and Soils VC was developed in accordance with industry and provincial regulatory guidelines and best management practices (BMPs), as well as in accordance with Tervita standards. The key mitigation measures include: constructing the landfill using a phased approach; implementing topsoil stockpiles that are contoured, stabilized, and seeded to prevent soil loss; suspending topsoil and subsoil salvaging during poor conditions; monitoring erosion after major storms or catastrophic events; implementing an Erosion and Sediment Control Plan, a Soil Conservation Plan, and a Dust and Odour Control Plan; installing a leak detection program; and monitoring design failures.

No potential residual effects have been identified for the Terrain and Soils VC. Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

Air Quality

The identification of the potential effects of the proposed Project expansion on the Air Quality VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of an increase in air emissions (such as, dust) and Project contribution to greenhouse gas (GHG) emission levels.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Air Quality VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include watering of roadways and curtailment of activity during high wind events, ensuring that equipment is well-maintained, reducing the idling of equipment, progressive capping of the waste with Low Density Polyethylene (LLDPE) to minimize the open landfill area, and implementing a Dust and Odour Control Plan and an Air Quality Monitoring Plan.

Residual adverse effects on the Air Quality VC are identified as an increase in air and GHG emissions during all phases of the proposed Project expansion. With implementation of the proposed mitigation measures, an increase in Project-related air emissions is predicted to be short-term in duration and of medium magnitude during construction, since long-term average concentrations will stay below Ambient Air Quality Objectives, and negligible magnitude during operation and closure/reclamation; therefore, the predicted residual effect is considered to be not significant. The proposed Project expansion's contribution to GHG emissions will be minor compared to provincial or national emissions totals, and the residual effect is considered to be not significant. With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on air emissions is of short-term duration and low magnitude, and is considered to be reversible. Consequently, the proposed Project expansion's contribution to cumulative effects on air emissions will be not significant.

Acoustic Environment

The identification of the potential effect of the proposed Project expansion on the Acoustic Environment VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of an increase in noise levels.

The mitigation identified for the potential adverse effect associated with the proposed Project expansion on the Acoustic Environment VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include construction work being done in daylight hours and operational work being done between the hours of 7 a.m. and 7 p.m, and equipment being well-maintained with properly functioning mufflers.

Residual adverse effects on the Acoustic Environment VC are identified as increased noise emissions during all phases of the proposed Project expansion. Noise emissions associated with the proposed Project expansion are short-term, localized, low in magnitude, and reversible; therefore, a residual effect of increased noise emissions is considered to be not significant. With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on the acoustic environment is of short-term duration and low magnitude, and is considered to be reversible. Consequently, the proposed Project expansion's contribution to cumulative effects on the Acoustic Environment VC will be not significant.

Surface Water

The identification of the potential effects of the proposed Project expansion on the Surface Water VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of increased sediment in stormwater runoff and contamination of surface water due to accidental release of chemicals, oil, or other fuels from stormwater or leachate. The potential effects of contamination of surface water due to accidental release of chemicals, oil, or other fuels from stormwater or leachate are assessed in the Accidents and Malfunctions VC.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Surface Water VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include constructing the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized, inspecting surface water control works weekly and/or immediately after a major storm or catastrophic event, repairing and mitigating erosion occurring on surface water control works as soon as possible, using mitigation measures to prevent surface water erosion, which may include swales, hay bales, rock riprap, and/or coconut matting, and implementing the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan.

No potential residual effects have been identified for the Surface Water VC. The landfill design along with the implementation of mitigation measures are expected to sufficiently avoid and/or prevent residual adverse effects to surface water quality. With the implementation of appropriate mitigation and remedial measures, there are no potential residual effects predicted for the Surface Water VC. Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

Groundwater

The identification of the potential effects of the proposed Project expansion on the Groundwater VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of alteration of groundwater hydrogeology and contamination of groundwater due to accidental release of leachate. The potential effects of contamination of groundwater are assessed in the Accidents and Malfunctions VC.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Groundwater VC was developed in accordance with industry and provincial regulatory guidelines

and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include constructing using a phased approach so that the disturbed and potentially exposed areas will be minimized.

No potential residual effects have been identified for the Groundwater VC. The existing landfill has mitigation measures in place that will be applied to the proposed Project expansion and the landfill design to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). With the implementation of appropriate mitigation and remedial measures, there are no potential residual effects predicted for the Groundwater VC. Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

Terrestrial Vegetation

The identification of the potential effects of the proposed Project expansion on the Terrestrial Vegetation VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of an introduction or spread of Noxious weeds; vegetation uptake of contaminants from air quality and dust dispersion and deposition; and loss or alteration of native vegetation.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Terrestrial Vegetation VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include: noting areas of Noxious weeds/invasive plants during weekly inspections; cleaning vehicles and equipment as best as reasonably possible; bringing in a certified pesticide applicator on an as-needed basis; occasional watering of roadways and curtailment of activity during high wind events; constructing the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized; implementing the Dust and Odour Control Plan and the Air Quality Monitoring Plan; reducing disturbance to native vegetation, to the extent possible; and using a cover crop to assist in weed and erosion control, where warranted.

Residual adverse effects on the Terrestrial Vegetation VC are identified as a loss or alteration of native vegetation. The residual effect of the proposed Project expansion on the loss or alteration of native vegetation is predicted to be of low magnitude and is considered to be not significant. With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on native vegetation resulting from existing activities in combination with the Project and reasonably foreseeable developments is of low magnitude, is not significant, and is likely to persist with or without the Project.

Fish and Fish Habitat

There are no identified potential effects of the proposed Project expansion on the Fish and Fish Habitat VC as there is no direct discharge of surface water to water bodies, and no known channel connections exist between the proposed Project expansion and nearby fish-bearing water bodies.

The proposed Project expansion is not expected to result in a change in habitat or mortality risk, and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no further assessment of the Fish and Fish Habitat VC is warranted.

Wildlife and Wildlife Habitat

The identification of the potential effects of the proposed Project expansion on the Wildlife and Wildlife Habitat VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Wildlife and Wildlife Habitat VC was developed in accordance with industry and provincial

regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include: scheduling construction activities outside of the migratory bird nesting period; suspending activities and notifying the Environment & Regulatory Advisor if previously unidentified wildlife species with special conservation status or their site-specific habitat (for example, dens and nests) are identified during construction; implementing the Dust and Odour Control Plan and the Air Quality Monitoring Plan surrounding the active landfill area with a fence to limit wildlife interactions; prohibiting feeding or harassment of livestock or wildlife; seeking an amphibian salvage permit from BC MFLNRORD to salvage any amphibians (if found) from the construction footprint prior to construction activities; and having all personnel abide by all speed limits on the Project site and on transit to the site.

Residual adverse effects on the Wildlife and Wildlife Habitat VC are identified as a loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk, and are considered to be not significant. With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on wildlife habitat resulting from existing activities in combination with the Project and reasonably foreseeable developments is of low magnitude, is not significant, and is likely to persist with or without the Project. The potential cumulative effects causing changes in wildlife movement in the Wildlife and Wildlife Habitat are of low-to-medium magnitude, are not significant, and are likely to persist with or without the Project. Increased wildlife mortality risk was assessed as having a low probability of occurrence and is not considered likely to interact spatially or temporally with the Project to have a cumulative effect.

Economy

The identification of the potential effects of the proposed Project expansion on the Economy VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of increased contract procurement and employment opportunities, and increased local, provincial, and federal revenue.

The predicted residual effects for the Economy VC are positive, and therefore, do not warrant mitigation or effects assessments.

Land and Resource Use

The identification of the potential effects of the proposed Project expansion on the Land and Resource Use VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of disruption of resource use activities (such as, agriculture, timber harvesting, industrial use, and trapping activities) and disruption of First Nation land and resource use (such as, access to lands).

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Land and Resource Use VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include fencing the proposed Project expansion footprint to restrict agricultural and recreational use, providing forest tenure holders and trappers with information and protocols regarding the timeframe for construction, placing signage on access roads in the vicinity of the construction activities to notify road users that construction activities are taking place, providing First Nations with information and protocols regarding the timeframe for construction, and consulting with First Nations and considering specific requests for mitigation.

With the implementation of appropriate mitigation measures, including mitigation measures for the VCs that support First Nation land and resource use, there are no potential residual effects predicted for the Land and Resource Use VC, and a characterization and evaluation of significance of residual effects is not warranted. Consequently, a cumulative effects assessment is not required.

Community Services

The identification of the potential effect of the proposed Project expansion on the Community Services VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of disruption of community life by temporary workers.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Community Services VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include informing all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, providing potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps, and adhering to Tervita's Alcohol and Drug Policy, and Health, Safety, and the Environment (HSE) Program.

Due to the limited size of the Project workforce and the sufficient availability of services in the City of Fort St. John, construction and operations of the Project are expected to have a negligible adverse impact on the Community Services VC and, consequently, with implementation of the mitigation provided, no residual effects were identified for the Community Services VC. Consequently, a cumulative effects assessment is not required.

Community Infrastructure

The identification of the potential effect of the proposed Project expansion on the Community Infrastructure VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of increased traffic volumes as a result of transporting workers, supplies, equipment, and incoming waste for disposal.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Community Infrastructure VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include: restricting all construction and operations activities to the approved designated survey area; adhering to safety and traffic regulations for all Project-related traffic; informing all responsible federal and provincial resource agencies and interested municipal officials of the Project developments; prebooking all incoming waste before arrival at the landfill site for receival during daylight hours, unless it is an emergency situation; implementing traffic management measures outlined in the Operations Plan; and adhering to Tervita's Alcohol and Drug Policy, and the HSE Program.

It is anticipated that the capacity of community infrastructure can handle the slight incremental demands of Project-related traffic without overburdening it. Consequently, construction and operations of the Project are expected to have a negligible impact on the Community Infrastructure VC and, with implementation of mitigation, no residual effects were identified for the Community Infrastructure VC. Consequently, a cumulative effects assessment is not required.

Cultural and Heritage Resources

The identification of the potential effect of the proposed Project expansion on the Cultural and Heritage VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of disturbance of previously unidentified cultural or heritage resources during construction or operations.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Cultural and Heritage VC was developed in accordance with provincial regulatory guidelines and in accordance with Tervita standards. The key mitigation measures include prohibiting the collection of historical resources by Project personnel, and, if historical features not previously identified are found on the construction footprint, immediately notifying the BC Archaeology Branch, stopping work within the site, and implementing any other measures identified by the BC Archaeology Branch.

Since no archaeological resources were found on the Project footprint during the Archaeological Impact Assessment, there is low potential to encounter previously undiscovered heritage resources during Project construction. Construction and operations of the Project are expected to have a negligible adverse impact on the Cultural and Heritage VC and, consequently, with implementation of the mitigation provided, no residual effects were identified for the Cultural and Heritage VC. Consequently, a cumulative effects assessment is not required.

Human Health

The identification of the potential effects of the proposed Project expansion on the Human Health VC is based on the results of the assessment performed for the proposed Project expansion, inclusive of: change in drinking water quality; potential adverse human health effects due to the disturbance of contaminated soil; leachate effects on surface water, groundwater, or soil quality; decreased quality of country foods in plant gathering areas, hunting sites, and fishing areas; air quality effects on respiratory and cardiovascular health; and noise disturbance to nearby land users, including First Nations.

The mitigation identified for the potential adverse effects associated with the proposed Project expansion on the Human Health VC was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include: using the existing stormwater management system for discharging surface water; extension of the existing landfill liner, leachate collection system, and leak detection system to prevent waste materials and leachate from being released to the subsurface; continuing quarterly ground water monitoring programs to detect any impacts to groundwater; continued use of existing dust suppression systems; implementing additional suppression measures to minimize dust generated from vehicular traffic; air filter monitoring at the property boundary; conducting construction work in daylight hours only and operational work between 7 a.m. and 7 p.m.; confirming that construction equipment adheres to low-emission Tier 4 engine specifications; confirming that equipment is well-maintained with properly functioning mufflers; confirming that operators take reasonable measures to control construction-related noise; and confirming that operators comply with all health and safety requirements.

No potential residual effects have been identified for the Human Health VC with the implementation of the proposed mitigation. Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

A qualitative Screening Level Human Health Risk Assessment (SLHHRA) was conducted to provide a conservative evaluation of potential risks to human health associated with the proposed Project expansion. The SLHHRA (Appendix 11) predicts that there are not significant risks of adverse health effects to human receptors from the proposed Project expansion. All pathways are predicted to have risks that are low or unlikely.

Accidents and Malfunctions

Potential Project accidents and malfunctions include: traffic-related accidents; release or spill of contaminants, such as hydrocarbons, hazardous materials, and naturally occurring radioactive materials (NORMs) containing materials (terrestrial, surface water, or groundwater); structural failure of a landfill component during construction or operations; onsite fires; and damage to existing Silverberry Landfill infrastructure. Consequences of these events potentially include effects on human health and contamination of onsite surface water, soil, and groundwater, and release of contaminants to air, adversely affecting nearby terrestrial and aquatic habitats.

As identified in the risk evaluation completed for accidents and malfunctions, the likelihood of any accidents and malfunctions occurring ranges from may to unlikely, while consequence ranges from minor to severe. Confidence ranges from high-to-moderate and is based on Tervita's extensive experience operating hazardous waste landfills throughout western Canada, including the safe and successful operational history of the existing Silverberry Landfill, as well as the effectiveness of mitigation, including Tervita's Operations Plan, and professional judgment. For all potential effects assessed, the risk rating was determined to range from low-to-medium after implementation of mitigation. There are no situations where likelihood and consequence would result in a very high risk or a high-risk accident or malfunction taking place.

Effects of the Environment on the Project

The identification of potential effects of the environment on the Project is based on the results of the assessment performed for the proposed Project expansion, inclusive of changing climate trends, extreme weather events, and wildfire.

The mitigation identified for the potential adverse effects associated with effects of the environment on the Project was developed in accordance with industry and provincial regulatory guidelines and BMPs, as well as in accordance with Tervita standards. The key mitigation measures include implementing: Tervita's Silverberry Site Emergency Response Plan; measures for erosion control and stormwater management; and procedures for dealing with fires specified in the Fire Control section of the Operations Plan.

The potential effects vary depending upon the timing, location, and magnitude of the event. However, given the implementation of the proposed mitigation, the probability of potential adverse effects to the Project are low. The magnitude of damage to the Project is considered to range from low-to-high depending on the variability of residual effects, but is immediate to short-term in duration and reversible. As a result, the predicted residual effects are not significant.

Conclusions

Based on the assessment results presented in this Application, Tervita concludes that the proposed Project expansion is not considered likely to result in significant residual adverse effects or cumulative effects.

Summary of Key Adverse Effects on Aboriginal Interests and Mitigation Measures

The potential Project-related effects identified by BRFN are as follows:

- Effects on TLU activities, including sensory disturbance (noise, odour, light, and visual effects) and effects on sense of place, cultural identity, and intergenerational transfer of knowledge
- Effects on resources used for TLU activities, including water, culturally important vegetation, fish, and wildlife
- Effects on traditional economy

The potential Project-related effects identified by DRFN are as follows:

- Effects on TLU activities, including sensory disturbance (noise and dust)
- Effects on resources used for TLU activities, including water, culturally important vegetation, trees, and wildlife

Mitigation measures to avoid or reduce adverse effects on Aboriginal interests identified by the Aboriginal groups include those relating to noise (see Section 4.3.4), air quality, including odour (see Section 4.2.4), light pollution at night (see Sections 4.8.4 and 4.2.4), surface water (see Section 4.4.4), groundwater (see Section 4.5.4), wildlife and wildlife habitat (see Section 4.8.4), and vegetation (see Section 4.6.4). As no effects have been identified for fish and fish habitat (Section 4.7), no mitigation measures are required.

Management Plans

To avoid or reduce the potential adverse effects and risk of adverse effects on the proposed Project expansion, Tervita has a number of management plans in place that describe: environmental protection measures; instructions for carrying out proposed Project expansion activities; environmental permit and approval conditions and other environmental commitments; and applicable environmental laws and regulations that will be implemented by Tervita and their contractors during construction, operations, and closure/reclamation. Outlines of existing and proposed management plans for all phases of the proposed

Project expansion are provided in Section 13 of this Application. These management plans include the following:

- Erosion and Sediment Control Plan
- Soil Conservation Plan
- Traffic Management Plan
- Emergency Preparedness and Response Plan
- Noxious Weeds Plan
- Vegetation Management Plan
- Wildlife Management Plan
- Air Quality Monitoring Plan
- Dust and Odour Control Plan
- Radiation Protection Plan
- Groundwater Monitoring Plan
- Leachate Management Plan
- Stormwater Management Plan
- Landfill Leak Detection Monitoring Plan
- Night Time Light Management Plan

Monitoring and Follow-up

Environmental monitoring refers to the procedures and activities that Tervita will implement as part of its environmental management systems to manage the environmental aspects of the proposed Project expansion. Environmental monitoring is a key component of Tervita's environmental compliance strategy and will be conducted by trained professionals, including the Environment & Regulatory Advisor, the Site Inspector, and resource-specific specialists, as needed. Trained personnel will monitor, advise, and work with Tervita construction management, as necessary, throughout all phases of the proposed Project expansion, to ensure continuous and consistent compliance with the environmental protection and socio-economic commitments.

Postconstruction monitoring (PCM) will be integrated with current operations and incorporated with other routine operational monitoring activities that will be expanded for the proposed Project expansion, including monitoring of soil erosion and dust control, groundwater quality, surface water quality, leachate generation, and air monitoring for NORM activity. Any environmental issues, associated mitigation, and follow-up will be incorporated into the annual operating reports and submitted to BC MECCS per guidance contained in the Operations Plan. Annual reclamation and closure reports will also be incorporated into the annual operating reports, as needed, detailing reclamation activities, such as drainage restoration, soil replacement, erosion control and revegetation, and associated follow-up, as needed.

While Tervita will integrate the proposed Project expansion into monitoring and reporting requirements currently in place for existing operations, Tervita will adhere to additional construction or PCM, follow-up, and reporting requirements required under Certificate Conditions.

Contents

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Attachments

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Figures

Acronyms and Abbreviations

°C	degree(s) Celsius
µg/m^3	microgram(s) per cubic metre
AAQO	Ambient Air Quality Objective(s)
AAC	annual allowable cut
AAIR	Amendment Application Information Requirements
the Agreement	Regional Strategic Environmental Assessment Interim Measures Agreement
ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
the Application	the Environmental Assessment Certificate Amendment Application
asl	above sea level
ATV	all-terrain vehicle
BACT	Best Available Control Technology
BC	British Columbia
BGC	Biogeoclimatic
BMP	best management practice
Blueberry River Enterprises	Blueberry River Enterprises GP Ltd.
Bq/g	becquerel(s) per gram
BRFN	Blueberry River First Nations
BWBS	Boreal White and Black Spruce
CAC	criteria air contaminant
CCL	compacted clay liner
CCME	Canadian Council of Ministers of the Environment
CCS	Canadian Crude Separators Inc.
CEA	Canadian Environmental Assessment
CH_4	methane
cm/y	centimetre(s) per year
CO	carbon monoxide
CO_2	carbon dioxide
COPC	contaminants of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CSR	*Contaminated Sites Regulation*
dAAIR	draft Amendment Application Information Requirements
dBA	decibel(s)
dBA Leq	decibel(s) absolute energy level equivalent
DRFN	Doig River First Nation

EA Act	*Environmental Assessment Act*
EAC	Environmental Assessment Certificate
EMA	*Environmental Management Act*
e-Pic	electronic Project Information Centre
BC EAO	British Columbia Environmental Assessment Office
EO	Element Occurrence
EPIC	BC EAO Project Information and Collaboration System
the existing landfill	the Silverberry Secure Landfill
GHG	greenhouse gas
GST	goods and services tax
H_2S	hydrogen sulphide
ha	hectare(s)
HHRA	Human Health Risk Assessment
HWR	*Hazardous Waste Regulation*
HSE	Health, Safety, and the Environment
IAPP	Invasive Alien Plant Program
IR	Indian Reserve
Jacobs	CH2M HILL Canada Limited
KI	Key Indicator
km	kilometre(s)
kW	kilowatt(s)
LAA	Local Assessment Area
LLDPE	Low Density Polyethylene
Ldn	day-night sound level
LRMP	Land and Resource Management Plan
LSA	Local Study Area
m	metre(s)
m^3	cubic metre(s)
mbgs	metres below ground surface
BC MECCS	British Columbia Ministry of Environment and Climate Change Strategy
BC MFLNRORD	British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development
BC MOE	British Columbia Ministry of Environment
m/s	metre(s) per second
mg/L	milligram(s) per litre
mm	millimetre(s)
MW	megawatt
NA	no applicable air quality objective or standard

NEB	National Energy Board
NGTL	NOVA Gas Transmission Ltd.
NO_2	nitrogen dioxide
NO_x	nitrogen oxide
NORM	naturally occurring radioactive material
NPS	nominal pipe size
O_3	ozone
Ontario MECP	Ontario Ministry of the Environment, Conservation and Parks
BC OGC	British Columbia Oil and Gas Commission
PAC	Project Approval Certificate
PAH	polycyclic aromatic hydrocarbon
PCM	postconstruction monitoring
PDMA	Potential Dust Migration Area
PM	particulate matter
$PM_{2.5}$	particulate matter less than 2.5 micrometres in aerodynamic diameter
PM_{10}	particulate matter less than 10 micrometres in aerodynamic diameter
ppb	part(s) per billion
PPE	personal protective equipment
the proposed Project expansion	the proposed Tervita Silverberry Landfill Amendment Application Project
PRRD	Peace River Regional District
PSL	permissible sound level
QA/QC	quality assurance/quality control
RAA	Regional Assessment Area
RPP	Radiation Protection Plan
SARA	*Species at Risk Act*
SLHHRA	Screening Level Human Health Risk Assessment
SO_2	sulphur dioxide
Stantec	Stantec Consulting Ltd.
SWDA	Surface Water Drainage Area
Taseko	Taseko Mines Ltd.
TEK	Traditional Ecological Knowledge
Tervita	Tervita Corporation
t/y	tonne(s) per year
TFL	Tree Farm License
TLU	Traditional Land Use
TRD	Treatment, Recovery, and Disposal
TSA	Timber Supply Area
UWR	Ungulate Winter Range

U.S. EPA	United States Environmental Protection Agency
VC	Valued Component
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons
Westcoast	Westcoast Energy Inc., doing business as Spectra Energy Transmission
WHA	Wildlife Habitat Area
WQG	Water Quality Guidelines

Preface

Tervita Corporation (Tervita) is proposing to expand the depleted capacity of the Silverberry Secure Landfill (the existing landfill). The existing landfill was originally constructed in 2003. The proposed Tervita Silverberry Landfill Amendment Application Project (the proposed Project expansion) will be located on land owned by Tervita, immediately east of the existing landfill, and will be approximately the same size as the existing landfill footprint (roughly 25 hectares). Landfill cells are constructed in a staged manner dependent on fill rate, typically with only one cell operational at a time. Associated infrastructure and facilities located on the existing Tervita property include access roads, drainage ditches, and groundwater monitoring wells, as well as the office and weigh scales. Infrastructure and associated facilities are in operation for the existing landfill and will continue to be used for the proposed Project expansion. In addition, stormwater and leachate management and monitoring systems are in place at the existing landfill, and will be expanded or upgraded, where appropriate, to account for stormwater retention and leachate generation associated with the proposed Project expansion.

Pursuant to Section 19 of the British Columbia (BC) *Environmental Assessment Act*, the proposed Project expansion is subjected to review by the BC Environmental Assessment Office (EAO) for amendment of the existing Project Approval Certificate (PAC WD02-01; now known as the Environmental Assessment Certificate [EAC]) and the BC Ministry of Environment and Climate Change Strategy (MECCS) for amendment of Permit PR 17150.

This EAC Amendment Application (the Application) has been developed pursuant to the Amendment Application Information Requirements dated January 23, 2019 (Tervita 2019). This Application has been developed in consultation with relevant provincial, municipal, and regional agencies. Aboriginal consultation and public consultation conducted during preparation of the Application are provided in Parts C and D, respectively.

Members of the BC EAO Working Group involved in the development of the Application are listed in Table P-1.

Table P-1. Members of the British Columbia Environmental Assessment Office Working Group for the Proposed Tervita Silverberry Landfill Amendment Application

Working Group Members	
Provincial Agencies	
BC EAO BC Ministry of Agriculture BC MECCS BC Ministry of Health BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development	BC Ministry of Natural Gas Development Northern Health
Regional Agencies	
Peace River Regional District	
Municipal Agencies	
City of Fort St. John	
Aboriginal Communities	
Blueberry River First Nations	Doig River First Nation

Table of Concordance

Tervita Corporation Silverberry Secure Landfill Project

Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
	Application Summary	The Application will include a summary, including the following:	Application Summary	Application Summary	Page AS-1	
		• A summary of the proposed Project including the Project scope, Project benefits, and applicable permits			Pages AS-1 to AS-3	
		• A brief overview of the assessment process including Project reviewability, and the pre-application and application review stages of the EA			Pages AS-3 to AS-4	
		• A brief overview of consultation approaches with Aboriginal groups, the public and government agencies to date			Pages AS-4 to AS-5	
		• A summary of the key issues raised by Aboriginal groups, the public and government agencies			Page AS-5 to AS-6	
		• A summary of key effects, proposed mitigation measures and residual and cumulative effects on VCs			Pages AS-6 to AS-12	
		• A summary of key adverse effects on Aboriginal Interests and mitigation measures			Page AS-12	
		• Proponent's conclusions regarding the potential for significant adverse effects on VCs			Pages AS-12	
Part A	**Introduction**		**Part A**	**Introduction**	**Page 1-1**	
1	Overview of Proposed Project		1	Overview of Proposed Project	Page 1-1 Figures 1.2-1 and 1.2-2	
1.1	Proponent Description	A description of the Proponent is included in the Project Description at https://projects.eao.gov.bc.ca/api/document/5886ea9eeed3c0016f856f6c/fetch.	1.1	Proponent Description	Pages 1-1 to 1-3 Tables 1.1-1 and 1.1-2	
		The Application will:				
		• Describe the Proponent, including history, type of company or organization, and affiliations				
		• Provide contact information for the Proponent				
		• Include a list of parties involved in the preparation of the Application, their qualifications, and the section(s) for which they were responsible				
1.2	Description of Proposed Project	A description of the proposed Project is included in the Project Description at: https://projects.eao.gov.bc.ca/api/document/5886ea9eeed3c0016f856f6c/fetch.	1.2	Description of Proposed Project	Page 1-3 to 1-4	
		The Application will:				
		• Describe the purpose of the proposed Project from the perspective of the Proponent, and identify whether the objectives of the proposed Project relate to any broader private or public sector policies, plans, or programs				
		• Describe the location of the proposed Project and the latitude and longitude coordinates of the site and include maps showing both regional context (identifying nearby communities and geographic features) and the specific location of the proposed Project	1.2.1	Proposed Project Location	Pages 1-4 to 1-7 Figures 1.2-1, 1.2-2, and 1.2-3	
		• Describe the location of the proposed Project relative to Aboriginal groups' asserted traditional territories, and/or Treaty Nation territories, including maps showing the location of the proposed Project components in relation to Aboriginal groups' and/or Treaty Nation territories				
		• Describe all phases of the proposed Project, including their duration and proposed scheduling	1.2.2	Phases of the Proposed Project	Page 1-8 Table 1.2-1	
		• Describe all onsite and offsite components associated with the proposed Project, with figures	1.2.3	Proposed Project Components and Activities	Page 1-8	
		• Describe the activities associated with the components and phases of the proposed Project, with figures	1.2.3	Proposed Project Components and Activites	Page 1-8	

Tervita Corporation Silverberry Secure Landfill Project

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
1.2 (cont'd)	See above	• Discuss the relevant history of the proposed Project, including exploratory or investigative history	1.2	Description of Proposed Project	Page 1-3 to 1-4	
		• Summarize existing and planned land use that overlaps or may be potentially impacted by the proposed Project components and activities, including:	1.2.4	Land Use	Subsections 1.2.4.1 – 1.2.4.5 Pages 1-9 to 1-12 Figure 1.2-4	
		– Land ownership [for example, private land, provincial Crown land, federal land [including Indian Reserves], and Aboriginal title) – Local government zoning or plans – Tenures (that is, municipal, provincial, and federal), licences, permits, or other authorizations – Non-tenured current land uses – Provincial land use plans (for example, Land and Resource Management Plans) and provincial land use designations (for example, Agricultural Land Reserve, Old Growth Management Areas, Wildlife Management Areas (including the Cecil Lake Important Bird Area), *Forests and Range Practices Act* designations) and provincial land use management objectives – Any other development or activities, whether or not directly related to the proposed Project – Maps showing location of other uses referenced above in relation to the proposed Project – References to the Application section that assesses land use and potential overlaps/impacts in more detail				
		• Describe the Project's economic benefits.	1.2.5 – 1.2.6	Economic Benefits	Pages 1-12 to 1-13 Table 1.2-2	
		– Capital construction cost estimates, including:				
		▪ Breakdown of costs (for example, land, buildings, and equipment) associated with the proposed Project ▪ Estimated operating costs over the life of the proposed Project, including breakdown of costs by category (for example, labour, supplies, materials, and administration) ▪ Estimated costs for decommissioning, closure, and reclamation				
		– Employment estimates including:				
		▪ Direct employment to be created, by job category by Project phase, in number of person year jobs for construction and decommissioning and full-time equivalent jobs for operations; direct employment estimates will be broken down into full-time, part-time, and seasonal job categories ▪ Average wages, by major job category, for the construction and operating periods ▪ Breakdown of jobs that will be filled from local, provincial, national, or international labour markets ▪ Indirect and induced employment to be generated, by Project phase ▪ Information about an employment strategy, if any				
		– Contractor supply services estimates including:				
		– List of the major types of businesses or contractors to be used, broken down at the local, provincial, and national level, by Project phase – Value of supply of service contracts expected, by Project phase – Information about a local purchasing strategy, if any				
		• Annual government revenues, by type (for example, income tax, licence rent, property tax, and mineral tax) and jurisdiction (for example, local, provincial, and federal), for all phases of the proposed Project				
		• Any benefits the proposed Project may have to the five pillars of assessment (Environmental, Economic, Social, Health, and Heritage)				
		• All Canadian dollar estimates will be provided in real dollars, with an explanation of how they are measured (for example, discount rates)				
		• State all assumptions and references for the above information				

Tervita Corporation Silverberry Secure Landfill Project

Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
1.3	Applicable Authorizations	A list of required authorizations, to the extent that was known at the time, is available in the Project Description at: https://projects.eao.gov.bc.ca/api/document/5886ea9eeed3c0016f856f6c/fetch.	1.3	Applicable Authorizations	Page 1-13 Table 1.3-1	
		The Application will: • List in table format (see example below) all applicable licenses, permits and/or approvals that are already received or required for the phases of the proposed Project, and the associated responsible regulatory body				
1.4	Project Design and/or Alternative Means of Carrying out the Project	The Application will include: • An assessment of the alternative means of carrying out the proposed Project that are technically and economically feasible including, but not limited to, the alternatives identified in the AAIR • The rationale and criteria used to select the proposed means of undertaking the proposed Project • The methodology and criteria used in the assessment of alternatives	1.4	Project Design and Alternative Means	Page 1-13 to 1-14	
1.5	Alternatives to the Proposed Project	The Application will include: • An assessment of the alternatives to the proposed Project that were technically and economically feasible including, but not limited to, the alternatives identified in the AAIR • The assessment of alternatives will include an assessment of building the capacity replacement for the landfill at an alternate location. The alternative will be assessed qualitatively using the criteria of effects to the existing environment, social, economic heritage, and health conditions. In addition, cost will be considered in the assessment of the alternative location	1.5	Alternatives to the Proposed Project	Page 1-14	
2	EA Process		2	EA Process	Page 2-1	
2.1	Provincial EA Process	The Application will include: • A statement that the proposed Project is subject to review under the *EA Act*, identifying the trigger(s) for the review under the *EA Act* • A statement that the Application has been developed pursuant to the AAIR approved by BC EAO and complies with instructions provided in the August 6, 2015 letter and any other direction provided by BC EAO • A table documenting applicable milestones, including, but not limited to, issuance of direction from BC EAO, working group meetings, any public comment periods or open houses and the issuance of the AAIR, including links to documents on BC EAO's public website • A list of the government agencies and Aboriginal Groups that participated in the EA, a summary of their participation, and a list of the key issues raised by each party and the status of issue resolution (the Proponent will cross-reference, as appropriate, other sections of the Application that deal further with consultation and issues raised) • A summary of public participation in the EA, a list of the key issues raised, and the status of issue resolution (with cross-references, as appropriate, to other sections of the Application that deal further with consultation and issues raised)	2.1	Provincial EA Process	Subsection 2.1.1 Page 2-1 to 2-41 Tables 2.1-1 and 2.1-2	
2.2	Federal EA Process	The Application will include: • The relevant review threshold that has been met under the federal Regulations Designating Physical Activities (Government of Canada 2015) • Whether the Canadian Environmental Assessment Agency has determined that a federal EA is required, including a link to the relevant documents on the Canadian Environmental Assessment Agency Registry • Whether the proposed Project is undergoing a substituted, coordinated, or other type of federal and provincial review process • A table documenting applicable completed and upcoming federal milestones. Milestones include, but are not limited to, any public comment periods, notice of commencement, and finalization of the Environmental Impact Statement Guidelines	2.2	Federal EA Process	Page 2-42	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
Part B	**Assessment of Environmental, Economic, Social, Heritage and Health Effects**		**Part B**	**Assessment of Environmental, Economic, Social, Heritage and Health Effects**	**Page 2-3**	
3	Assessment Methodology	This section of the Application must describe the methods used to assess the potential adverse effects of the proposed Project. The assessment methodology must be based on the BC EAO's Guideline for the Selection of VCs and Assessment of Potential Effects (BC EAO 2013a).	3	Assessment Methodology	Page 3-1	
3.1	Issues Scoping and Selection of Valued components	The selected VCs include:	3.1	Issues Scoping and Selection of Valued components	Pages 3-1 to 3-4 Table 3.1-1	
		• Terrain and Soils				
		• Air Quality and Odour				
		• Acoustic Environment				
		• Surface Water				
		• Groundwater				
		• Terrestrial Vegetation				
		• Fish and Fish Habitat				
		• Wildlife and Wildlife Habitat				
		• Land and Resource Use				
		• Community Services				
		• Community Infrastructure				
		• Cultural and Heritage Resources				
		• Human Health				
		• Economy				
		• The Application will summarize the process and methodologies used to identify and select the VCs for assessment. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.				
3.2	Assessment Boundaries	The Application will describe the methods used in identifying spatial, temporal, administrative and technical boundaries. Information on spatial, temporal, administrative and technical boundaries for specific VCs will be included in the appropriate VC sections of this document and will encompass all relevant Project phases, components and activities. It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, study area boundaries will be revised. The Application will include the rationale for any differences in boundaries from those presented in the final AAIR.	3.2	Assessment Boundaries	Pages 3-4 to 3-5	

Tervita Corporation Silverberry Secure Landfill Project

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.2.1	Spatial, Temporal, Administrative, and Technical Boundaries	The spatial boundaries are considered as follows.	3.2.1 – 3.2.4	Spatial Boundaries, Temporal Boundaries, Administrative Boundaries, Technical Boundaries	Pages 3-5 to 3-10 Figures 3.2-1, 3.2-2, 3.2-3, and 3.2-4	
		• Project Footprint: The land area directly disturbed by Project construction and cleanup activities, including associated physical works and activities.				
		• Project Footprint: The land area directly disturbed by Project construction and cleanup activities, including associated physical works and activities.				
		• LAA: The LAA varies with the VC being considered. The LAA includes the Project Footprint and extends beyond it to incorporate the area within which the VC is most likely to be affected by the Project.				
		• RAA: The RAA varies with the VC being considered and includes the Project Footprint and LAA, and the area extending beyond the LAA where there is potential for the Project to have regional effects on the VC.				
		• Provincial: The area extending beyond regional or administrative boundaries, but confined to BC.				
		• National: The area extending beyond BC but confined to Canada.				
		• International: The area extending beyond Canada.				
		Each VC has specific definitions for spatial and temporal boundaries described under Sections 4.0 through Section 8.0 of the EA. The Application will identify any requested revisions for each VC and provide the rationale for boundary revisions or the retention of original boundaries.				
3.3	Existing Conditions	For each VC section (Environmental, Economic, Social, Heritage, and Health), the Application will include a description of the existing (or baseline) conditions within the study area in sufficient detail to enable potential Project-VC interactions to be identified, understood, and assessed:	3.3	Existing Conditions	Pages 3-10 to 3-11	Appendices 1 to 11
		• A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities				
		• Tervita will consider baseline conditions prior to construction of the original landfill as context for the cumulative effects assessment on environmental, economic, social, heritage, and health effects				
		• Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage, and health setting, irrespective of the changes that may occur as a result of the proposed Project or other Project and/or activities in the area				
		• An explanation of if and how other past and present Projects and activities in the study area have affected or are affecting each VC				
		• Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed				
		• Where additional Project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods, where these are available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application				
		• Description of what TEK, was used in the VC assessment; an effort should be made, and the effort described in the Application, to integrate TEK with western data to identify both mutually supporting conclusions and areas of disagreement. Areas of disagreement may point to areas where further data collection is required				
		The Application will contain the existing (or baseline) technical reports in the Appendices and will summarize key findings contained in these technical reports directly in the Application, in a manner that allows the reader to understand each VC's effects assessment.				

Tervita Corporation Silverberry Secure Landfill Project

Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.4	Potential Effects	The Application will summarize the overall process and methodologies used to identify and assess the potential effects of the proposed Project on the identified VCs.	3.4	Potential Effects	Pages 3-11 to 3-12	
		For each VC section, the Application will:				
		• Identify the potential interactions of the proposed Project and the considered and selected VCs				
		• Identify and describe the potential adverse effects resulting from the proposed Project				
		• Demonstrate how feedback from Aboriginal Groups, the public, stakeholders and government agencies on VC selection and assessment was incorporated, as appropriate				
		The Application will identify any Project activity-VC interactions that were excluded from further assessment, including the methods and criteria used to justify the exclusion and input received from BC EAO, government agencies, Aboriginal groups, and the public regarding the exclusion.				
3.5	Mitigation Measures	For each VC section, the Application will:	3.5	Mitigation Measures	Subsections 3.5.1 – 3.5.2 Pages 3-12 to 3-14	
		• Describe the approach to identify and analyze mitigation measures, including any management and compensation plans proposed by the Proponent, which will be implemented to address potential effects				
		• Describe the mitigation measures incorporated into the Project, including site and route selection, Project scheduling, Project design (for example, equipment selection, placement, and emissions abatement measures), and construction and operation procedures and practices				
		• Identify any mitigation measures associated with land use planning processes or bilateral and government to government agreements				
		• Describe any standard mitigation assumed or proposed to be implemented, including consideration of best management practices, environmental management plans, environmental protection plans, contingency plans, emergency response plans, and other general practices				
		• Clearly indicate how the mitigation measures will mitigate the potential adverse effects on the VC				
		• Provide the rationale for the proposed mitigation measures, including why further avoidance or reduction measures for adverse effects may not be considered feasible, and the need for and scope of any proposed compensation or offset				
		• Evaluate the anticipated success of each mitigation measure and describe rationale and analysis for these evaluations. If there is little relevant or applicable experience with a proposed mitigation measure and there may be some question as to its effectiveness, describe the potential risks and uncertainties associated with use of the mitigation				
		• Include the time required for mitigation to become effective, to enable understanding of the duration of residual effects and the temporal characteristics of reversibility				
		• Summarize the mitigation measures for potential Project effects by Project phase and identify any mitigation measures that are in management or compensation plans				
3.6	Characterization of Residual Effects	The following subsections summarize the assessment criteria to be used in the Application to characterize potential residual effects and make a significance determination.	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	
3.6.1	Context	Context is informed by information on existing conditions, as well as ecological thresholds and levels of existing disturbance. Context provides an indication of the sensitivity and resilience of the VC to effects.	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.6.2	Spatial Boundary	Each VC has a specific definition for the LAA and RAA described under Section 4.0 through Section 8.0 of the EA. The following categories will be used to characterize extent:	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	
		• Project area and Site-specific – Residual effect is restricted to the Project area or a specific area of the LAA				
		• Local – Residual effect is restricted to the LAA				
		• Regional – Residual effect is restricted to the RAA				
		• Beyond Regional – Residual effect extends beyond the RAA				
		• Global – Residual effect extends globally				
		It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, study area boundaries will be revised.				
3.6.3	Temporal Context	Duration (the length of time the residual effect persists (which may be longer than the duration of the physical work or activity that gave rise to the residual effect):	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	
		• Immediate: Residual effect is limited to less than or equal to 2 days				
		• Short-term: Residual effect is limited to the initial construction phase, or any 1 year during the life of the Project				
		• Medium-term: Residual effect extends into the operations phase for up to 10 years				
		• Long-term: Residual effect extends into the operations phase for more than 10 years, but ceases during the operational life of the Project or upon decommissioning				
		• Extended-term: Residual effect extends beyond the decommissioning phase				
		Frequency (how often would the potential residual effect would occur):				
		• Single or Rare: Residual effect occurs one time or rarely occurs				
		• Infrequent: Residual effect occurs infrequently at multiple times				
		• Frequent or Regular: Residual effect occurs frequently, at regular intervals				
		• Continuous: Residual effect occurs continuously				
		Reversibility (period of time over which the residual adverse effect extends):				
		• Reversible: Residual effect is reversible to pre-construction or equivalent conditions • Irreversible: Residual effect is permanent				
		The temporal boundaries identified for the proposed Project include:				
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure/reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.6.4	Magnitude	Magnitude of the residual adverse effect on the Environment, Social, Economic, and Health Pillars:	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	
		• Negligible: There is no detectable change from baseline conditions				
		• Low: The effect results in conditions that differ from the average value for baseline conditions, but remain within the range of natural variation and below a guideline or threshold value where applicable				
		• Medium: The effect results in conditions that differ measurably from the average value for baseline conditions and are equal to or slightly above the limits of natural variation, and/or are equal to or slightly above a guideline or threshold value, where applicable				
		• High: The effect results in conditions that differ substantially from baseline conditions, resulting in a clearly detectable change beyond the range of natural variation, and/or are measurable beyond a guideline or threshold value or at a regional population level, where applicable				
		Magnitude of the residual adverse effect on the Heritage Pillar:				
		• Negligible: No detectable changes to heritage or archaeology sites				
		• Minor: There are detectable changes to heritage or archaeology sites, but limited to small portions of sites of low significance, or portions of sites of higher significance that are already substantially disturbed				
		• Medium: Changes to small but intact portions of heritage or archaeological sites of moderate or high significance, or substantial and intact portions of sites of low significance				
		• High: Changes to substantial and intact heritage or archaeology sites of moderate or high significance				
		Magnitude of the residual adverse effect on GHG Emissions:				
		• Negligible: No measurable contribution to provincial or national emissions; very little or no measurable change based on comparison with national and provincial inventories				
		• Low: Emissions represent a small contribution to provincial or national emissions				
		• Medium: Emissions represent a moderate contribution to provincial or national emissions but are within regulatory limits and objectives				
		• High: Emissions cause exceedances of provincial or national emissions objectives or standards				
		The assessment period for the effects assessment includes planning, construction, operations, and decommissioning phases for the Project. In addition to the phases included in the assessment period of the effects assessment, the assessment period for the cumulative effects assessment includes the planning, construction, and operations phases of activities or projects that have previously occurred and those that are planned (publicly disclosed). The Application will describe, in a table format, the residual effects using the residual effects criteria context, magnitude, extent, duration, reversibility, and frequency, as defined in BC EAO's Guideline for the Selection of VCs and Assessment of Potential Effects (BC EAO 2013a). Where feasible, these criteria will be described quantitatively in the Application for each VC. When residual effects cannot be characterized quantitatively, the Application will characterize these effects qualitatively. Definitions will be provided when qualitative terms are used. The use of any qualitative terms (for example, high, moderate, or low) will be accompanied by distinct definitions for each of these rankings. An explanation will be included for the conclusion reached for each criterion used to characterize a residual effect. When residual effects on a VC are determined and the VC is also considered a “pathway” for other potential effects on other VCs, the Application will identify the linkages between the VCs and the discipline-specific studies to which the information has been forwarded for further evaluation.					

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.7	Likelihood	The Application will assess the likelihood for all residual adverse effects using appropriate quantitative or qualitative terms and sufficient description to understand how the conclusions were reached. Definitions of any qualitative terms, such as 'low', 'moderate', or 'high' probability will be provided.	3.6	Characterization of Residual Effects	Pages 3-14 to 3-16 Table 3.6-1	
		• Low: The effect is unlikely to occur (as in a malfunction or accident or other low probability event)				
		• Medium: The effect may occur, depending upon the effectiveness of mitigation measures				
		• High: The effect will occur should the Project proceed				
3.8	Proponents Determination of significance	The Application will present the process and methodology used to define and evaluate the significance of residual effects, including how the term "significance" has been used in relation to each VC using quantitative and qualitative thresholds. A conclusion of significance of residual adverse effects will be provided for each VC.	3.7	Proponents Determination of significance	Page 3-16	
3.9	Confidence and Risk	The Application will summarize the process and methodology used to evaluate the levels of confidence associated with residual effects predictions and, in particular, how any identified uncertainty may affect either the likelihood or the significance of the predicted residual effect. The Application will also describe any measures to reduce uncertainty through monitoring, adaptive management, or other follow-up programs. The Application will summarize the process and methodology used to determine if additional risk analysis is required. If additional risk analysis is required, the Application will summarize the process and methodology used for this analysis and the conclusions, including the range of likely, plausible and possible outcomes with respect to likelihood and significance.	3.8	Confidence and Risk	Pages 3-16 to 3-17	
3.1	Cumulative Effects Assessment		3.9	Cumulative Effects Assessment	Pages 3-17 to 3-30 Subsections 3.9.1 to 3.9.8 Table 3.9-1 Figures 3.9-1 and 3.9-2	
3.10.1	Identifying Past, Present and Reasonably Foreseeable Projects, and/or Activities	The following development categories will be considered in the Application:				
		• Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project (that is, certain)				
		• Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project (that is, reasonably foreseeable)				
		The preliminary list of reasonably foreseeable projects that will be used in the cumulative effects assessment was developed using regulatory registries of major projects in BC (including BC Major Projects, BC Oil and Gas Commission, Canadian Environmental Assessment Agency, and BC EAO). See preliminary list on pages 26-27 for a minimum list of Projects that must be included (Tervita 2019). The search for future developments will be cut off 3 months prior to the submission of the Amendment Application to allow time for assessment of cumulative effects and mapping.				
		The Application will describe the methodology for identifying potential interactions between residual Project effects and the effects of other developments, including a description of the following:				
		• The spatial boundaries for the cumulative effects assessment for each VC, including maps				
		• The spatial and temporal boundaries of other developments				
		• The potential for interaction (spatial and temporal) and linkages (overlap) of VCs with other developments				
		The Application will include:				
		• A table of all past, present and reasonably foreseeable developments that will be included in the cumulative effects assessment, should one be required for a particular VC				
		• A general description of the information sources used to identify reasonably foreseeable developments and activities				
		• A map showing the location of the Projects and activities				
		• A discussion of cumulative effects since European contact to provide a context for the Project and development in the region				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
3.10.2	Conducting a Cumulative Effects Assessment	The Application will summarize the process and methodology used to conduct the cumulative effects assessment, including the identification of potential cumulative effects, identification of additional mitigation measures, and evaluation of any (residual) cumulative effects using the same methodology described above in Sections 3.6 to 3.9 of this AAIR template.	See above	See above	See above	
3.11	Follow-up Strategy	Where a residual adverse effect and/or cumulative effect has been identified for a specific VC, the Application will include a description of a follow-up strategy, where appropriate, that:	3.10	Follow-up Strategy	Page 3-30	
		• Identifies the measures to evaluate the accuracy of the original effects prediction				
		• Identifies the measures to evaluate the effectiveness of proposed mitigation measures				
		• Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected; this includes reference to further mitigation, involvement of key stakeholders, Aboriginal groups, government agencies, and any other measures deemed necessary to manage the issue				
		• The follow-up strategy shall be sufficiently described with timelines and structures such that its efficacy can be assessed				
4	Environmental Affects Assessment	The Application will include an assessment of Environmental Effects VCs identified in the AAIR. The assessment will be conducted in accordance with the methodology specified in Section 3.0, Assessment Methodology of the AAIR, using the organizational structure demonstrated in this section.	4	Environmental Affects Assessment	Page 4-1	
4.1	Terrain and Soils	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.1	Terrain and Soils	Pages 4-1 to 4-10 Table 4.1-1	
		The Terrain and Soils VC includes the following subcomponents: Soils and Terrain				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Terrain and Soils VC include soil quality and erosion.				
4.1.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Terrain and Soils VC.	4.1.1	Assessment Boundaries	Page 4-1	
4.1.1.1	Spatial Boundaries	The spatial boundaries for the Terrain and Soils VC are shown on Figure A 2 and Figure A 3 and include the Project Footprint as well as:	4.1.1.1	Spatial Boundaries	Page 4-2	
		• LAA - Same as Project Footprint				
		• RAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
4.1.1.2	Temporal Boundaries	The temporal boundaries identified for the Terrain and Soils VC include:	4.1.1.2	Temporal Boundaries	Page 4-2	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
4.1.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Terrain and Soils VC at this time.	4.1.1.3	Administrative Boundaries	Page 4-2	
4.1.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Terrain and Soils VC at this time.	4.1.1.4	Technical Boundaries	Page 4-2	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.1.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions, of this AAIR template.	4.1.2 to 4.1.3	Existing Conditions	Subsections 4.1.2.1 to 4.1.2.4 Pages 4-2 to 4-6 Figure 4.1-1	Appendix 1
		The following methods of data collection will be used to inform the description of existing conditions for the Terrain and Soils VC:				
		• Desktop review of provincial and regional information sources				
		• Site investigations and field data collection efforts, including results of soil sampling activities conducted in August 23 and 24, 2016 (provided in report dated March 6, 2017)				
		• Field Manual for Describing Terrestrial Ecosystems - Second Edition (BC Ministry of Forests and Range and BC Ministry of Environment 2010)				
		• CCME Environmental Quality Guidelines (CCME 2014) and BC Contaminated Sites Regulation				
		• Existing information will be provided in the Contaminated Soils Technical Report, which will be attached as an appendix to the Amendment Application and will include the results of the soil sampling activities conducted August 23 and 24, 2016				
4.1.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template.	4.1.4	Terrain and Soils Effects Assessment	Subsections 4.1.3.1 to 4.1.3.3 Pages 4-8 to 4-10 Table 4.1-2	
		The proposed Project is anticipated to interact with the Terrain and Soils VC during the following construction, operations, and closure/reclamation activities:				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
4.1.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.1.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.1.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination, and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.1.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.1.5	Follow-up Strategy	Page 4-9	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.2	Air Quality	The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.2	Air Quality	Page 4-11 Table 4.2-1	Appendix 2
		The Air Quality VC includes the following subcomponents: • Dust, odours, emissions from combustion, fugitive emissions, and emissions for other sources				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Air Quality VC include:				
		• Visible dust				
		• Detectable odour at sensitive receptor				
		• Ambient air concentrations of particulate matter, nitrogen oxides, and other landfill gases				
		• VOCs				
		• GHG emissions				
4.2.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Air Quality VC.	4.2.1	Assessment Boundaries	Page 4-11	
4.2.1.1	Spatial Boundaries	The spatial boundaries for the Air Quality VC are shown on Figure A 3 and include the Project Footprint as well as:	4.2.1.1	Spatial Boundaries	Page 4-11	
		• RAA – A 10-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
4.2.1.2	Temporal Boundaries	The temporal boundaries identified for the Air Quality VC include:	4.2.1.2	Temporal Boundaries	Page 4-11	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure/reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
4.2.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Air Quality VC at this time.	4.2.1.3	Administrative Boundaries	Page 4-12	
4.2.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Air Quality VC at this time.	4.2.1.4	Technical Boundaries	Page 4-12	
4.2.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AAIR template.	4.2.2 – 4.2.3	Existing Conditions	Pages 4-12 to 4-15 Subsections 4.2.2.1 – 4.2.2.2 Tables 4.2-2, 4.2-3, and 4.2-4	
		The following methods of data collection will be used to inform the description of existing conditions for the Air Quality VC:				
		• Desktop review of Environment and Climate Change Canada and BC air monitoring station data				
		• Bi-annual air monitoring to determine the effect of received NORM waste on air quality at the site				
		• Information from other ongoing monitoring and data collection efforts, including the results of VOC air sampling activities conducted August 23 and 24, 2016 (provided in report dated October 28, 2016).				
		• A review of the nature and number of equipment to be used, and review of the nature of landfill waste and likely construction equipment emissions and odours.				
		• Existing information and recommendations for ongoing monitoring will be provided in the Air Quality Technical Report, which will be attached as an appendix to the Amendment Application and will include the results of the VOC air sampling activities conducted August 23 and 24, 2016.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.2.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template.	4.2.4	Air Quality Affects assessment	Pages 4-13 to 4-16 Subsections 4.2.4.1 to 4.2.4.5 Tables 4.2-5, 4.2-6, and 4.2-7	
		The proposed Project is anticipated to interact with the Air Quality VC during the following construction, operations, and closure and reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Air quality and dust dispersion and deposition of contaminants, including the results of modelling to assess potential effects within the RAA				
		• Cell capping				
4.2.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.2.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template. Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.2.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present, and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section, 3.10.1, Identifying Past, Present, or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.2.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.2.5	Follow-up Strategy	Page 4-19	
4.3	Acoustic Environment	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection, of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.3	Acoustic Environment	Page 4-19 Table 4.3-1	
		The Acoustic Environment VC includes the following subcomponents: • Wildlife and Land and Resource Use				
		The KI that will be used to measure the potential adverse effects of the proposed Project on the Acoustic Environment VC is: • Noise levels and Level of Annoyance				
4.3.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Acoustic Environment VC.	4.3.1	Assessment Boundaries	Page 4-19	

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4.3.1.1	Spatial Boundaries	The spatial boundaries for the Acoustic Environment VC are shown on Figures A 2 and Figure A 3 and include the Project Footprint as well as: • LAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities • RAA – A 5-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities	4.3.1.1	Spatial Boundaries	Page 4-19	
4.3.1.2	Temporal Boundaries	The temporal boundaries identified for the Acoustic Environment VC include: • Construction phase (approximately 6 months at the initiation of the proposed Project) • Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25) • Closure and reclamation phase (approximately 1 year following operations – Year 26) • Post-closure phase (approximately 25 years – Years 26 to 51)	4.3.1.2	Temporal Boundaries	Page 4-19	
4.3.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Acoustic Environment VC at this time.	4.3.1.3	Administrative Boundaries	Page 4-20	
4.3.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Acoustic Environment VC at this time.	4.3.1.4	Technical Boundaries	Page 4-17	
4.3.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions, of this AAIR template. The following methods of data collection will be used to inform the description of existing conditions for the Acoustic Environment VC: • Desktop review of provincial and regional information sources • A review of the nature and number of equipment to be used during construction • A qualitative noise study based on observed increases above current facility level, if any • Noise pathways will feed into the SLHHRA, and the assessment of effects on Wildlife and Wildlife Habitat and TLU	4.3.2 – 4.3.3	Existing Conditions	Page 4-20 - 4-21	
4.3.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template. The proposed Project is anticipated to interact with the Acoustic Environment VC during the following construction, operations, and closure/reclamation activities: • Transportation/mobilization of equipment and workers to site • Waste acceptance, placement, and compaction • Leachate management, storm water management, and ongoing monitoring • Cell capping • Post-closure maintenance and monitoring	4.3.4	Acoustic Environmental Effects Assessment	Pages 4-21 to 4-23 Subsections 4.3.4.1 to 4.3.4.4 Tables 4.3-2 and 4.3-3	
4.3.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.3.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.	See above	See above	See above	
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.3.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.3.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.3.5	Follow-up Strategy	Page 4-24	
4.4	Surface Water	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection, of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.4	Surface Water	Page 4-24 Table 4.4-1	
		The Surface Water VC includes the following subcomponents: • Water quality • Water quantity				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Surface Water VC include: • Water quality parameters (for example,, sediment, metals, hydrocarbons, perceived taste and smell) Water volume and movement				
4.4.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Surface Water VC.	4.4.1	Assessment Boundaries	Page 4-25	
4.4.1.1	Spatial Boundaries	The spatial boundaries for the Surface Water VC are shown on Figure A 2 and Figure A 3 and include the Project Footprint as well as:	4.4.1.1	Spatial Boundaries	Page 4-25	
		• LAA – A 500-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
		• RAA – The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site				
4.4.1.2	Temporal Boundaries	The temporal boundaries identified for the Surface Water VC include:	4.4.1.2	Temporal Boundaries	Page 4-25	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.4.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Surface Water VC at this time.	4.4.1.3	Administrative Boundaries	Page 4-26	
4.4.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Surface Water VC at this time.	4.4.1.4	Technical Boundaries	Page 4-26	
4.4.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AAIR template.	4.4.2 – 4.4.3	Existing Conditions	Pages 4-26 to 4-27 Subsections 4.4.2.1 to 4.4.2.3	Appendix 3 and 4
		The following methods of data collection will be used to inform the description of existing conditions for the Surface Water VC:				
		• Desktop review of provincial and regional information sources				
		• Information from site investigations, ongoing surface water discharge analytical data at the existing facility and data collection efforts				
		• Comparison of the surface water quality data to the BC WQGs, at a minimum; this comparison should cover a number of water uses including aquatic life, wildlife, agriculture, and drinking water and if there are no BC WQGs applicable, Tervita could expand their comparison to other guidelines such as CCME guidelines				
4.4.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template.	4.4.4	Surface Water Effects Assessment	Page 2-27 to 4-32 Subsections 4.4.3.1 to 4.4.3.4 Tables 4.4-2 and 4.4-3	
		The proposed Project is anticipated to interact with the Surface Water VC during the following construction, operations, and closure/reclamation activities:				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
4.4.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.4.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.4.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.4.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.4.5	Follow-up Strategy	Page 4-32	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.5	Groundwater	The Application will identify the VCs selected for assessment according to the methodology specified in section 3.1 Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.5	Groundwater	Page 4-28 Table 4.5-1	Appendix 2
		The Groundwater VC includes the following subcomponents: • Water quality • Water quantity				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Groundwater VC include:				
		• Water quality parameters (for example,, inorganic parameters, ions, dissolved metals, perceived taste and smell, and other contaminants)				
		• Water volume and movement				
4.5.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Groundwater VC.	4.5.1	Assessment Boundaries	Page 4-33	
4.5.1.1	Spatial Boundaries	The spatial boundaries for the Groundwater VC are shown on Figures 3.2-1 and 3.2-2 of the EA and include the Project Footprint as well as:	4.5.1.1	Spatial Boundaries	Page 4-33	
		• LAA – A 500-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
		• RAA – The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site				
4.5.1.2	Temporal Boundaries	The temporal boundaries identified for the Groundwater VC include:	4.5.1.2	Temporal Boundaries	Page 4-33 – 4-34	
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
4.5.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Groundwater VC at this time.	4.5.1.3	Administrative Boundaries	Page 4-34	
4.5.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Groundwater VC at this time.	4.5.1.4	Technical Boundaries	Page 4-34	
4.5.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AAIR template.	4.5.2 – 4.5.3	Existing Conditions	Pages 4-43 to 4-35 Subsections 4.5.2.1 to 4.5.2.3	Appendix 5
		The following methods of data collection will be used to inform the description of existing conditions for the Groundwater VC:				
		• Desktop review of provincial and regional information sources				
		• Information from site investigations and data collection efforts (that is,, annual groundwater monitoring program)				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.5.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4, Potential Effects, of this AAIR template.	4.5.4	Groundwater Effects Assessment	Pages 4-36 - 4-38 Subsections 4.5.4.1 - 4.5.4.4 Tables 4.5-2, 4.5-3	
		The proposed Project is anticipated to interact with the Groundwater VC during the following construction, operations, and closure and reclamation activities:				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
4.5.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.5.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk of this AAIR template.				
4.5.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with section 3.10.2 Conducting a Cumulative Effects Assessment of this AAIR template				
		• Identify any additional mitigation measures, consistent with section 3.5 Mitigation Measures of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk of this AAIR template				
4.5.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy of this AAIR template.	4.5.5	Follow-up Strategy	Page 4-38	
4.6	Terrestrial Vegetation	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.6	Terrestrial Vegetation	Page 4-39 Table 4.6-1	Appendix 4
		The Terrestrial Vegetation VC includes the following subcomponents:				
		• Plant species of concern, including rare plant species and plant species used for traditional purposes				
		• Vegetation communities of concern				
		• Invasive plant species				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Terrestrial Vegetation VC include:				
		• Loss of plant species of concern, including rare plant species and plant species used for traditional purposes				
		• Loss of vegetation communities of concern				
		• Vegetation uptake of contaminants from air quality and dust dispersion and deposition				
		• Introduction or spread of Noxious weeds				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.6.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Terrestrial Vegetation VC.	4.6.1	Assessment Boundaries	Page 4-39	
4.6.1.1	Spatial Boundaries	The spatial boundaries for the Terrestrial Vegetation VC are shown on Figures A-2 and A-3, and include the Project Footprint as well as: • LAA – A 100-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities • RAA – A 1 km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities	4.6.1.1	Spatial Boundaries	Page 4-39 – 4-40	
4.6.1.2	Temporal Boundaries	The temporal boundaries identified for the Terrestrial Vegetation VC include: • Construction phase (approximately 6 months at the initiation of the proposed Project) • Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25) • Closure and reclamation phase (approximately 1 year following operations – Year 26) • Post-closure phase (approximately 25 years – Years 26 to 51)	4.6.1.2	Temporal Boundaries	Page 4-40	
4.6.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Terrestrial Vegetation VC at this time.	4.6.1.3	Administrative Boundaries	Page 4-40	
4.6.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Terrestrial Vegetation VC at this time.	4.6.1.4	Technical Boundaries	Page 4-40	
4.6.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with section 3.3 Existing Conditions of this AAIR template. The following methods of data collection will be used to inform the description of existing conditions for the Terrestrial Vegetation VC: • Desktop review of provincial and regional information sources • Information from site investigations and data collection efforts • Noxious weed information received from Peace River Regional District • Soil sampling program for the Potential Dust Migration Area Field survey based on the following: • Protocols for Rare Plant Surveys (Penny and Klinkenberg 2013) • Field Manual for Describing Terrestrial Ecosystems – Second Edition (BC Ministry of Forests and Range and BC Ministry of Environment 2010) • Field Guide to Noxious and Other Selected Weeds of BC – Fourth Edition (Cranston et al. 2014) Existing information will be provided in the Vegetation Technical Report, which will be attached as an appendix to the Amendment Application.	4.6.2 – 4.6.3	Existing Conditions	Page 4-41 Subsections 4.6.2.1 & 4.6.2.2	Appendix 6

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.6.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4, Potential Effects, of this AAIR template.	4.6.4	Terrestrial Vegetation Effects Assessment	Pages 4-42 to 4-45 Subsections 4.6.4.1 to 4.6.4.4 Tables 4.6-2 and 4.6-3	
		The proposed Project is anticipated to interact with the Terrestrial Vegetation VC during the following construction, operations, and closure/reclamation activities:				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Cell capping				
		• Post-closure maintenance and monitoring				
		• Vegetation uptake of contaminants from air quality and dust dispersion and deposition				
4.6.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.6.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.6.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.6.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.6.5	Follow-up Strategy	Page 4-45	
4.7	Fish and Fish Habitat	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.7	Fish and Fish Habitat	Page 4-45 Table 4.7-1	
		The Fish and Fish Habitat VC includes the following subcomponent:				
		• Fish species of management interest and their habitat, including fish species of concern to First Nations				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Fish and Fish Habitat VC include:				
		• Change in habitat (including possible effects to the food chain, such as effects to invertebrates through contamination or loss of habitat that have an effect on fish species of management interest and fish species of concern to First Nations)				
		• Change in mortality risk				
4.7.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Fish and Fish Habitat VC.	4.7.1	Assessment Boundaries	Page 4-46	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.7.1.1	Spatial Boundaries	The spatial boundaries for the Fish and Fish Habitat VC are shown on Figure A 2 and Figure A 3 and include the Project Footprint as well as:	4.7.1.1	Spatial Boundaries	Pages 4-39 to 4-46	
		• LAA – A 500-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
		• RAA – The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site				
4.7.1.2	Temporal Boundaries	The temporal boundaries identified for the Fish and Fish Habitat VC include:	4.7.1.2	Temporal Boundaries	Page 4-46	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
4.7.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Fish and Fish Habitat VC at this time.	4.7.1.3	Administrative Boundaries	Page 4-47	
4.7.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Fish and Fish Habitat VC at this time.	4.7.1.4	Technical Boundaries	Page 4-47	
4.7.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3 Existing Conditions of this AAIR template.	4.7.2 – 4.7.3	Existing Conditions	Page 4-40	
		The following methods of data collection will be used to inform the description of existing conditions for the Fish and Fish Habitat VC:				
		• Desktop review of provincial and regional information sources				
		• Information from site investigations, ongoing surface water discharge analytical data at the existing facility and data collection efforts				
		• Traditional Knowledge information regarding species presence, abundance, and distribution				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.7.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4, Potential Effects, of this AAIR template.	4.7.4	Fish and Fish Habitat Effects Assessment	Page 4-48 Subsections 4.7.4.1 to 4.7.2.4	
		The proposed Project is anticipated to interact with the Fish and Fish Habitat VC during the following construction, operations, and closure and reclamation activities:				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
4.7.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
4.7.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
4.7.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.7.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.7.5	Follow-up Strategy	Page 4-48	

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Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.8	Wildlife and Wildlife Habitat	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	4.8	Wildlife and Wildlife Habitat	Page 4-48 Table 4.8-1	Appendices 5 to 8
		The Wildlife and Wildlife Habitat VC includes the following subcomponents:				
		• Moose				
		• Other ungulates (including deer)				
		• Black bear				
		• Furbearers (including species of importance to First Nations such as porcupine and beaver)				
		• Mature and old-forest birds				
		• Early seral forest birds				
		• Western toad				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Wildlife and Wildlife Habitat VC include:				
		• Change in habitat (including usage of mineral licks, changes to diet, and vegetation uptake of contaminants from air quality and dust dispersion)				
		• Change in movement and distribution				
		• Change in mortality risk				
4.8.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Wildlife and Wildlife Habitat VC.	4.8.1	Assessment Boundaries	Page 4-48	
4.8.1.1	Spatial Boundaries	The spatial boundaries for the Wildlife and Wildlife Habitat VC are shown on Figure A 2 and Figure A 3 and include the Project Footprint as well as:	4.8.1.1	Spatial Boundaries	Page 4-48	
		• LAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
		• RAA – A 5-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
4.8.1.2	Temporal Boundaries	The temporal boundaries identified for the Wildlife and Wildlife Habitat VC include:	4.8.1.2	Temporal Boundaries	Page 4-48	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
4.8.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Wildlife and Wildlife Habitat VC at this time.	4.8.1.3	Administrative Boundaries	Page 4-50	
4.8.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Wildlife and Wildlife Habitat VC at this time.	4.8.1.4	Technical Boundaries	Page 4-50	

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Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.8.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions, of this AAIR template.	4.8.2 – 4.8.3	Existing Conditions	Pages 4-50 to 4-52 Subsections 4.8.2.1 to 4.8.2.3	Appendix 7, 8, 9 and 10
		The following methods of data collection will be used to inform the description of existing conditions for the Wildlife and Wildlife Habitat VC:				
		• Desktop review of provincial and regional information sources				
		• Site investigations and data collection efforts				
		• Soil sampling program for the Potential Dust Migration Area				
		• Traditional Knowledge information regarding species presence, abundance, distribution, and the presence of game trails, bear dens, stick nests, lick sites, amphibian movement corridors, etc.				
		Field survey based on the following:				
		• Inventory Methods for Forest and Grassland Songbirds (BC Ministry of Environment, Lands, and Parks 1999)				
		• Inventory Methods for Raptors (BC Ministry of Sustainable Resource Management 2001)				
		Existing information will be provided in the Wildlife and Wildlife Habitat Technical Report, which will be attached as an appendix to the Amendment Application.				
4.8.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4 Potential Effects of this AAIR template.	4.8.4	Wildlife and Wildlife Habitat Effects Assessment	Page 4-52 to 4-59 Subsections 4.8.4.1 to 4.8.4.8 Table 4.8-2 and 4.8-3	
		The proposed Project is anticipated to interact with the Wildlife and Wildlife Habitat VC during the following construction, operations, and closure/reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
		• Air quality and dust dispersion, deposition and vegetation uptake of contaminants				
4.8.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other Sections in the Application must be identified.				
4.8.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
4.8.6	Cumulative Effects and their Significance	Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.	See above	See above	See above	
		If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
4.8.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	4.8.5	Follow-up Strategy	Page 4-50	
5	Economic Effects Assessment	The Application will include an assessment of economic VCs identified in the AAIR. The assessment will be conducted in accordance with the methodology specified in Section 3.0, Assessment Methodology, of this AAIR template and reported using the organizational structure demonstrated in the Section 4.0, Environmental Effects Assessment.	5	Economic Effects Assessment	Page 5-1	
5.1	Economy	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1 Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	5.1	Economy	Page 5-1 Table 5.1-1	
		The Economy VC includes the following subcomponents:				
		• Resource-based economy				
		• Barter economy				
		• Employment				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Economy VC include:				
		• Economic activity levels in the LAA and RAA				
		• Employment levels				
5.1.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative, and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Economy VC.	5.1.1	Assessment Boundaries	Page 5-1	
5.1.1.1	Spatial Boundaries	The spatial boundaries for the Economy VC are shown on Figures 3.2-3 and 3.2-4 of this EA and include the Project Footprint as well as:	5.1.1.1	Spatial Boundaries	Page 5-1	
		• LAA – Includes municipalities and communities, including First Nations communities, where it can be reasonably expected that direct economic activities will be conducted; these communities include Blueberry First Nations, Doig River First Nation, the Community of Buick, and the City of Fort St. John				
		• RAA – The area within Electoral Area B of the Peace River Regional District				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
5.1.1.2	Temporal Boundaries	The temporal boundaries identified for the Economy VC include:	5.1.1.2	Temporal Boundaries	Page 5-2	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
5.1.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Economy VC at this time.	5.1.1.3	Administrative Boundaries	Page 5-2	
5.1.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Economy VC at this time.	5.1.1.4	Technical Boundaries	Page 5-2	
5.1.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions, of this AAIR template.	5.1.2 – 5.1.3	Existing Conditions	Pages 5-2 to 5-3 Subsections 5.1.2.1 to 5.1.2.3	
		The following methods of data collection will be used to inform the description of existing conditions for the Economy VC:				
		• Desktop review of economic activity in the LAA and RAA, using provincial, regional, and municipal information sources				
5.1.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4 Potential Effects of this AAIR template.	5.1.4	Economic Effects Assessment	Pages 5-3 to 5-6 Subsections 5.1.4.1 to 5.1.4.5 Tables 5.1-2 and 5.1-3	
		The proposed Project is anticipated to interact with the Economy VC during the following construction, operations, and closure and reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
5.1.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
5.1.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
5.1.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:	See above	See above	See above	
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
5.1.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	5.1.5	Follow-up Strategy	Page 5-6	
6	Social Effects Assessment	The Application will include an assessment of social VCs identified in the AAIR. The assessment will be conducted in accordance with the methodology specified in Section 3.0, Assessment Methodology, of this AAIR template and reported using the organizational structure demonstrated in the Section 4.0, Environmental Effects Assessment.	6	Social Effects Assessment	Page 6-1	
6.1	Land and Resource Use	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	6.1	Land and Resource Use	Page 6-1 Table 6.1-1	
		The Land and Resource Use VC includes the following subcomponents:				
		• Agriculture				
		• Oil and gas activity				
		• Trapping				
		• First Nation land and resource use including, but not limited to, hunting and trapping, as well as travel to First Nation land and resource use sites				
		• Logging/forestry				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Land and Resource Use VC include:				
		• Area of grazing tenures and Agricultural Land Reserve affected				
		• Oil and gas infrastructure and pipeline tenures affected				
		• Viability of trapping tenures				
		• Viability of identified First Nation land and resource use sites				
6.1.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Land and Resource Use VC.	6.1.1	Assessment Boundaries	Page 6-1	
6.1.1.1	Spatial Boundaries	The spatial boundaries for the Land and Resource Use VC are shown on Figure A 2 and Figure A 3 and include the Project Footprint as well as:	6.1.1.1	Spatial Boundaries	Page 6-1	
		• LAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				
		• RAA – A 5-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
6.1.1.2	Temporal Boundaries	The temporal boundaries identified for the Land and Resource Use VC include:	6.1.1.2	Temporal Boundaries	Page 6-2	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
6.1.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Land and Resource Use VC at this time.	6.1.1.3	Administrative Boundaries	Page 6-2	
6.1.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Land and Resource Use VC at this time.	6.1.1.4	Technical Boundaries	Page 6-2	
6.1.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3 Existing Conditions of this AAIR template.	6.1.2	Existing Conditions	Page 6-2 to 6-5 Subsections 6.1.2.1 to 6.1.2.5	
		The following methods of data collection will be used to inform the description of existing conditions for the Land and Resource Use VC:				
		• Desktop review of provincial and regional information sources				
		• Discussion with local land users, including First Nations				
		• Review of available First Nations Traditional Use Studies				
6.1.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4, Potential Effects, of this AAIR template.	6.1.3	Land and Resource Use Effects Assessment	Pages 6-5 to 6-7 Subsections 6.1.3.1 to 6.1.3.3 Table 6.1-2	
		The proposed Project is anticipated to interact with the Land and Resource Use VC during the following construction, operations, and closure/reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Cell capping				
		• Post-closure maintenance and monitoring				
6.1.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
6.1.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk of this AAIR template.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
6.1.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:	See above	See above	See above	
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7 Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
6.1.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	6.1.4	Follow-up Strategy	Page 6-7	
6.2	Community Services	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	6.2	Community Services	Page 6-7 Table 6.2-1	
		The Community Services VC includes the following subcomponent: • Community utilities and services				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Community Services VC include:				
		• Community and utility services capacity and demand				
		• Accommodation capacity and demand				
		• Health service impacts				
6.2.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Community Services VC.	6.2.1	Assessment Boundaries	Page 6-7	
6.2.1.1	Spatial Boundaries	The spatial boundaries for the Community Services VC are shown on Figure A 4 and Figure A 5 and include the Project Footprint as well as:	6.2.1.1	Spatial Boundaries	Page 6-7	
		• LAA – The areas within the boundaries of the City of Fort St. John and the Community of Buick				
		• RAA – The area within Electoral Area B of the Peace River Regional District				
6.2.1.2	Temporal Boundaries	The temporal boundaries identified for the Community Services VC include:	6.2.1.2	Temporal Boundaries	Page 6-7	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
6.2.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic, or social boundaries on an EA. No administrative boundaries have been identified for the Community Services VC at this time.	6.2.1.3	Administrative Boundaries	Page 6-8	
6.2.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Community Services VC at this time.	6.2.1.4	Technical Boundaries	Page 6-8	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
6.2.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions, of this AAIR template.	6.2.2 – 6.2.3	Existing Conditions	Page 6-7 Subsection 6.2.2.1	
		The following methods of data collection will be used to inform the description of existing conditions for the Community Services VC:				
		• Desktop review of provincial, regional, and municipal information sources.				
6.2.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with section 3.4 Potential Effects of this AAIR template.	6.2.4	Community Services Effects Assessment	Pages 6-8 to 6-10 Subsections 6.2.4.1 and 6.2.4.2 Table 6.2-2	
		The proposed Project is anticipated to interact with the Community Services VC during the following construction, operations, and closure and reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Post-closure maintenance and monitoring				
6.2.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
6.2.5	Residual Effects and Their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
6.2.6	Cumulative Effects and Their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
6.2.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	6.2.4	Follow-up Strategy	Page 6-10	
6.3	Community Infrastructure	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	6.3	Community Infrastructure	Pages 6-10 to 6-11 Table 6.3-1	
		The Community Infrastructure VC includes the following subcomponent: • Traffic and transportation infrastructure				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Community Infrastructure VC include:				
		• Traffic volumes				
		• Transportation infrastructure disturbance				
6.3.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Community Infrastructure VC.	6.3.1	Assessment Boundaries	Page 6-11	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
6.3.1.1	Spatial Boundaries	The spatial boundaries for the Community Infrastructure VC are shown on Figures A-4 and A-5 and include the Project Footprint as well as:	6.3.1.1	Spatial Boundaries	Page 6-11	
		• LAA – The areas within the boundaries of the City of Fort St. John and the Community of Buick				
		• RAA – The area within Electoral Area B of the Peace River Regional District				
6.3.1.2	Temporal Boundaries	The temporal boundaries identified for the Community Infrastructure VC include:	6.3.1.2	Temporal Boundaries	Page 6-11	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure and reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
6.3.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic, or social boundaries on an EA. No administrative boundaries have been identified for the Community Infrastructure VC at this time.	6.3.1.3	Administrative Boundaries	Page 6-11	
6.3.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Community Infrastructure VC at this time.	6.3.1.4	Technical Boundaries	Page 6-11	
6.3.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3 Existing Conditions of this AAIR template.	6.3.2 – 6.3.3	Existing Conditions	Page 6-12 Subsection 6.3.2.1	
		The following methods of data collection will be used to inform the description of existing conditions for the Community Infrastructure VC:				
		• Desktop review of provincial, regional, and municipal information sources.				
6.3.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4 Potential Effects of this AAIR template.	6.3.4	Community Infrastructure Effects Assessment	Page 6-12 to 6-14 Subsections 6.3.4.1 to 6.3.4.2 Table 6.3-2	
		The proposed Project is anticipated to interact with the Community Infrastructure VC during the following construction, operations, and closure and reclamation activities:				
		• Transportation/mobilization of equipment and workers to site				
		• Post-closure maintenance and monitoring				
6.3.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other Sections in the Application must be identified.				
6.3.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6 Characterization of Residual Effects of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
6.3.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:	See above	See above	See above	
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
6.3.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	6.3.5	Follow-up Strategy	Page 6-14	
7	Cultural and Heritage Effects Assessment	The Application will include an assessment of heritage VCs identified in the AAIR. The assessment will be conducted in accordance with the methodology specified in Section 3.0, Assessment Methodology, of this AAIR template and reported using the organizational structure demonstrated in Section 4.0, Environmental Effects Assessment.	7	Cultural and Heritage Effects Assessment	Page 7-1	
7.1	Cultural and Heritage Resources	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1, Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	7.1	Culture and Heritage	Page 7-1 Table 7.1-1	
		The Cultural and Heritage Resources VC includes the following subcomponents: • Archaeological sites • Historic sites				
		The KI that will be used to measure the potential adverse effects of the proposed Project on the Cultural and Heritage Resources VC is:				
		• Characteristics, conditions, and location of archaeological and heritage sites, if any				
7.1.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative, and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Cultural and Heritage Resources VC.	7.1.1	Assessment Boundaries	Page 7-1	
7.1.1.1	Spatial Boundaries	The spatial boundaries for the Cultural and Heritage Resources VC are shown on Figure A 3 and include the Project Footprint as well as:	7.1.1.1	Spatial Boundaries	Page 7-1	
		• LAA - Same as Project Footprint				
		• RAA – The area within all Borden Blocks crossed by the proposed Project. A Borden Block measures 16 km x 16 km and is a terrestrial mapping system used to permanently name and register archaeological sites				
7.1.1.2	Temporal Boundaries	The temporal boundaries identified for the Cultural and Heritage Resources VC include:	7.1.1.2	Temporal Boundaries	Page 7-2	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
7.1.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Cultural and Heritage Resources VC at this time.	7.1.1.3	Administrative Boundaries	Page 7-2	
7.1.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Cultural and Heritage Resources VC at this time.	7.1.1.4	Technical Boundaries	Page 7-2	

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
7.1.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3, Existing Conditions of this AAIR template.	7.1.2 – 7.1.3	Existing Conditions	Pages 7-2 to 7-3	
		The following methods of data collection will be used to inform the description of existing conditions for the Cultural and Heritage Resources VC:				
		• An initial desktop review to document previously recorded archaeological and historic sites in proximity to the proposed Project and to identify areas of potential for heritage resources				
		• Note: There are no changes to the Project Footprint as proposed in the original Project Approval Certificate Application and subsequently approved for development by the former Ministry of Sustainable Resource Management (Archaeological Planning and Assessment), therefore, an Archaeological Impact Assessment will not be required for the proposed Project				
7.1.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4 Potential Effects of this AAIR template.	7.1.4	Culture and Heritage Effects Assessment	Pages 7-3 to 7-4 Subsection 7.1.4.1 and 7.1.4.2 Table 7.1-2	
		The proposed Project is anticipated to interact with the Heritage Resources VC during the following activities:				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
7.1.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5 Mitigation Measures of this AAIR template. Relevant management plans will be referenced. Linkages to other sections in the Application must be identified.				
7.1.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6 Characterization of Residual Effects of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				
7.1.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:				
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1, Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities, of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7 Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
7.1.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy, of this AAIR template.	7.1.5	Follow-up Strategy	Page 7-4	
8	Health Effects Assessment	The Application will include an assessment of health VCs identified in the AAIR. The assessment will be conducted in accordance with the methodology specified in Section 3.0, Assessment Methodology, of this AAIR template and reported using the organizational structure demonstrated in Section 4.0, Environmental Effects Assessment.	8	Health Effects Assessment	Page 8-1	Appendix 9

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
8.1	Human Health	The Application will identify the VCs selected for assessment according to the methodology specified in Section 3.1 Issues Scoping and Selection of VCs. The Application will also include the rationale for any differences in the list of VCs presented in the Application from those listed in the final AAIR.	8.1	Selection of VCs and KIs	Page 8-1 Table 8.1-1	
		The Human Health VC includes the following subcomponents:				
		• Soil quality				
		• Air quality				
		• Water quality				
		• Leachate quality				
		• Visual quality				
		• Noise				
		• NORM				
		• Quality of vegetation, fish, wildlife, and water consumed as country foods, including consumption of First Nation-specific foods				
		The KIs that will be used to measure the potential adverse effects of the proposed Project on the Human Health VC include:				
		• Indicators under the Terrain and Soils, Air Quality, Acoustic Environment, Vegetation, Fish and Fish Habitat, Wildlife and Wildlife Habitat and Surface Water VCs as applicable				
		• NORM levels				
		• Traffic-related injuries				
		• Radiological risk assessment				
		• Community health				
		• Other indicators if developed through SLHHRA and consultation on social/cultural determinants of health				
8.1.1	Context and Boundaries	The Application will identify the spatial, temporal, administrative and technical study area boundaries, as applicable of the VC, including maps, in a manner consistent with Section 3.2, Assessment Boundaries, of the AAIR template. The following assessment boundaries have been defined for the Human Health VC.	8.2	Assessment Boundaries	Page 8-2	
8.1.1.1	Spatial Boundaries	The spatial boundaries for the Human Health VC are shown on Figures A-2 and A-3 of the EA and include the Project Footprint as well as:	8.2.1	Spatial Boundaries	Pages 8-3 to 8-4 Table 8.2-1	
		• LAA – The maximum extent of the area encompassed by the Acoustic Environment LAA, the Surface Water LAA, and the Groundwater LAA				
		• RAA – The maximum extent of the area encompassed by the Acoustic Environment RAA, the Air Quality RAA, the Surface Water RAA, the Groundwater RAA, the Fish and Fish Habitat RAA, and the Wildlife and Wildlife Habitat RAA				
8.1.1.2	Temporal Boundaries	The temporal boundaries identified for the Human Health VC include:	8.2.2	Temporal Boundaries	Page 8-5	
		• Construction phase (approximately 6 months at the initiation of the proposed Project)				
		• Operations phase, including ongoing landfill clearing and construction activities, and progressive closure (approximately 25 years – Years 1 to 25)				
		• Closure/reclamation phase (approximately 1 year following operations – Year 26)				
		• Post-closure phase (approximately 25 years – Years 26 to 51)				
8.1.1.3	Administrative Boundaries	Administrative boundaries refer to the effects of political, economic or social boundaries on an EA. No administrative boundaries have been identified for the Human Health VC at this time.	8.3	Regulatory and Policy Setting	Pages 8-4 to 8-5 Subsections 8.3.1.1 to 8.3.1.5	
8.1.1.4	Technical Boundaries	Technical boundaries refer to a proponent's ability to predict the effects of a Project. No technical boundaries have been identified for the Human Health VC at this time.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
8.1.2	Existing Conditions	The Application will summarize existing conditions in a manner consistent with Section 3.3 Existing Conditions of this AAIR template.	8.4	Existing Conditions and Context	Pages 8-7 to 8-12 Subsections 8.4.1 to 8.4.10	Appendix 11
		The following methods of data collection will be used to inform the description of existing conditions for the Human Health VC:				
		• Interpretation and analysis of results obtained by air quality, noise, and water quality specialists as they relate to human health				
		Desktop review of provincial and regional information sources, including the following Health Canada guidance documents:				
		• Evaluating the following Human Health Impacts in EA: Noise, Air Quality, Water Quality, and Radiological Impacts				
		• Radiological risk assessment				
		• Description potential receptors, nearby water sources and historic usage of land				
		SLHHRA Report – the SLHHRA for the proposed Project will be carried out using industry-accepted methods (that is,, Health Canada guidance and BC Protocol 13) and will be formatted as a stand-alone report that will be attached to the Amendment Application for the proposed Project. The SLHHRA will evaluate chemicals of potential concern in environmental media based on supporting studies for the Amendment Application, which include air quality, soil quality, water quality (groundwater), and sediment quality, as well as assessment of NORMs. For each environmental media, a conceptual site exposure model will be developed, identifying the pathway of exposure from the chemicals of potential concern in the source media, through release mechanism and exposure routes to human receptors. The results of the SLHHRA will be used to inform the description of existing conditions related to the Human Health VC, as well as inform the identification and characterization of potential adverse effects and proposed mitigation measures.				
		An SLHHRA report if deemed required after review of the SLHHRA.				
8.1.3	Potential Effects	The Application will identify potential adverse effects to the VC in a manner consistent with Section 3.4 Potential Effects of this AAIR template.	8.5	Human Health Effects Assessment	Pages 8-12 to 8-17 Subsections 8.5.1 to 8.5.3 Table 8.5-1	
		The proposed Project is anticipated to interact with the Human Health VC during the following construction, operations, and closure and reclamation activities:				
		• Transportation and mobilization of equipment and workers to site				
		• Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure				
		• Waste acceptance, placement, and compaction				
		• Leachate management, storm water management, and ongoing monitoring				
		• Cell capping				
		• Post-closure maintenance and monitoring				
8.1.4	Mitigation Measures	The Application will identify measures to avoid, manage or otherwise mitigate potential adverse effects to the VC in a manner consistent with Section 3.5, Mitigation Measures, of this AAIR template. Relevant management plans will be referenced. Linkages to other Sections in the Application must be identified.				
8.1.5	Residual Effects and their Significance	Where an adverse residual effect is identified, the Application will characterize the residual effect based on the context, magnitude, extent, duration, reversibility, and frequency as described in Section 3.6, Characterization of Residual Effects, of this AAIR template.				
		Where an adverse residual effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Sections 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template.				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
8.1.6	Cumulative Effects and their Significance	If a residual effect is identified, unless stated otherwise by BC EAO, the Application will:	See above	See above	See above	
		• Determine whether any cumulative interactions between residual effects of the proposed Project and the potential residual effects of other developments, based on the preliminary list of past, present and reasonably foreseeable developments provided in the AAIR, are likely to occur, consistent with Section 3.10.1 Identifying Past, Present or Reasonably Foreseeable Projects and/or Activities of this AAIR template				
		• Conduct a cumulative effects assessment consistent with Section 3.10.2, Conducting a Cumulative Effects Assessment, of this AAIR template				
		• Identify any additional mitigation measures, consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• Where an adverse residual cumulative effect is identified, the Application will also describe the likelihood, Proponent's significance determination and predictive confidence, in accordance with Section 3.7, Likelihood, Section 3.8, Proponent's Determination of Significance, and Section 3.9, Confidence and Risk, of this AAIR template				
8.1.7	Follow-up Strategy	Where a residual effect and/or cumulative effect have been identified, the Application will include a description of a follow-up strategy that is consistent with Section 3.11, Follow-up Strategy of this AAIR template.	8.5.4	Follow-up Strategy	Page 8-17	
9	Accidents and Malfunctions	The Application will include the following:	9	Accidents and Malfunctions	Pages 9-1 to 9-7 Tables 9.2-1, 9.2-2, and 9.2-3	
		• Identification of potential accidents and malfunctions:				
		– Traffic-related accidents				
		– Release or spill of contaminants such as hydrocarbons, hazardous materials, and NORM-containing materials (terrestrial, surface water, or groundwater)				
		– Structural failure of a landfill component during construction or operations				
		– Onsite fires				
		– Damage to existing Silverberry landfill infrastructure				
		• The overall methodology for assessing the potential risk of an event (likelihood and consequence):				
		– Definitions of each category of likelihood				
		– Definitions for each category of consequence				
		– An assessment of the likelihood of the event occurring, based on historical trends and predictive models				
		– Identification of proposed measures to reduce the likelihood of the event				
		– Assessment of consequence of the event, in a manner consistent with the direct effects assessment				
		– Identification of measures to mitigate the consequences to VCs				
		– Conclusions on the potential risk (likelihood multiplied by consequence) of the accident or malfunction				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
10	Effects of the Environment of the Project	The Application will include:	10	Effects of the Environment of the Project	Page 10-1 to 10-5 Subsections 10.1.1 to 10.1.5.4 Tables 10.1-1 and 10.1-2	
		• The environmental factors deemed to have possible consequences on the proposed Project, including, but not necessarily limited to, consideration of natural hazards such as:				
		– Climate change, including temperature rise and precipitation				
		– Extreme weather and weather-related events (for example,, heavy precipitation, extreme temperatures, and wind)				
		– Seismic events				
		– Wildfire				
		• A description of any changes or effects on the proposed Project that may be caused by the above-mentioned environmental factors				
		• The likelihood and consequence of the changes or effects to relevant VCs				
		• Practical mitigation measures, including design strategies and environmental contingency plans, to avoid or minimize the likelihood and consequence of the effects of the environment on the proposed Project				
		• A conclusion about the potential risk of an effect of the environment on the proposed Project and to relevant VCs				
Part C	**Aboriginal Consultation**		**Part C**	**Aboriginal Consultation**		
11	Aboriginal Consultation		11	Aboriginal Consultation		
11.1	Aboriginal Interests	The Aboriginal Groups discussed in this Section will include:	11.1 to 11.3	Aboriginal Interests	Page 11-1 to 11-7 Subsections 11.2.1 to 11.3.7	
		• Blueberry River First Nations				
		• Doig River First Nation				
		For each Aboriginal Group, the Application will include:				
		• A summary of past and planned consultation activities				
		• A summary of proposed changes to the Aboriginal Consultation Plan resulting from the Aboriginal Groups' feedback, or experience from consultation to date, including any such changes which have been implemented				
		• A summary of the key issues and concerns raised by Aboriginal Groups relevant to the EA, the Proponent's responses to those issues and concerns, and the status of resolution				
		• A map that identifies Indian Reserves and Aboriginal communities, for the Aboriginal Groups and the proposed Project location, including proposed Project components in relation to Aboriginal Group's and/or Treaty Nation's traditional territories				
		• TEK and TLU information, as available, with a description of how TEK and TLU Studies information was gathered and incorporated into the assessment of impacts of the proposed Project on Aboriginal Interests				
		• A description of the Aboriginal Interests of each group identified through secondary research techniques or provided directly through consultation activities; the description will include background information on ethnography, language, governance, economy, and reserves				
		• A description of potential adverse effects of the proposed Project on Aboriginal Interests				
		• A description or summary of mitigation measures to avoid or reduce potential adverse effects on Aboriginal Interests consistent with Section 3.5, Mitigation Measures, of this AAIR template				
		• A characterization of the residual adverse effects on Aboriginal Interests after mitigation using the methodology described in Section 3.6, Characterization of Residual Effects, Section 3.7, Likelihood, and Section 3.9, Confidence and Risk, of this AAIR template and incorporating the findings of the VC chapters in the Application that are relevant to Aboriginal Interests				
		• A summary of any outstanding Aboriginal Interests issues identified by Aboriginal Groups				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
11.1 (cont'd)	See above	• A summary of publicly available arrangements or agreements reached between the proponent and Aboriginal Groups	See above	See above	See above	
		The description of potential effects and characterization of residual effects will be developed by assessing the potential effects pathways to Aboriginal Interests. The potential effects will include, but are not limited to, the following topics requested by First Nations to date:				
		• Effects to the exercise of traditional practices, including via perceived odor, noise, and light				
		• Effects to cultural practices and cultural sites, for example, cultural sites where transmission of traditional knowledge may take place				
11.2	Other Matters of Concern to Aboriginal Groups	The Application will include:	11.4	Other Matters of Interest to Aboriginal Groups	Page 11-7 To be prepared for final version	
		• A list of other matters of concern raised by Aboriginal Groups with respect to potential environmental, economic, social, heritage and health effects of the proposed Project, which have not already been considered in the discussion about Aboriginal Interests				
		• A description (or summary if described elsewhere in the Application) of the mitigation measures to address potential effects on other matters of concern to Aboriginal Groups				
		• A characterization of the residual adverse effects after mitigation, in a manner consistent with assessment methodology in this AAIR template				
		• A description of how these matters of concern have been addressed from the perspective of the Aboriginal Groups and the Proponent				
11.3	Issue Summary Table	The Application will include:	11.5	Issue Summary Table	Page 11-7 To be prepared for final version	
		• A Summary Table (see example below) that identifies Aboriginal Interests or other matters of concern to Aboriginal Groups that may be impacted by the proposed Project, and the measures to avoid, mitigate or otherwise manage the effects				
		• An Appendix, the Aboriginal Consultation Report, which contains comments received from Aboriginal Groups regarding this Section of the Application				
		Table 3: Summary table of the results of Aboriginal consultation related to Aboriginal interests and other matters of concern to Aboriginal groups				
Part D	**Public Consultation**		**Part D**	**Public Consultation**		
12	Public Consultation	The Application will include a report on the results of implementation of the approved Public Consultation Plan including:	12	Public Consultation	Page 12-1 to 12-3 Subsections 12.1 to 12.3 To be prepared for final version	
		• Background information:				
		– Identification of local governments, residents, property owners, and other rights holders who are potentially impacted by the proposed Project				
		– Maps of local government boundaries, private land, tenures/authorizations, or residences with respect to the proposed Project				
		– Background information about each potentially affected municipality and/or stakeholder group				
		• Public Consultation:				
		– A summary of the past and planned consultation activities				
		– A summary of any proposed changes to the approved Public Consultation Plan as a result of feedback from local governments, stakeholders, or individuals, or experience from consultation to date				
		– A description of the key issues raised by the public that are relevant to the EA, the responses to those issues, and the status of their resolution				
		• Summary Table:				
		– Identification of concerns raised by the public and the measures to avoid, reduce or mitigate those impacts; this information will be provided in the form of a table				

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AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
Part E	**Management Plans and Follow up Programs**		**Part E**	**Management Plans and Follow up Programs**		
13	Management Plans	The Application will include:	13	Management Plans	Pages 13-1 to 13-5 Subsections 13.1 to 13.13	
		• A list of Management Plans for all phases of the proposed Project, including but not limited to:				
		– Erosion and Sediment Control Plan				
		– Soil Handling Plan				
		– Emergency Preparedness and Response Plan				
		– Invasive Species Management Plan				
		– Wildlife Management Plan				
		– Dust Control and Air Quality Management Plan				
		– Odour Management Plan				
		– Night Time Light Management Plan				
		A comprehensive description of the contents of each Management Plan, including the identification of any mitigation measures described in previous sections that will be included within the plans.				
14	Monitoring and Follow up Programs	The Application will include:	14	Monitoring and Follow up	Pages 14-1 to 14-2	
		• A description of the monitoring and follow-up programs the Proponent will implement, including their activities, objectives, and reporting; and				
		• Reporting structure as identified within the environmental management plans, monitoring plans and EA Certificate Conditions.				
Part F	**Conclusions**		**Part F**	**Conclusions**		
15	Conclusions	The Application will:	15	Conclusions	Page 15-1 To be prepared for final version	
		• Provide the Proponent's conclusions regarding the potential for significant adverse effects on VCs from the proposed Project				
		• Request an EA Certificate for the proposed Project				
		• Acknowledge the need, if applicable, to successfully complete a federal EA and subsequent permitting/authorization processes prior to proceeding with Project construction, operation and decommissioning				
15.1	Summary of Residual Effects	The Application will summarize all potential residual effects, including cumulative residual effects, in a table format that depicts the potential effect, Project phases, Project activity or physical work linked to the effect, proposed mitigation and significance of effect on VCs.	15.1	Summary of Residual Effects	Page 15-1 To be prepared for final version	
15.2	Summary of Mitigation Measures	The Application will include a table that identifies the proposed measures to mitigate potential impacts to VCs as shown in Table 4. This information provides the foundation for the development of a Table of Conditions for the proposed Project, which would be appended to an EA Certificate, should one be issued.	15.2	Summary of Mitigation Measures	Page 15-1 To be prepared for final version	
		Table 4: summary of Proposed Mitigation Measures.				
16	Reference Material	The Proponent will provide a list of reference material used in developing the Application.	16	References	Page 16-1	
			16.1	Personal Communications	Page 16-1	
16.1	Literature Cited		16.2	Literature Cited	Pages 16-1 to 16-6	
16.2	GIS Data and Mapping References	This subsection includes references cited on the figures accompanying this report.	16.3	GIS Data and Mapping References	Page 16-6	

Tervita Corporation Silverberry Secure Landfill Project

Table of Concordance - Application for Amendment of Project Approval Certificate WD02-01 (now known as Environmental Assessment Certificate) for Landfill Expansion

AAIR Section/ Subsection	AAIR Section Title	AAIR Section Language	Amendment Application Section/Subsection	Amendment Application Section Title	Amendment Application Volume, Section, Subsection, and Page Number	Relevant Appendix
17	Appendices	This section will include the appendices referenced in the Application. Information prepared by professionals and provided under their professional seal will be identified in the Application and the related sealed studies will be included in an Appendix.	Appendices	Soil Sampling Report		Appendix 1
				Volatile Organic Compound Air Sampling Report		Appendix 2
				2018 Surface Water Discharge Report – Silverberry Landfill, Block A-18-088-20 W6M		Appendix 3
				2018 Groundwater Monitoring Program – Silverberry Secure Landfill, Block A-18-088-20 W6M		Appendix 4
				Hydrogeological Siting Suitability Investigation		Appendix 5
				Vegetation Survey Report		Appendix 6
				Early Summer Wildlife Survey Report		Appendix 7
				Early-mid Winter Snow Tracking Survey Report		Appendix 8
				Late-Winter Snow Tracking Survey Report		Appendix 9
				Spring Breeding Bird and Amphibian Survey Report		Appendix 10
				Screening Level Human Health Risk Assessment		Appendix 11
				EAO Working Group Comments during Pre-Application Stage for the Proposed Project Expansion		Appendix 12
				EAO Working Group First Nations Comments during Pre-Application Stage for the Proposed Project Expansion		Appendix 13

Notes:
AAIR = Amendment Application Information Requirements
BC = British Columbia
BC EAO = British Columbia Environmental Assessment Office
BC WQG = British Columbia Water Quality Guidelines
CCME = Canadian Council for Ministers of the Environment
EA = Environmental Assessment
GHG = greenhouse gas
KI = Key Indicator
km = kilometre(s)
LAA = Local Assessment Area
NORM = naturally occurring radioactive material
RAA = Regional Assessment Area
SLHHRA = Screening Level Human Health Risk Assessment
TEK = Traditional Ecological Knowledge
Tervita = Tervita Corporation
the Project = Tervita Silverberry Landfill Amendment Application Project
TLU = Traditional Land Use
VC = Valued Component
VOC = Volatile Organic Compounds

Part A: Introduction

Part A of the Environmental Assessment Certificate (EAC) Amendment Application (the Application) includes an overview of the proposed Tervita Silverberry Landfill Amendment Application Project (the proposed Project expansion) (Section 1) and provides a description of the British Columbia (BC) Environmental Assessment Office (EAO) process through which the proposed Project expansion will be reviewed (Section 2).

The information provided in Part A follows the requirements set out in the Amendment Application Information Requirements (AAIR) for the proposed Project expansion issued on January 23, 2019 by the BC EAO.

1. Overview of Proposed Project Expansion

This section of the Application provides an overview of the proposed Project expansion, describing the proponent, the proposed Project expansion location and components, applicable authorizations, alternative means of undertaking the proposed Project expansion, and Project benefits. An overview map of the proposed Project expansion is provided on Figure 1.2-1, while a more detailed overview of the proposed Project expansion can be found on Figure 1.2-2.

1.1 Proponent Description

Tervita Corporation (Tervita) owns and operates the Silverberry Secure Landfill (the existing landfill), which is located approximately 50 kilometres (km) northwest of Fort St. John, BC. The existing landfill was originally constructed in 2003, and currently holds approval (PR 17150) from the BC Ministry of Environment and Climate Change Strategy (MECCS) and approval (EAC WD02-01) from the BC EAO.

Based in Calgary, Alberta, Tervita is a leading environmental and energy services company that provides the energy industry with a comprehensive suite of services that include waste management, drilling and coring, well servicing, and other environmental services. These services cover every stage of the production life cycle, from development to reclamation. Through innovation, science, knowledge, and experience, Tervita helps their clients, communities, and governments ensure responsible and sustainable development of our resources, while demanding safety, enhancing efficiency, and minimizing the environmental impact.

Operating under previous names such as Canadian Crude Separators Inc. (CCS), Hazco, Concord, Beck, HMI, Prodrill, and others, Tervita is the largest owner and operator of Class II landfills in Western Canada with stringent operating standards and procedures. Tervita currently operates 20 engineered landfills in Western Canada, with 2 in northeastern BC (Silverberry and Northern Rockies). In addition, Tervita operates 22 Treatment, Recovery, and Disposal (TRD) or wastewater disposal facilities and 2 Cavern facilities across Western Canada.

Tervita (then CCS) was incorporated in the Province of Alberta in November 2007, and is registered as an Extraprovincial Company in the Province of BC (Attachment 1). Prior to 2007, CCS operated as a publicly-traded common stock company. In 2012, CCS and 12 owned subsidiaries (including HAZCO, Prodrill, Concord, and others) came together under the new name of Tervita Corporation. On May 21, 2019, Tervita requested that the name on EAC WD02-01 be changed from CCS to Tervita Corporation (see Attachment 2). There were no ownership changes to the company. Tervita's website can be accessed at the following address: http://www.tervita.com. The proponent's contact information for the proposed Project expansion is provided in Table 1.1-1.

Table 1.1-1. Proponent Contact Information

Contact	Address
John Cooper (Chief Executive Officer)	Tervita Corporation 1600, 140-10th Avenue SE Calgary, AB, T2G 0R1 jcooper@tervita.com D: (403) 231-1139
Peter Nelson (Advisor, Environment & Regulatory)	Tervita Corporation 1600, 140-10th Avenue SE Calgary, AB, T2G 0R1 pnelson@tervita.com D: (403) 234-4875

This Application was prepared by CH2M HILL Canada Limited (Jacobs) with the input of Tervita and the assistance of other professional consulting firms. Identified in Table 1.1-2 are the companies responsible for the various supporting studies and activities to support Tervita in developing the proposed Project expansion. Discipline leads are the individuals responsible for reviewing and, in some cases, writing effects assessments and technical reports to ensure consistency and accuracy.

Table 1.1-2. Application Contributors

Component of Application	Contributors	Discipline Lead
Part A - Introduction		
Overview of Proposed Project Expansion (Section 1)	Jacobs and Tervita	Peter Nelson (Tervita)
Environmental Assessment Process (Section 2)	Jacobs	Carmen Holschuh (M.Sc., R.P.Bio.)
Part B - Assessment of Environmental, Economic, Social, Health, and Heritage Effects		
Assessment Methodology (Section 3)	Jacobs	Carmen Holschuh (M.Sc., R.P.Bio.)
Terrain and Soils (Section 4.1)	Jacobs	Jennifer Keller (PMP, RT[Ag], CET)
Air Quality (Section 4.2)	Jacobs	Darryl Chartrand (Ph.D)
Acoustic Environment (Section 4.3)	Jacobs	Darryl Chartrand (Ph.D)
Surface Water (Section 4.4)	Jacobs	Liz van Warmerdam, (M.Sc. P.Geo.)
Groundwater (Section 4.5)	Jacobs	Liz van Warmerdam, (M.Sc. P.Geo.)
Terrestrial Vegetation (Section 4.6)	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Fish and Fish Habitat (Section 4.7)	Jacobs	Mike Climie (B.Sc., R.P Bio)
Wildlife (Section 4.8)	Jacobs	Jody Bremner (BNRS, PBiol)
Economy (Section 5.1)	Jacobs	Julie Greenwood (Ph.D)
Land and Resource Use (Section 6.1)	Jacobs	Julie Greenwood (Ph.D)
Community Services (Section 6.2)	Jacobs	Julie Greenwood (Ph.D)
Community Infrastructure (Section 6.3)	Jacobs	Julie Greenwood (Ph.D)
Heritage Resources (Section 7.1)	Jacobs	Sean Lynch, (M.A.)
Human Health (Section 8.1)	Jacobs	James Sprenger (M.Sc.)
Accidents and Malfunctions (Section 9)	Jacobs	Sang Vo (M.Sc., PBiol)
Effects of the Environment on the Project (Section 10)	Jacobs	Sang Vo (M.Sc., PBiol)
Part C – Aboriginal Consultation		
Aboriginal Consultation (Section 11)	Jacobs and Tervita	Peter Nelson (Tervita)
Part D – Public Consultation		
Public Consultation (Section 12)	Jacobs and Tervita	Peter Nelson (Tervita)
Part E – Management Plans and Follow-up Programs		
Management Plans (Section 13)	Jacobs and Tervita	Peter Nelson (Tervita)
Follow-up Programs (Section 14)	Jacobs and Tervita	Peter Nelson (Tervita)
Part F – Conclusions		
Conclusions (Section 15)	Jacobs	Sang Vo (M.Sc., PBiol)
References (Section 16)	Jacobs	--
Appendices		
Appendix 1 – Soil Sampling Report	Jacobs	Jennifer Keller (PMP, RT[Ag], CET)
Appendix 2 – Hydrogeological Siting Suitability Investigation	Clifton Associates Ltd.	--

Table 1.1-2. Application Contributors

Component of Application	Contributors	Discipline Lead
Appendix 3 – Volatile Organic Compound Air Sampling Report	Jacobs	Darryl Chartrand (Ph.D.)
Appendix 4 – Vegetation Survey Report	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Appendix 5 – Early Summer Wildlife Survey Report	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Appendix 6 – Early-mid Winter Snow Tracking Survey Report	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Appendix 7 – Late-winter Snow Tracking Survey Report	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Appendix 8 – Spring Breeding Bird and Amphibian Survey Report	Jacobs	Tyler Innes (M.Sc., R.P.Bio.)
Appendix 9 – Screening Level Human Health Risk Assessment	Jacobs	James Sprenger (M.Sc.)

Supporting technical reports are provided in Appendices 1 to 11. The technical reports provide topic-specific background information, the methodology and results of field surveys, and research conducted in support of the Application. These technical reports, surveys, and studies provide an information base for the assessment of the proposed Project expansion. The authors of the supporting technical reports participated in the identification of potential adverse effects, the development of mitigation measures, and the evaluation of the significance of the potential residual adverse effects within their respective disciplines. The technical reports contain information to demonstrate the expertise of the authors.

1.2 Description of Proposed Project Expansion

The existing landfill is located on privately owned land at 8-88-20 W6M, approximately 50 km northwest of Fort St. John, BC. A Project Approval Certificate (PAC) (now known as an EAC) Application was submitted to the BC EAO for the existing landfill in March 2002, and the Project was approved in July 2002, with the existing landfill being operational in 2003. The existing landfill consists of seven secure landfill cells, with one still to be developed under the existing approval, for a total of eight cells and an approved capacity of 3,933,000 cubic metres (m^3). Silverberry is approved to accept nonhazardous and select hazardous waste. The select hazardous waste that Silverberry is able to accept includes waste with leachable benzene, toluene, ethylbenzene, and xylenes levels, solids containing flammable liquid (UN3175 Class 4.1), and waste oil. No waste streams at the landfill are incinerated. All waste is primarily generated from the oil and gas industry. Just under 300,000 m^3 of waste was accepted by the existing landfill in 2018.

The purpose of the proposed Project expansion is to expand the depleted capacity of the existing landfill. The proposed Project expansion will be located on land owned by Tervita, immediately east of the existing landfill, and will be approximately the same size as the existing landfill footprint (roughly 25 hectares [ha]). Landfill cells are constructed in a staged manner dependent on fill rate, typically with only one cell operational at a time. Associated infrastructure and facilities located on the existing Tervita property include access roads, drainage ditches, and groundwater monitoring wells, as well as the office and weigh scales. Infrastructure and associated facilities are in operation for the existing landfill and will continue to be used for the proposed Project expansion. In addition, stormwater and leachate management and monitoring systems are in place at the existing landfill, and will be expanded or upgraded, where appropriate, to account for stormwater retention and leachate generation associated with the proposed Project expansion.

Similar to the existing landfill, the proposed Project expansion will be developed as a series of cells. The future landfill development area has been conceptually designed to accommodate six cells of varying sizes. As additional cells are developed, the liner and leachate collection systems will be tied together to provide a continuous liner system under the entire proposed Project expansion footprint. This will allow

final development of the area as one contiguous fill mass, rather than six individual pockets, as is standard landfill operating and construction practice. The additional cells will provide an additional 5,274,340 m^3 of capacity. The location of the proposed Project expansion provides for a 50-metre (m) wide secure buffer zone on the property owned by Tervita, surrounding the active area of the existing landfill, as required under Section 25 (10) of the *Hazardous Waste Regulation* (HWR).

The type of waste accepted is not expected to change as a result of the proposed Project expansion, as the purpose of this Application is to replace depleted capacity. The types of waste that are currently accepted at the existing landfill include hydrocarbon-contaminated soils and sands, sulphur-contaminated soil, salt-contaminated soils, and other wastes associated with the oil and gas industry. Examples of other waste that may be accepted include construction and demolition materials such as cement, absorbents and desiccants, drill cuttings, and other sources of industrial waste.

Waste is screened for naturally occurring radioactive materials (NORMs) prior to being accepted at the existing landfill, and materials containing NORMs are accepted in accordance with all provincial and federal regulatory requirements. This same procedure will apply to the proposed Project expansion.

Based on current knowledge of the types and volumes of oilfield waste in the northeast BC area, Tervita estimates that the proposed Project expansion will handle approximately 250,000 to 300,000 tonnes per year of solid waste, depending on economic conditions. There is potential for variability in annual waste quantities accepted by the proposed Project expansion. The capacity replacement is estimated to provide an estimated 25 years of operating capacity. There will be no new buildings or structures added as part of the proposed Project expansion. The proposed Project expansion is not associated with any broader public sector policies, plans, or programs.

1.2.1 Proposed Project Expansion Location

The existing landfill is located on privately owned land, approximately 50 km northwest of Fort St. John in Electoral Area B of the Peace River Regional District (PRRD), at 8 88-20 W6M (latitude: 56°37'21.49"N; longitude: 121°9'24.88"W). The landfill expansion area is located immediately east of the current landfill footprint in Block A of Section 8. The expansion footprint will be approximately 25 ha (roughly the same size as the existing landfill footprint) and will be designed to handle approximately 5,275,000 m^3 of material. The location of the expansion area provides for a 50- m)-wide secure buffer zone on the property, surrounding the active area of the landfill. Tervita estimates that the proposed Project expansion will handle approximately 600,000 tonnes per year of oilfield waste and will add approximately 20 years to the operating life of the existing landfill. Figure 1.2-1 shows the regional location of the proposed Project expansion, while Figure 1.2-2 provides a more detailed overview of the proposed Project expansion.

The proposed Project expansion is within Treaty 8 boundaries and the asserted traditional territories of several Aboriginal groups and Métis organizations. Per a letter from BC EAO dated August 6, 2015, Tervita is required to consult with the following Aboriginal groups with asserted traditional territories overlapping the proposed Project expansion:

- Blueberry River First Nations (BRFN)
- Doig River First Nation (DRFN)

The proposed Project expansion is also located in proximity to the following Indian Reserves (IRs):

- Approximately 5 km south of the Blueberry River IR No. 205
- Approximately 20 km southeast of the Beaton River IR No. 204 (South Half)
- Approximately 40 km west-southwest of the Doig River IR No. 206
- Approximately 40 km northwest of the Halfway River IR No. 168

The location of the proposed Project expansion in relation to the previously noted traditional territories and IRs is provided on Figures 1.2-1 and 1.2-2.

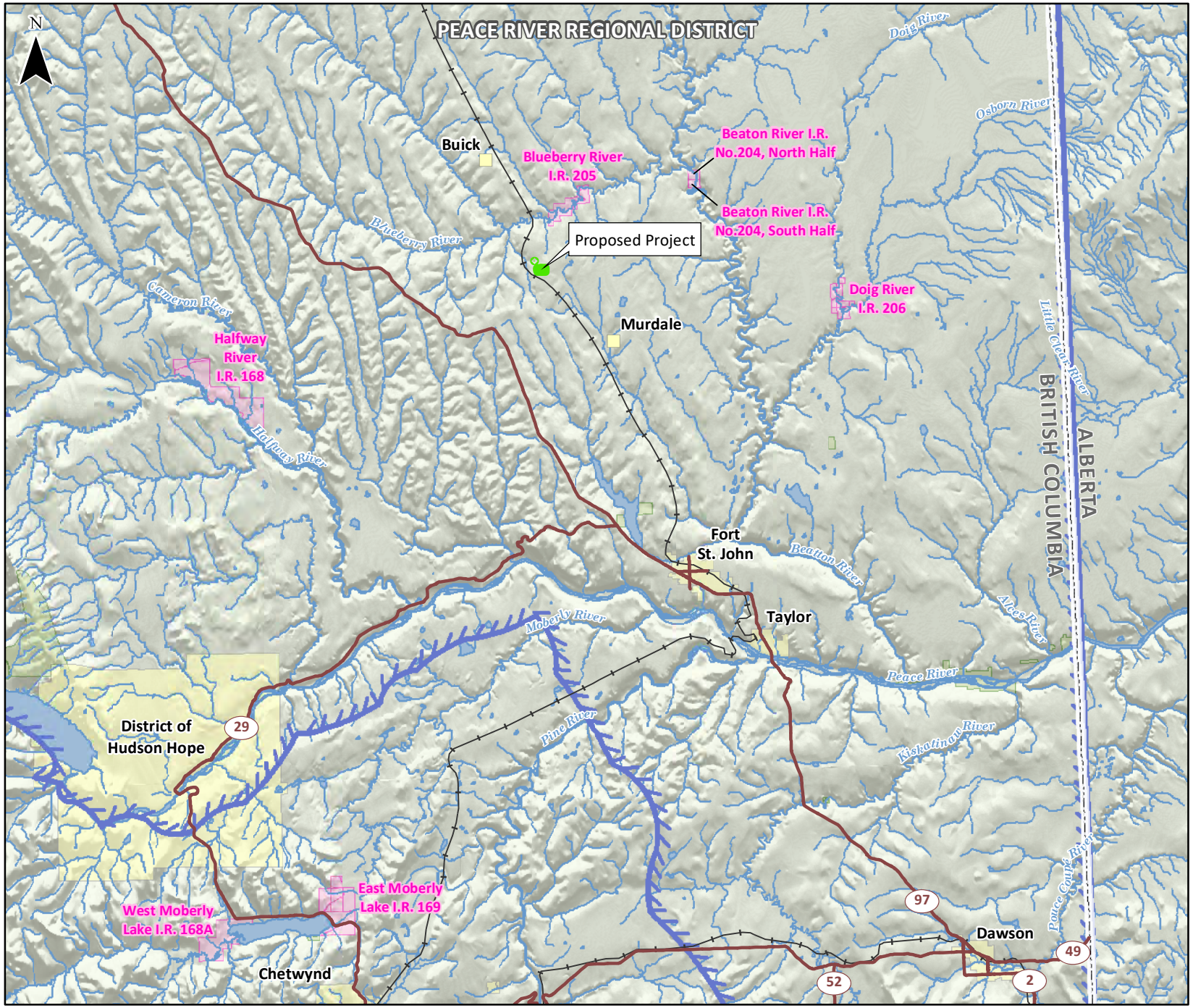

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FIGURE 1.2-1

REGIONAL LOCATION

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Road
- Highway
- Railway
- Watercourse
- Water Body
- Project Footprint
- Indian Reserve/ First Nation Settlement
- BRFN Traditional Territory
- City/Town/Village
- Park/Protected Area

Note:
The British Columbia map extent falls within the Treaty 8 - Area Recognized by BC

SCALE: 1:750,000

0 5 10 15 20
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Highway/Road: NRCan 2015; Railway: NRCan 2012; Hydrography: NRCan. 2009; BC FLNRO 2008; Project Footprint: Tervita 2016; Indian Reserve: Government of Canada 2018; City/Town/Village: BC MFLNRO 2007, NRCan 2003; Park/Protected Area: BC MFLNRO 2008; Regional District: BC MFLNRO 2007; Grid: TERA 2010; Hillshade: TERA 2008.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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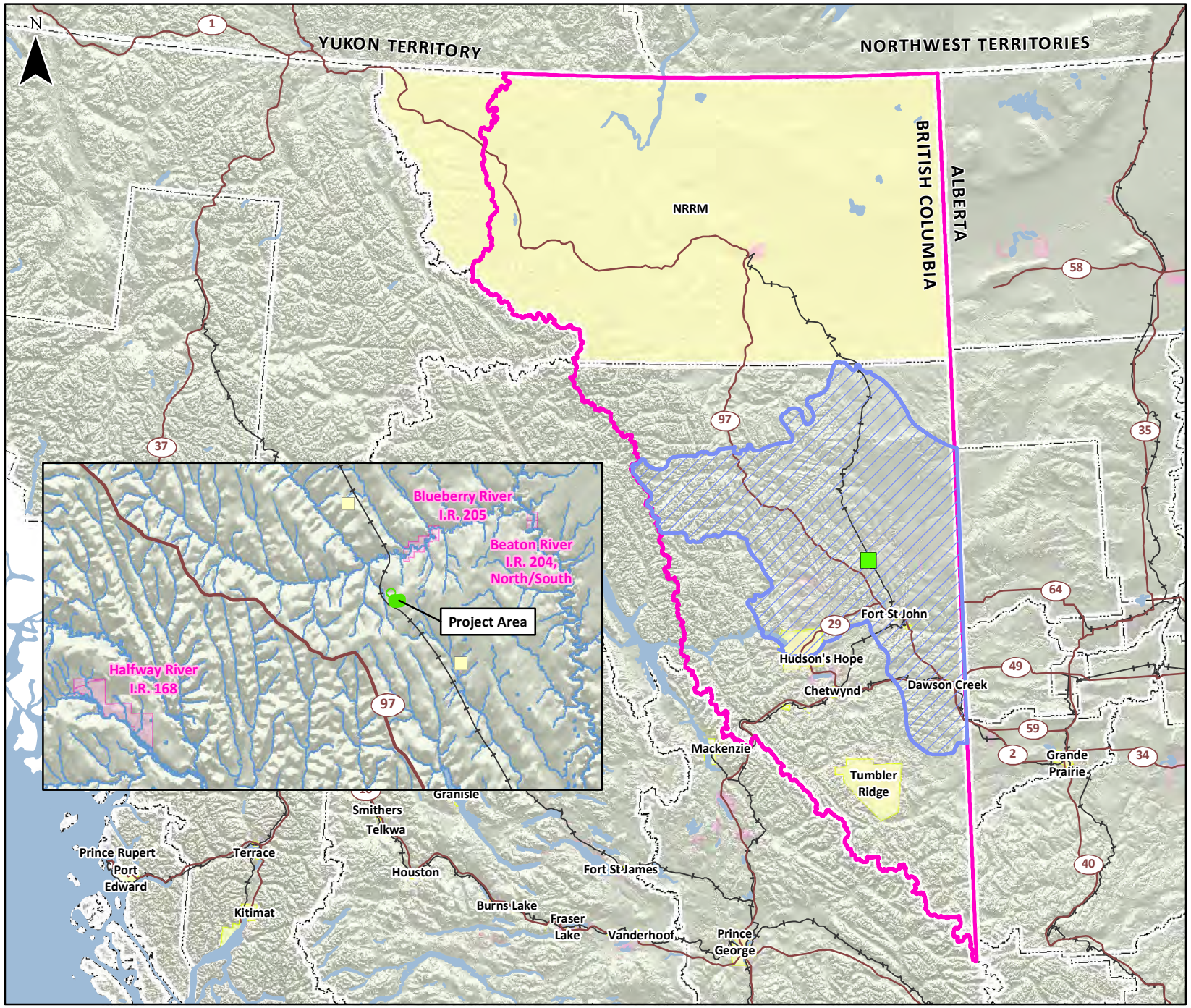

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FIGURE 1.2-2

TREATY 8 - AREA RECOGNIZED BY BC

TERVITA SILVERBERRY
LANDFILL AMENDMENT
APPLICATION PROJECT

661198

- Road
- Highway
- Railway
- Watercourse
- Water Body
- Project Footprint
- Indian Reserve/ First Nation Settlement
- BRFN Traditional Territory
- Treaty 8 - Area Recognized by BC
- City/Town/Village

SCALE: 1:4,250,000

0 20 40 60 80
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Highway/Road: NRCan 2015; Railway: NRCan 2012;
Hydrography: NRCan. 2009; BC FLNRO 2008;
Project Footprint: Tervita 2016;
Indian Reserve: Government of Canada 2018;
City/Town/Village: BC MFLNRO 2007, NRCan 2003;
Park/Protected Area: BC MFLNRO 2008; Regional District: BC MFLNRO 2007; Grid: TERA 2010; Hillshade: TERA 2008.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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1.2.2 Phases of the Proposed Project Expansion

It is anticipated that the final cell of the existing landfill will be constructed and filled to capacity by 2020. Tervita estimates that all amendments will be in place by spring 2020, with construction of the proposed Project expansion to commence in summer 2021. A schedule for the entire proposed Project expansion is outlined in Table 1.2-1. The landfill operation will be progressive in nature, with each cell being constructed and capped independently. When all cells have been decommissioned, the entire site will be decommissioned and reclaimed.

Table 1.2-1. Proposed Project Expansion Schedule

Project Phase	Activities	Date
BC EAO and BC MECCS permits obtained	Permitting	Spring 2020
Equipment mobilized to site	Transportation	Spring 2021[a]
Construction of landfill expansion	Land clearing, excavating, grading, stockpiling of excavated material, compaction, and liner installation	Summer-fall 2021[a]
Demobilization of equipment	Transportation	Fall 2021[a]
Landfill operation	Excavating, grading, and compaction; capping used cells	2021-2050
Closure or future expansion	To be determined[b]	--

[a] Dates for equipment mobilization, construction, and demobilization are provided for development of the first cell. These activities will be repeated approximately every 2 to 3 years thereafter as more cells are developed.

[b] At the end of its operational life, the proposed Project expansion will be decommissioned and postclosure activities will commence. Any reclamation requirements will be determined at this time. Postclosure activities will be completed for a minimum of 25 years.

1.2.3 Proposed Project Expansion Components and Activities

Construction is scheduled to start as soon as practical following the receipt of Project approvals and seasonal limitations. The current estimate is for construction to start in summer 2021. The construction period will be approximately 6 months, starting with major earthworks, proceeding through liner installation, and finishing with the leachate collection system installation. The construction labour force will consist of project engineers, liner installation specialists, and contractors for general earthwork. The total labour force will vary from 5 to 20 persons at any time, depending on the stage of construction. There will be no construction camp onsite. Construction personnel will likely be accommodated in Fort St. John, BC.

During operation, waste will arrive at the site on trucks owned and operated by oilfield companies. There will be no increase in traffic volume as a result of the proposed Project expansion. Existing access roads to the landfill will be utilized. Internal access roads to the cells will be built within the Project footprint. Power transmission is only used to run the scale house, and no increase in power usage is expected. All other equipment runs on fuel.

Only solid, nonsecure (nonhazardous), and select secure (hazardous) oilfield and industrial wastes are accepted for disposal at the landfill. Municipal solid wastes are not permitted for disposal at the landfill. Gases resulting from the decomposition of landfilled wastes are not expected, due to the nature of the solid wastes accepted. The landfill utilizes specific waste acceptance procedures prior to accepting and processing all incoming waste to ensure that only approved wastes are accepted. Hydrocarbon odours may be present at times in the vicinity of the active landfilling area, but are not expected to be detectible at the property boundaries. Emissions are negligible and are only attributed to onsite heavy machinery. Landfill leachate will be collected and stored within engineered, lined ponds and trucked offsite for disposal in injection wells and other approved facilities. The water injection wells are permitted by the BC Oil and Gas Commission (OGC) and BC MECCS for disposal of nonhazardous waste. Leachate volumes are expected to remain consistent, as landfill cells are progressively capped in order to reduce the generation of leachate.

1.2.4 Land Use

The proposed Project expansion will be constructed on land that is owned by Tervita and is located within the existing fenced boundaries of the operating landfill. There is low natural vegetation diversity within the Project footprint, as vegetation has been disturbed by past agricultural activities. There is a small area (2.2 ha) of native vegetation along the east margin of the Project footprint that will be cleared to accommodate the expanded landfill; however, this area is not expected to be cleared for 10 to 15 years, once new landfill cells are required. The proposed Project expansion is surrounded by mainly Crown-owned, forested lands, which support oil and gas exploration and development, forestry, and agriculture. Other land use activities with the potential to take place in the area include hunting, trapping, fishing, gathering, and offroad recreation (for example, snowmobiling and all-terrain vehicle [ATV] use). The following subsections describe planned land use in the proposed Project expansion area. Additional details on surrounding land and resource use activities are provided in Section 6.1.

1.2.4.1 Zoning and Local Planning

The Tervita property was rezoned from “Public” to “Oil and Gas Production” under the PRRD Zoning By-law No. 1000 to accommodate the construction of the existing secure landfill in 2003. Lands at the proposed Project expansion site are therefore permitted to be used only for oil and gas production, land treatment facilities, and associated accessory buildings and structures (PRRD Zoning By-law No. 1000 [PRRD 1996]).

1.2.4.2 Tenures, Licenses, Permits, and Authorizations

A PAC (now known as an EAC) Application was submitted to the BC EAO for the existing landfill in March 2002, and the Project was approved and issued the PAC WD02-01 in July 2002, with the existing landfill being constructed in 2003. Tervita currently holds the following permits and approvals for the Project:

- BC MECCS – Permit 17150 (issued on October 18, 2002, under the *Environmental Management Act* [*EMA*])
- BC Ministry of Sustainable Resource Management – Water Licence No. C113545 (issued on February 18, 2002, under the *Water Act*)

Tervita also currently holds the following permit for the Landfarm facility to the north of the Project:

- BC Ministry of Water, Land and Air Protection – Permit 10758 (issued on October 7, 1994 under the *Waste Management Act*).

Applicable licenses, permits, and/or authorizations that are required for the proposed Project expansion are described in Section 1.3.

1.2.4.3 Provincial and Regional Land Use Plans

The proposed Project expansion is located in the Fort St. John Forest District on land designated for “Agriculture/Settlement” in the *Fort St. John Land and Resource Management Plan* (LRMP) (Fort St. John LRMP Working Group 1997). Although agriculture is a high priority in these areas, the Fort St. John LRMP encourages multiple land and resource uses as long as agricultural soil productivity is maintained (Fort St. John LRMP Working Group 1997). The proposed Project expansion is compatible with LRMP objectives for the area given that final cover upon closure of the landfill will meet agricultural standards, as provided in the *Contaminated Sites Regulation* (CSR), and Tervita will work with BC MECCS to consider future land uses upon closure.

In July 2018, a new Regional Strategic Environmental Assessment Interim Measures Agreement (the Agreement) signed by BRFN, the BC Ministry of Energy, Mines and Petroleum Resources, the BC OGC, and the BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development (MFLNRORD) will apply to defined areas within the BRFN traditional territory. The Agreement is designed to address immediate concerns with respect to oil and gas development activities in BRFN’s critical areas

while supporting the access and development of resources in specific areas identified by the parties. There are critical areas where new surface disturbance will not be permitted or will be restricted and other areas where development activities will be managed. The proposed Project expansion is located within Region 3, where the management objective is “no new surface disturbance”. The Agreement is specifically for oil and gas applications under the BC OGC. The proposed Project expansion will take place on private, previously disturbed land and, therefore, is not inconsistent with the Agreement.

1.2.4.4 Provincial Land Use Designations

The proposed Project expansion is located on lands zoned as Agricultural Land Reserve (ALR) by BC’s Agricultural Land Commission (ALC). The purpose of the ALR is to protect land with agricultural potential in BC (PRRD 2014). ALR lands are considered to have the greatest agricultural capability in the province with agriculture recognized as the priority land use. Although agriculture and farming are prioritized in the ALR, other compatible land uses are permitted. Nonagricultural uses must be approved by the ALC (ALC 2014a). The land in the Project footprint was approved for nonfarm use by the ALC (see Figure 1.2-3 and Section 4.1.2 for additional details).

The proposed Project expansion is also located in the Fort St. John Timber Supply Area (TSA) with a current allowable annual cut (AAC) of 2,115,000 m^3 (Province of BC 2018d) (see Figure 1.2-3 and Section 3.9.1.2 for more details on the TSA).

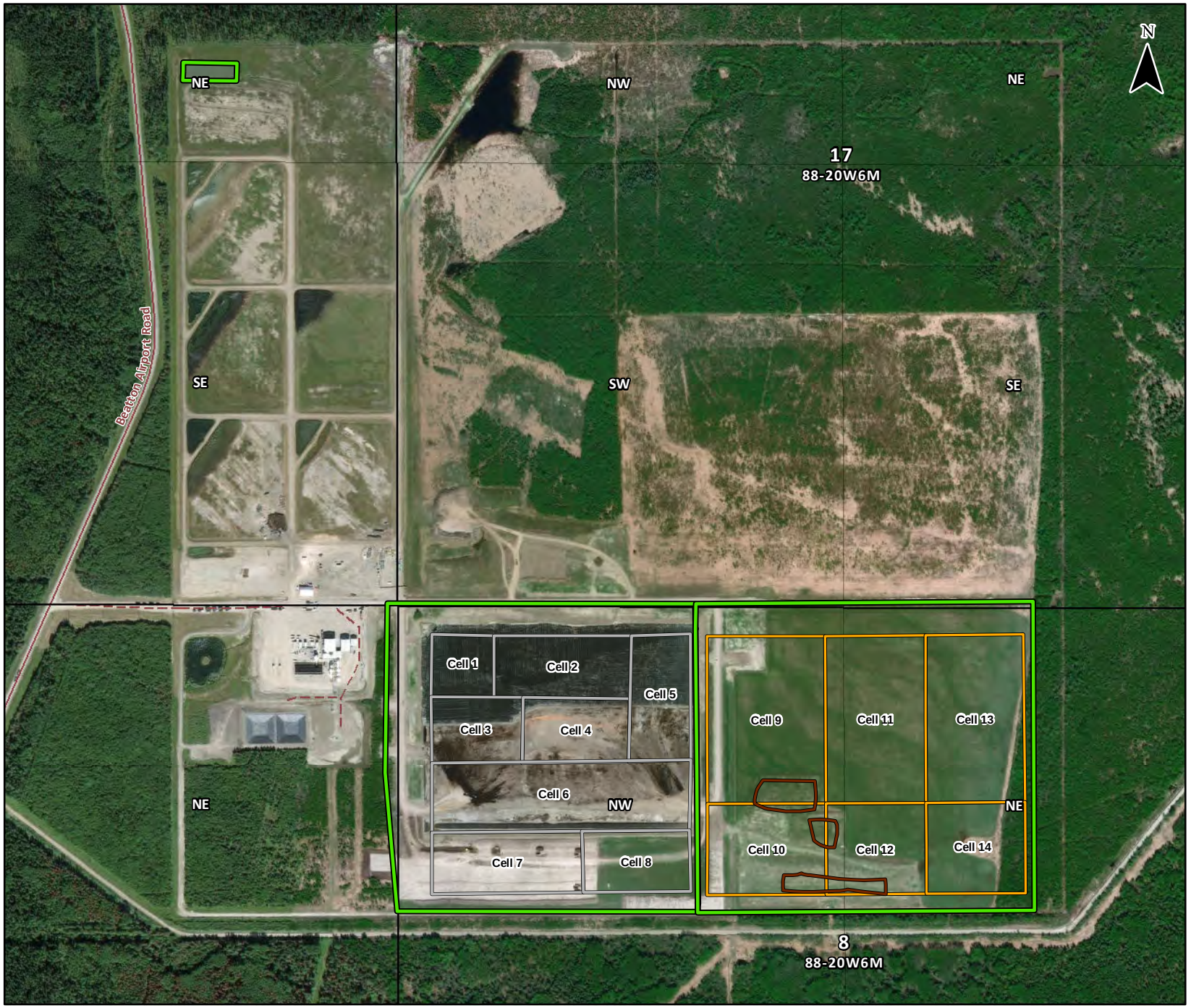

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FIGURE 1.2-3

SITE-SPECIFIC LOCATION

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Resource Road
- Road
- Project Expansion Footprint
- Proposed Cell Block
- Existing Cell Block
- Soil Stockpile

SCALE: 1:10,000

0 100 200 300

Metres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Imagery: DigitalGlobe 2015;
Road: BC MFLNRO 2012, NRCan 2015;
Proposed Project Data: Tervita 2015 - 2016.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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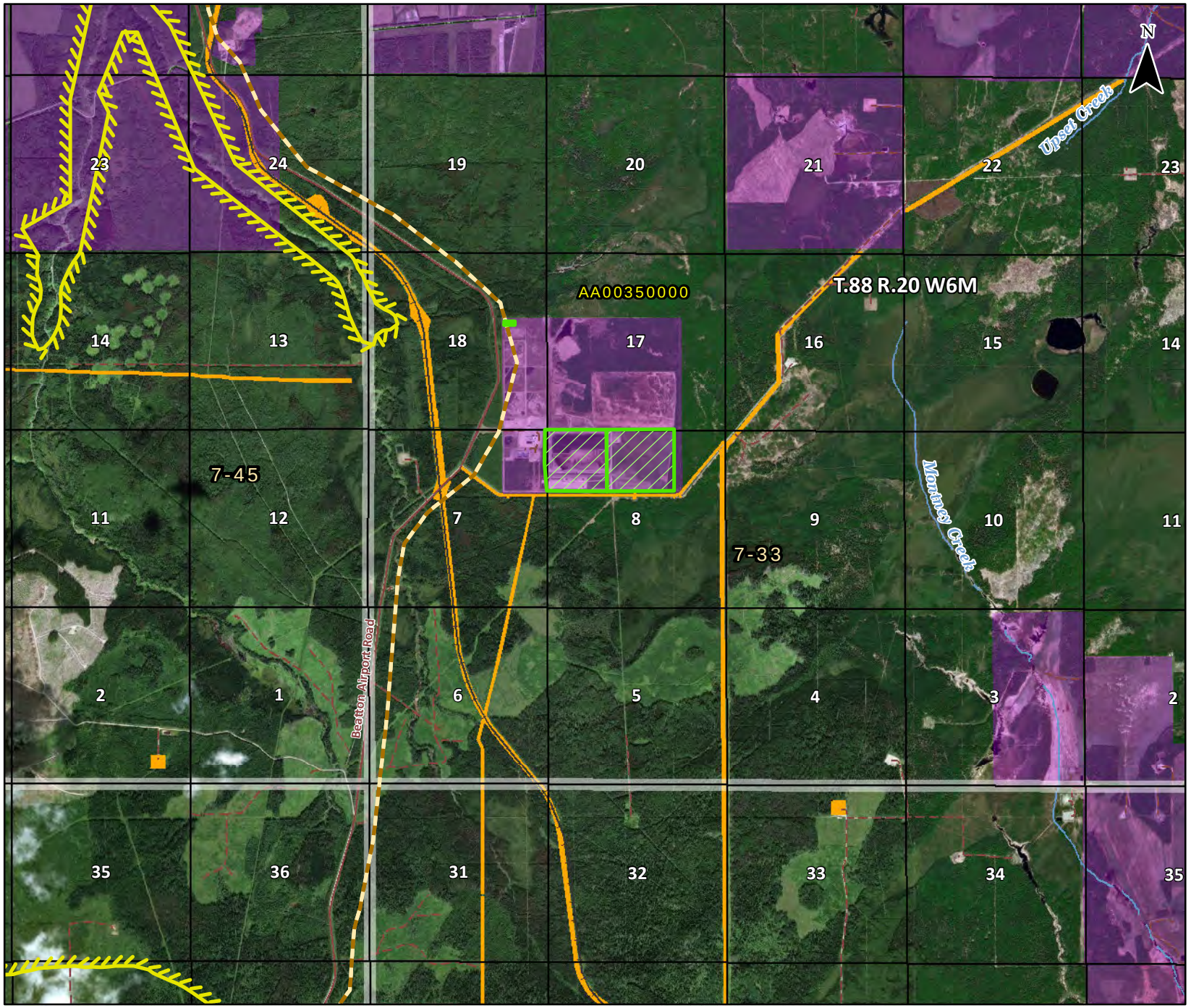

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FIGURE 1.2-4

OTHER LAND USES IN RELATION TO THE PROPOSED PROJECT

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Resource Road
- Road
- Project Expansion Footprint
- Agricultural Land Reserve
- Wildlife Management Unit Boundary
- Crown Land
- Private Land
- 7-33 / 7-45 Wildlife Management Unit Identifier

The entire map extent is within the Timber Supply Area (TSA) 40.

SCALE: 1:50,000

0 500 1,000 1,500

Meters

(All Locations Approximate)

JACOBS

UTM Zone 10N
Imagery: DigitalGlobe 2015;
Road: BC MFLNRO 2012, NRCan 2015;
Proposed Project Data: Tervita 2016;
Agricultural Land Reserve: ALC 2018;
Wildlife Management Unit: MFLNRORD 2017;
Parcel Fabric: BCGov 2019;
Timber Supply Area: MFLNRORD 2018.

Mapped By: DR | Checked By: NP

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1.2.4.5 Wildlife Management Areas

The proposed Project expansion is located within the Peace Region Management Unit 7-33 (Region 7B) (GBC 2019b). The proposed Project expansion is not located within any provincially identified wildlife management areas (for example, Ungulate Winter Ranges [UWRs] or Wildlife Habitat Areas [WHAs]) (GBC 2019b). The proposed Project expansion is not located within any Parks and Protected Areas (BC MFLNRORD 2018a), Important Bird Areas (Bird Studies Canada and Nature Canada 2004-2010), Migratory Bird Sanctuaries (ECCC 2017), National Wildlife Areas (ECCC 2018), Western Hemisphere Shorebird Reserves (WHSRN 2018), or Ramsar wetlands (Bureau of the Convention on Wetlands 2016).

1.2.5 Economic Benefits

Construction expenditures are estimated to total approximately $43.5 million for all proposed cells. Of this amount, approximately $4 million will be spent on engineering and design and $9 million will be spent to construct the first cell (Cell 9). The operations phase expenditures are estimated to total approximately $3 million per year, and include regular maintenance and material expenditures, labour, and contracting. Costs associated with initial decommissioning and abandonment are estimated at approximately $7 to $8 million, and include activities such as soil and groundwater monitoring, leachate and stormwater testing, demolishing the office site, weigh scales, clay liners and berms, grading and contouring, erosion and dust control, topsoil replacement, seeding, and inspections. Annual costs associated with decommissioning and abandonment are estimated at $140,000, and include activities such as annual inspections and maintenance, soil and groundwater monitoring, laboratory testing of leachate and stormwater, dust control, mowing, and vegetation control. Reclamation requirements and associated costs will be determined during the decommissioning phase.

The proposed Project expansion will, over more than 25 years of life, contribute millions of dollars in construction-related expenditures, labour income and employment, and taxes to the municipal, regional, provincial, and federal governments. Capital cost of the proposed Project expansion is estimated at $43.5 million. Currently, Silverberry pays a royalty of $0.90 per tonne of waste accepted per the *Waste Discharge Regulation*, which amounted to $269,199.73 in royalties in 2018. This revenue is expected to be similar for the proposed Project expansion if rates remain the same. The operations of the proposed Project expansion will also generate revenue in the form of property taxes. The construction of the proposed Project expansion will generate a demand for goods, services, and workers, which will contribute to the local and regional economy. There will be direct and indirect business income, and direct and indirect employment income. There will also be increased tax revenues during construction and operations as a result of sales tax and fuel tax, for example.

The proposed Project expansion will generate employment and contracting opportunities for Aboriginal and non-Aboriginal community members and businesses. The construction phase will require a workforce of approximately 20 personnel for 4 to 5 months to construct each cell, which is the equivalent to a total of 36 person-years for construction of all 6 proposed cells. The proposed Project expansion construction will provide most employment opportunities for local businesses and community members. Types of job requirements for landfill cell construction include an Environment & Regulatory Advisor, a Landfill Project Manager, third-party landfill engineering firms, a construction crew, a liner crew, and an inspector. Although Tervita will endeavour to hire locally, all major construction is sent out to bid and awarded to companies with appropriate experience versus cost. Companies are, however, typically Western Canadian. Tervita currently employs seven full-time personnel (175 person-years for the operations phase) residing in Fort St. John for operations and no additional full-time employment is expected to be generated for the proposed Project expansion. Wages paid by Tervita will be aligned with the average wages in the region for technical and nontechnical work.

Predicted benefits include an influx of tax revenues that may be used by the government for services related to the environmental, economic, social, health, and heritage pillars of assessment. The predicted social benefits of the proposed Project expansion include training, education, and employment opportunities for unemployed or underemployed individuals.

A summary of economic benefits is provided in Table 1.2-2.

Table 1.2-2. Economic Benefits

Economic Benefit	Project Phases	Amount (approximate)
Expenditures	Construction	$43.5 million
	Operations	$3 million per year
	Decommissioning and abandonment	$7 to $8 million
Royalties	Operations	$0.90 per tonne of waste accepted
GST	Construction and operations	$150,000 to $500,000
Employment and contracting opportunities	Construction	36 person-years
	Operations	175 person-years

Note:
GST = goods and services tax

1.2.6 Assumptions

The following assumptions were made in relation to the information presented in Section 1.2:

- Tax rates and royalties are based on current market prices (that is, GST from $150,000 to $500,000 and a royalty of $0.90 per tonne).
- The proposed Project expansion will not be subject to any additional taxes or royalties other than the existing landfill.
- The majority of construction purchases will be made locally.
- Construction and operations of the proposed Project expansion are based on Tervita's current knowledge of the types and volumes of oilfield waste in the northeast BC area and Tervita's previous secure landfill experience.

1.3 Applicable Authorizations

Table 1.3-1 outlines the applicable licenses, permits, and/or approvals that are required for the phases of the proposed Project expansion.

Table 1.3-1. Applicable Authorizations

Statute and Authorizing Agency	Permit/Authorization	Description/Need for Authorization
BC MECCS *EMA*, HWR, and *Waste Discharge Regulation*	Amendment of BC MECCS Permit PR 17150	Required for discharge of nonhazardous and select hazardous waste
BC EAO *EMA* and *Reviewable Projects Regulation*	Amendment of PAC (now known as the EAC)	Required for construction and operations of the proposed Project expansion

1.4 Project Design and Alternative Means

Alternative means are the various technically and economically feasible ways to implement a project (CEA Agency 2015). Increased landfill capacity is required to meet potential future waste management needs in the region, and the existing landfill does not currently provide sufficient capacity. Alternative means were sought through a siting process. In order to determine the best option to meet the needs and

purpose of the proposed Project expansion, a multidisciplinary team used a balanced approach that emphasized public safety, protecting the environment, constructability, and cost.

The main alternative to the proposed Project expansion is the construction of a new landfill at a different location. Not constructing a landfill is not an option as there is a need for increased landfill capacity in the region to address the ongoing production of industrial waste. The proposed Project expansion will allow Tervita to continue to provide timely, orderly, environmentally sound, and economical options for the disposal of oilfield waste in northeastern BC.

If Tervita were to construct the proposed Project expansion at a new location, most of the existing infrastructure and safety systems would need to be re-established, increasing costs and the overall risk to people and the environment. New land and access requirements would result in increased native vegetation disturbance and risks to wildlife and wildlife habitat. In addition, a new site would result in a cumulative decrease to the aesthetic value of the landscape and increased nuisance to land users, for example, as a new source of noise and traffic.

Site selection is one of the primary mitigation options for minimizing conflict between a proposed Project expansion and biophysical, socio-economic, and cultural resources. Co-locating the proposed Project expansion at Tervita's existing landfill instead of constructing and operating a landfill at a new site allows for a lower impact for the following reasons:

- Reduces impacts on other land owners and land users since Tervita holds the disposition rights to the proposed Project expansion area, leveraging existing data regarding the Project Area given the ongoing monitoring of the existing landfill, and minimizing visual and land use impacts.
- Minimizes potential adverse effects by limiting the overall physical disturbance necessary to construct and operate the proposed Project expansion to locations where Tervita holds the disposition rights to that land.
- Incorporates operational activities associated with new infrastructure into existing activities.
- Leverages existing data to understand potential interactions of the existing landfill and the environment, with over a decade of results through routine monitoring of surface and groundwater quality, air quality, and soil quality.
- Keeps the proposed Project expansion away from residential areas
- Avoids the creation of new access corridors, which may result in adverse and unintended consequences on wildlife and wildlife habitat, and interfere with surrounding land uses.
- Minimizes potential adverse effects on aesthetic value of the landscape, since the proposed Project expansion will be co-located with an existing landfill that has already altered the viewshed in the area.
- Reduces the likelihood that the proposed Project expansion will interact with previously unidentified heritage resources, since the land is previously disturbed and has low potential for heritage resources.
- Reduces costs consistent with prudent company management and long-term sustainability; expanding the existing landfill site is substantially more cost-effective than constructing and operating a landfill at a new site.

1.5 Alternatives to the Proposed Project Expansion

No technically and economically feasible alternative locations were identified to meet the needs of the proposed Project expansion. Consequently, a qualitative assessment associated with building the capacity replacement for the landfill at an alternate location was not considered in this assessment.

2. Environmental Assessment Process

2.1 Provincial Environmental Assessment Process

This subsection outlines the stages of the BC EAO process including the Pre-Application stage and the Application Review stage for amendments to EAC. The BC EAO established a Working Group consisting of representatives from provincial and federal government agencies, local and regional governments, and Aboriginal groups to assist the EAO with the Application process. The EAO Working Group identified for the proposed Project expansion are as follows:

Provincial government agencies:

- BC EAO
- BC Ministry of Agriculture
- BC MECCS
- BC MFLNRORD
- BC Ministry of Health
- BC Ministry of Natural Gas Development
- Northern Health

Municipal and Regional Agencies:

- PRRD
- City of Fort St. John

Aboriginal Groups:

- BRFN
- DRFN

2.1.1 Pre-Application Stage

After reviewing materials that Tervita provided February 24, 2014, and based on subsequent meetings and discussions, in a letter dated August 6, 2015, the EAO determined that Tevita's amendment request to the existing PAC (WD02-01; now known as the EAC) for the proposed Project expansion is deemed to require an Application pursuant to Section 19 of the BC *Environmental Assessment Act* (*EA Act*). An amendment of the PAC WD02-01 (now known as the EAC) is required because Tervita (as holder of the EAC) proposes a change or changes to the design, location, construction, operation or decommissioning of Silverberry. An approval from BC MECCS for amendment of Permit PR 17150 is also required for the proposed Project expansion pursuant to Section 19 of the *EA Act*. This Application has been developed pursuant to the BC EAO-approved AAIR. The Pre-Application stage has concluded with the Tervita filing of the proposed Project expansion Application to the BC EAO.

During the Pre-Application stage of the proposed Project expansion, Tervita conducted consultation activities with the Working Group for their inputs on the selection of appropriated Valued Components (VCs) and on details of the AAIR. Details of issues raised by the Working Group during these consultation activities are provided in Parts C and D, and Appendix 12 and 13 of this Application. A summary of key issues raised by the EAO Working Group's government agencies and status of resolution is provided in Table 2.1-1. Summaries of key issues raised by the EAO Working Group's Aboriginal groups and status of resolution are provided in Tables 11.2-1 and 11.3-1. These issues have been addressed prior to the finalization of the AAIR or are addressed in this Application.

Tervita initiated public consultation on July 1, 2015. Residences, occupants, and landowners within 3,200 m of the Project were consulted in-person and by phone on September 9 and 10, 2015. Residences, occupants, and landowners within 5,000 m of the Project were notified by registered mail on September 10, 2015. An open house was held in the Community of Buick on February 16, 2016. An

"Invitation to Comment" by the BC EAO was posted on the May 11, 2017 issue of the *Alaska Highway News*, seeking public comments on the draft VCs. No public concerns have been expressed about the proposed Project at this time.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Terrain and soils	BC MECCS asked what soil sampling will be collected to support the assessment of soils, where soil chemistry will be sampled and analyzed, and what is the soil quality at the existing effluent discharge location and in soils that are downwind of the facility. BC MECCS requested soil chemistry sampling downgradient to determine if stormwater effluent discharge has impacted soil quality and downwind of the landfill to evaluate the efficacy of current dust suppression mitigation for preventing contamination of regional soils. BC MECCS is also concerned about impacts to soils and biota on lands and surface waters downwind of the prevailing winds from the transport of contaminated or radioactive dust.	There was a siting investigation done before the original landfill was built (Appendix 5). The original geology of the area will not have changed. However, Tervita is supplementing the original siting investigation with some further analysis of the expansion area. Soil chemistry and quality have been assessed in the field (Appendix 1) and are discussed in the Application (Section 4.1). Tervita performs NORM air monitoring bi-annually (Appendix 11) to ensure that onsite mitigation measures are sufficient to prevent the spread of naturally occurring radiation outside the landfill.	Addressed in Section 4.1 and Appendices 1, 5, and 11 of the Application.
	BC MECCS raised a concern that “Potential atmospheric impacts associated with a proposed secure landfill site include: fugitive dust from equipment activities that may adversely affect vegetation and increase the intake of particles on wildlife and human receptors;”	Fugitive dust emissions are addressed under the Dust subcomponent in Section 4.2 of the Application.	Addressed in Section 4.2 of the Application.
	BC MECCS noted this reference: Integrated Approach for the Analysis of Ecosystems at Risk: A Case Study in a Waste Landfill. R. Mazzeo et al. 2013. Environmental Engineering and Management Journal 12: 165-168. “Quantification of heavy elements levels in soil and air cannot generate sufficient information on impact because the absolute metal concentration alone does not reflect the degree to which these compounds affect the environment (Cheung et al., 1993). Data on the bioaccumulation and effects of leachate on wild populations are essential to assess the environmental impact of these disposal sites.”	Tervita reviewed the extended abstract of the article referenced. The landfill referenced in the abstract is a municipal solid waste landfill. No details of landfill design, siting, or geology are given; therefore, a correlation between the environmental effects of Ginestreto and Tervita Silverberry cannot be made.	Addressed in the response.
	PRRD requested for clarification regarding soil sampling, while they have a sample regimen stated in one of their documents, it is unclear how often they would be sampling (that is, whether it is monthly, annually, case-by-case, etc.).	The soil sampling program is planned to be a one-time-only study to determine if existing operations have impacted the surrounding soils.	Addressed in the response.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Terrain and soils (cont'd)	Northern Health suggested that the LAA for soils should be expanded to capture potential effects from potential offsite soil contamination associated with surface water discharge and dust deposition.	There are no proposed changes to the spatial boundaries for assessment at this time. Section 3.2.1 in the AAIR stated that "if information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, study area boundaries will be revised". Tervita has reviewed the information collected for the Application and determined that there are no findings that warrant a revision of the LAAs and RAAs.	Addressed in the response.
	Northern Health noted that the soil data would be compared to the BC CSR Schedule 4 Standards, and asked for other applicable CSR Schedules (for example, Schedule 5) to be included in the assessment. BC MECCS noted that where CCME soil quality guidelines do not exist for a particular parameter, the BC CSR numerical standards should be used in the evaluation of soil analysis results. Alternatively, other applicable guidelines or standards can be used, if available, such as guidelines or standards from the U.S. EPA.	Considerations suggested by Northern Health and BC MECCS have been addressed in Section 4.1 and Appendix 1 of the Application.	Addressed in Section 4.1 and Appendix 1 of the Application.
Soil study method	Northern Health noted that screening criteria based on CCME's human health-based soil quality guidelines and/or BC CSR standards are only acceptable for assessing risk from direct contact. Northern Health suggested that tissue modelling and/or sampling would be required to assess the risk to human health if there is a potential for the bioaccumulation of contaminants into the food chain.	In order to determine effects of emissions on vegetation, the potential emissions from Silverberry first have to be understood. If vegetation sampling or monitoring is required, this should be discussed in the *EMA* Permit amendment. Tervita has committed to completing soil sampling at the surface water discharge location and in the Project Area adjacent to the existing landfill to determine if contamination is present. If contamination is discovered, mitigation will be implemented to reduce the risk of contaminants reaching receptors. In addition, Tervita has committed to conducting air quality monitoring to determine if emissions are being produced by the landfill, and NORMs are monitored twice a year to determine if atmospheric levels are within regulatory standards. Since the possible pathways for contamination are being studied, it would be duplicative to sample vegetation tissue to determine if contamination is being spread through air, water, or soil; therefore, Tervita is not proposing a tissue sampling program at this time.	Addressed in the response.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Soil study method (cont'd)	BC Ministry of Natural Gas Development noted that it does not appear that any samples were taken to the northwest; the samples were only taken to the north.	When surface water is discharged, it is discharged directly north from the stormwater pond. If there is no sign of contamination directly north where water is discharged, it can be assumed that no/minimal contamination is reaching the ephemeral drainage that drains northwest.	Addressed in the response.
	BC Ministry of Natural Gas Development asked why no sample was collected southwest of the work area (that is, south/southeast of the leachate frac/water ponds or west of Cell 6 given prevalent conditions.	Land by the leachate ponds is on the footprint of an oilfield waste management facility and water injection facility. Any sampling taken in this area would make it difficult to differentiate between contamination caused by the landfill and oilfield waste management facility. Land directly west of Cell 6 is going to be developed into new landfill cells. The study work plan was circulated to the Working Group prior to initiation and the sampling locations were deemed satisfactory.	Addressed in the response.
	BC Ministry of Natural Gas Development noted that barium results from onsite locations are consistently higher than offsite locations. Are we seeing a possible impact from operations here (even though they are still below regional background levels)?	Further investigation will have to be performed to draw a more substantial correlation between operations and a possible barium impact. Tervita will take into consideration further investigation on the source of barite/barium.	Addressed in the response.
	BC MECCS suggested adding a separate chapter for GHGs.	GHGs were originally excluded in the VC document. After Working Group feedback, Tervita added GHGs under the air quality VC as a KI.	Addressed in Section 4.2.4 of the application.
Air study method	BC MECCS suggested that, when including the discrete data collected on August 24, 2016, ensure to compare the nature of this sampling program to the bullets detailed in Section 3.3 of the dAAIR. Specifically, consider these two samples relative to the first bullet: "A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities".	The data gathered on air quality and potential effectiveness regarding uncertainty and sufficiency have been expanded upon in Section 4.2 of the Application.	Addressed in Section 4.2 of the Application.
	BC MECCS noted that fugitive emissions (of coarse particles, VOCs and odourants) are missing from the list of potential effects. Fugitive emissions should be considered an activity of sorts.	Tervita added fugitive emissions to the list of potential effects in Section 4.2.4.	Addressed in Section 4.2.4 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Air study method (cont'd)	BC MECCS asked which data can be presented to support the assertion that the site does not produce uncontrolled releases of CH_4 and which information is gathered through ongoing monitoring and data collection efforts? Which ambient air quality monitoring occurs onsite?	Data regarding air monitoring and landfill gas generation have been discussed in Section 4.2.2 and Appendix 2 of the Application.	Addressed in Section 4.2.2 and Appendix 2 of the Application.
	BC MECCS noted that the potential impacts from landfill dust and emissions remains a key uncertainty that should be resolved prior to the submission of an application. BC MECCS suggested a limited sampling program, such as lichen sampling and tissue analysis for assessing the potential impact of emissions.	In order to determine effects of emissions on vegetation, the potential emissions from Silverberry first have to be understood. If vegetation sampling or monitoring is required, this should be discussed in the *EMA* Permit amendment. Tervita has committed to completing soil sampling at the surface water discharge location and in the Project Area adjacent to the existing landfill to determine if contamination is present. If contamination is discovered, mitigation will be implemented to reduce the risk that contaminants will reach receptors. In addition, Tervita has committed to conducting air quality monitoring to determine if emissions are being produced by the landfill, and NORMs are monitored twice a year to determine if atmospheric levels are within regulatory standards. Since the possible pathways for contamination are being studied, it would be duplicative to sample vegetation tissue to determine if contamination is being spread through air, water, or soil; therefore, Tervita is not proposing a tissue sampling program at this time.	Addressed in the response and Sections 4.4.5 and 4.2.5 of the Application.
	BC MECCS suggested an annual or other monitoring survey and indicated that the concerns with the need for long-term air emission monitoring and evaluation of potential contaminants of concern also apply to whether there will be effects to nearby water bodies and terrestrial ecosystems from the landfill gas emissions.	The HWR does not stipulate conditions or guidelines on air/ landfill gas monitoring at Secure Landfills. Ongoing monitoring requirements has been discussed in the Application. The VC Document was edited to include VOCs as an indicator of air quality, and VCs to assess effects to aquatic and terrestrial environments have been included in Section 4.2.5 of the Application.	Addressed in Section 4.2.5 of the Application.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Air study method (cont'd)	Northern Health and PRRD noted that it was not clear how it was concluded that additional monitoring is not warranted based on one sampling event. BC MECCS also noted that monitoring of emissions for the air study appears to occur on a single day in July. Typically, monitoring involves more than one sampling event and should be a scheduled period of sampling to capture annual and seasonal variations that take into account temperature and precipitation changes.	Additional monitoring is not needed as the monitoring event provided an adequate snapshot to understand the chemical composition of landfill gas, collected during a warm summer day and at a location when/where emissions would be expected to be near maximum. Ongoing monitoring requirements has been discussed in the dAAIR and Section 4.2.5 of the Application.	Addressed in the response and Section 4.2.5 of the Application.
	Northern Health noted that insufficient rationale was provided for the air quality criteria that were used.	Tervita has provided rationale for the air quality criteria in Table 4.2-1 of the Application.	Addressed in Table 4.2-1 of the Application.
	Northern Health noted that it should be recognized that some contaminants can work cumulatively (for example, impacting the same target organ), and that there can be compounded effects from multiple exposure pathways. Why were additive effects not considered?	The results of the air study are intended to report on the findings of the field work; they are not intended to provide an effects assessment. The atmospheric environment, as well as human health, have been assessed in Sections 4.2.4 and 8.5 of the Application, which considered potential cumulative and additive impacts.	Addressed in Sections 4.2.4 and 8.5 of the Application.
	Northern Health asked that Tervita include VOCs as a KI for Air Quality and Human Health, or at least that VOCs are included in the AAIR.	The VC Document has been edited to include VOCs as an indicator of air quality.	Addressed in Table 4.2-1 of the Application.
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Surface water	BC MECCS asked whether analysis of discharge of stormwater and contaminated water would need to be developed - a plan on disposal of water and emergency overflow (flood event).	Due to the existing landfill in operation, Tervita has developed plans to analyze, control, and discharge stormwater. Details of surface water controls have been provided in Section 4.4.5 of the Application.	Addressed in Section 4.4.5 of the Application.
	BC MECCS noted that although a stream is found on private land, the water and stream/bed channel is vested property to the Crown; therefore, if a stream does not appear on a desktop exercise, a drainage having stream characteristics, whether flowing or not, at any time of the year can be a regulated stream under water legislation. The proponent should ensure that surface water surveys address stream classification in the field to meet legislative standards.	Tervita has reviewed applicable legislation to ensure that surface water is classified properly.	Addressed in the response.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Surface water (cont'd)	BC MECCS asked for inclusion of a brief description of the proposed leachate treatment system, the locations of discharge, and the parameters of concern in the discharged effluent, including radioactivity.	Leachate characteristics, disposal, etc. have been discussed in Section 4.4.2 of the Application.	Addressed in Section 4.4.2 of the Application.
	BC MECCS asked how the Important Features in the Project Area were identified, how priorities of local, provincial, or federal governments, First Nations, or the public were determined, and why the creek to the west of the Project Area was omitted as an Important Feature. BC MECCS also noted that the surface water streams to the north and west of the Tervita property should be included in the assessment of potential impacts to surface water.	Through the comment periods of the Application process, Tervita has been able to determine the priorities of local, provincial, and federal government, First Nations, and the public. Nearby creeks that may be impacted are an Important Feature. Surface water is a proposed VC. Surface water streams to the north and west will be included in the assessment of potential impacts to surface waters.	Addressed in the response and Sections 4.4.1 and 4.4.2 of the Application.
	BC MECCS is concerned about surface water contamination from leachate leakage, or from contaminated stormwater discharge.	Surface water contamination is a VC, and it is noted that surface water may come into contact with waste (leachate). Tervita has discussed mitigation in Section 4.4.4 of the Application. Based on Tervita's experience constructing and operating the existing landfill, the potential adverse effects of the proposed Project expansion on Surface Water VC are generally well-understood. Evidence at the existing landfill (refer to Appendix 3) indicates that Tervita's mitigation measures and construction practices are effective in preventing or reducing potential residual effects on Surface Water VC. Section 9 of the Application assesses the likelihood of accidents and malfunctions occurring, which ranges from may to unlikely, while consequence ranges from minor to severe. Confidence ranges from high to moderate and is based on Tervita's extensive experience operating hazardous waste landfills throughout Western Canada, including the safe and successful operational history of the existing Silverberry landfill, as well as the effectiveness of mitigation, including Tervita's Operations Plan.	Addressed in Sections 4.4.4 and 9 of the Application.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Surface water (cont'd)	BC MECCS asked for more definition of water quality parameters, how the sampling of water quality would be evaluated, and against which standards it would be evaluated. BC MECCS noted that enough data are needed to determine the potential effects. An understanding is also needed as to whether water quality is better by dilution from snow melt in the spring or whether the spring runoff picks up more contaminants and reduces water quality. The same understanding is needed for the late summer period, when the main contributor to runoff is from groundwater. BC MECCS asked if there are enough data collected to answer these questions.	Currently, the surface water at site is tested for Schedule 1.2 of the HWR. As described in Section 4.4.2 of the Application, surface water within the property (which includes the proposed Project expansion and the existing landfill) is controlled by a water management system consisting of a network of onsite ditches, runon and runoff systems, and a surface water (stormwater) pond. Surface water generally flows from the southeast side of the property to the northwest side of the property, and a ditch constructed around the perimeter will direct runoff towards the stormwater pond on the northwest side of the existing landfill; therefore, the existing conditions related to surface water at the proposed Project expansion are based on analytical results of sampling events for the stormwater pond conducted by Nichols Environmental (Canada) Ltd. in spring and summer, yearly, from 2014 to 2019 at the existing landfill. Data reported in the surface water sampling report (Appendix 3) identify that analytical results of surface water samples collected in 2018 were less than the applicable standards for petroleum hydrocarbons, organics, and metals. Data from desktop review of provincial and regional information sources, information from site investigations, ongoing surface water discharge analytical data at the existing facility and data collection efforts, as well as comparison of the surface water quality data to the BC HWR provide an appropriate baseline for assessing the effects of the proposed Project expansion on surface water.	Addressed in the response and Section 4.4.2 of the Application.
	BC MECCS noted that it appeared that only a few years of data containing three samples are currently available, despite discharging from the sediment pond occurring throughout the season. Sampling needs to match the discharging. Considering the evaluation of effects of the Project, additional sampling may be needed to properly determine the effects for this amendment.	Tervita keeps records of analytical, dates, and volumes of surface water discharged. Tervita analyzes the water prior to discharge against Schedule 1.2 of the HWR. Discharge is intermittent, depending on precipitation, and is only typically done in spring and fall.	Addressed in the response.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Surface water (cont'd)	BC MECCS noted that there are only three samples for water quality for the discharge from the sediment pond over a 2-year period. It is not appropriate to evaluate the predictions for impacts to the environment from three sample points. BC MECCS suggested that during the Environmental Assessment process, the proponent should collect some additional data to validate the predictions.	Tervita performed a soil sampling program as requested by Working Group members to help determine impacts of the surface water discharge. Tervita can resupply this report to BC MECCS.	Addressed in the response.
	BC MECCS suggested that Tervita should include any monitoring surface water data collected during operation of the existing landfill, developing the water quality predictions for the expansion. This information would not only strengthen their predictions, but would also provide more certainty to the surface water quality assessment portion of the Application.	Tervita has included existing monitoring data in Sections 4.4.2 and 4.4.4 of the Application when developing the water quality predictions for the expansion.	Addressed in Sections 4.4.2 and 4.4.4 of the Application.
	BC MECCS noted that the spatial boundaries of the RAA include a number of creeks and rivers. How will those be monitored to ensure no deleterious effects to surface water from the discharge and from groundwater infiltration? Sites will need to be established for long-term monitoring.	Tervita can work with BC MECCS on potentially developing a Surface Water Monitoring Plan during the *EMA* permit amendment. Due to the development of oil and gas infrastructure in the area, potential contamination found in rivers and creeks may be inadvertently and incorrectly tied to Silverberry Landfill operations. Tervita follows the HWR developed by BC MECCS to ensure surface water discharge has limited impacts on the surrounding environment.	Addressed in the response.
	BC MECCS asked if the surface water retention pond is sized adequately to accommodate potential increased loading from seasonal runoff emitted from the new footprint and to prevent risk of overflow, and whether a KI for a retention volume should be included.	Tervita will meet the requirements of the HWR for Secure Landfills. Stormwater management and monitoring systems are already in place at the existing facility, and will be adjusted accordingly to account for stormwater retention associated with the proposed Project expansion. As described in Section 4.4.2.2 of the Application, surface water must regularly be removed from the system to maintain operating levels, as per Section 26(6) of the HWR. As per Section 26(1)(b)(i) of the HWR, the surface water collection system will be inspected weekly and/or immediately after a major storm or a catastrophic event. Surface water monitoring includes inspections of the surface water controls, and analytical and volume disposed/discharged/sent for alternate reuse. Water volume and movement were included as a KI in the Application.	Addressed in the response and in Section 4.4.2.2 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Surface water (cont'd)	BC MECCS asked for inclusion of baseline water quality data (including hydrocarbons and radiation) for surface waters and groundwater, capturing seasonal variation in streams to the north and west of the landfill facility.	Relevant information has been provided in Sections 4.4.2 and 4.5.2 of the Application. Tervita's groundwater consultant has reported seasonal groundwater elevations and concentrations. Based on the results presented in the report in Appendix 4, seasonality in groundwater concentrations is not evident.	Addressed in Sections 4.4.2 and 4.5.2 of the Application.
	Northern Health noted that the LAAs for surface and groundwater are limited to a 500-m radius from the site. This area may represent the area with the highest COPC concentrations. However, drinking water intakes may be outside that area and may represent the locations where receptors are at a greater risk of exposure.	Tervita has reviewed the information collected for the Application and determined that there are no findings that warrant a revision of the LAAs and RAAs. The locations of sensitive receptors will be considered on a case-by-case basis depending on the potential for, and the severity of, Project interactions with that receptor. Section 3.2.1 in the AAIR stated that "if information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, study area boundaries will be revised".	Addressed in the response.
	Northern Health noted that, similar to the potential for surface water NORM contamination, it should be recognized that surface water could be contaminated by metals contained in dust, which also could "settle into surface water".	Considerations suggested by Northern Health have been addressed in the Application. Metals have been identified as COPCs in surface water, soil, and groundwater VCs. As described in Section 4.2.4 of the Application, dust from construction material (rock and/or gravel) handling and earth grading may contain contaminants, which could be transported away from the proposed Project expansion. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic. Operational restrictions will take place if visible dust clouds are noted by onsite operators. These restrictions could include curtailment or cessation of work under high wind conditions, minimizing drop distances, covering or watering of open stockpiles, rehabilitating completed sections of the landfill as soon as practical, and adhering to posted speed limits onsite.	Addressed in Section 4.4.2 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Groundwater	BC MFLNRORD noted that new water legislation requires groundwater works to be authorized by BC MFLNRORD. Groundwater wells and monitoring may require water authorizations under the *Water Sustainability Act*. Groundwater Monitoring - Contact Yin Jun at the Omnica Region - Groundwater Specialist.	Tervita will review the *Water Sustainability Act* and contact Yin Jun to determine if the existing groundwater monitoring network requires authorization. Tervita would like to note that BC MECCS will review the groundwater monitoring network during the Waste Discharge Permit Amendment for Silverberry Landfill.	Addressed in the response.
	BC MFLNRORD asked whether references to existing monitoring well information would be included in the methods of data collection and assessment, and the monitoring plan.	Existing well information will be provided in the monitoring plan, which has been detailed in Section 4.5.2 of the Application.	Addressed in Section 4.5.2 of the Application.
	BC MECCS noted that the list of groundwater quality parameters is incomplete and should be corrected. Furthermore, an analysis of risks posed by an exceptionally high or seasonally high water table should be completed. Details about the direction of flow and flow rate of the groundwater are recommended.	The water quality parameters provided for review at that time were an example of what may be analyzed. Full details of parameters and the groundwater monitoring program have been discussed in the Sections 4.5.1 and 4.5.2 of the Application.	Addressed in Sections 4.5.1 and 4.5.2 of the Application.
	BC MECCS asked which parameters are measured, where, and how frequently. The regional groundwater flows northwest. What is the rate? What is the predicted fate of leachate should a liner breach occur during high and low groundwater seasons?	Groundwater monitoring has been discussed in detail in Section 4.5.2.2 of the Application. A leak detection system is also in place to ensure that landfill integrity is maintained.	Addressed in Section 4.5.2.2 of the Application.
	BC MECCS asked what would be the fate of leachate in the event of a liner breach? What direction/path is the groundwater flow pattern and what is the rate of groundwater movement? How long would it take to reach the nearest receptors? BC MECCS requests that these concerns be addressed in the groundwater section of the Application.	In the event of a liner breach, the leachate is still contained by the compact clay liner and is driven towards the leachate collection. The shallow groundwater flows to the northwest. The horizontal groundwater velocity beneath the site is estimated to be less than 0.3 m per year in 2014. Potential receptors and potential accidents and malfunctions will be discussed in the Application.	Addressed in Sections 4.5.4 and 9.2 of the Application.
	BC MECCS was concerned about groundwater contamination from leachate leakage through ruptured cell liners or elevated groundwater events.	Groundwater contamination is a VC and it is noted that leachate may migrate into groundwater. Tervita has discussed mitigation in Section 4.5.4 of the Application.	Addressed in Section 4.5.4 of the Application.
	BC MECCS noted how groundwater sample results would be evaluated and whether the BC CSR numeric standards would be used, or the contaminated sites federal interim groundwater guidelines.	Tervita's groundwater consultant uses the BC CSR when interpreting monitoring results. For consistency, the Application also uses the BC CSR when comparing results.	Addressed in Section 4.5 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Groundwater (cont'd)	BC MECCS noted that the background well, BH-103, has had issues and periodic parameter levels higher than the monitoring wells. This should be discussed and the work should be completed to understand why the results are high and how it is assured to be background only. Has there been consideration of another background well?	Tervita has discussed BH-103 with BC MECCS staff. Tervita will properly decommission and replace background monitoring well BH-103, including the installation of a deeper nested monitoring well with landfill cell 8 construction in 2019.	Addressed in the response.
	BC MECCS asked for inclusion of baseline water quality data (including hydrocarbons and radiation) for surface waters and groundwater, capturing seasonal variation in streams to the north and west of the landfill facility.	Relevant information has been provided in Appendices 3 and 4 of the application.	Addressed in Appendices 3 and 4 of the Application.
	PRRD noted that groundwater is not marked off as a candidate VC, and asked for clarification whether the construction of the expansion goes below ground for the first cells, and if so, if it is deep enough to interact with groundwater.	Groundwater was included as a VC in the Application. The new cells will be built below grade and shallow groundwater is present at the site. In 2002, BC MECCS granted Tervita an exemption to the Special Waste Regulation because "…the natural geology and designs exceed the minimum requirements of the Special Waste Regulation with respect to groundwater protection." Leachate management and monitoring systems are already in place at the existing landfill and will be adjusted accordingly to account for leachate generation associated with the proposed Project expansion. Leachate at the existing landfill is monitored as part of the groundwater monitoring program. The proposed Project expansion will connect to the existing system. A review of the leak detection sample data suggests that the current landfill leachate collection and containment system is operating effectively (refer to Appendix 4).	Addressed in the response and in Section 4.5 of the Application.
	PRRD asked whether the BC CSR Technical Guidance Document #6 (2010) been taken into account for water well and water body searches in the BC Water Resources Atlas. This is specific to any aquifer that may be within 500 m of a site, such as the planned expansion area, and focuses on whether or not the water quality of the aquifer could be affected.	Tervita has included relevant technical baseline information and guidance documents in Appendix 4 of the Application.	Addressed in Appendix 4 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Groundwater (cont'd)	Northern Health noted that the LAAs for surface and groundwater are limited to a 500-m radius from the site. This area may represent the area with the highest COPC concentrations. However, drinking water intakes may be outside that area and may represent the locations where receptors are at a greater risk of exposure.	Tervita has reviewed the information collected for the Application and determined that there are no findings that warrant a revision of the LAAs and RAAs. The locations of sensitive receptors will be considered on a case-by-case basis depending on the potential for, and severity of, Project interactions with that receptor. Section 3.2.1 in the AAIR stated that "if information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, study area boundaries will be revised".	Addressed in the response.
	Northern Health asked that information be provided to justify that there are "no registered wells, aquifers or community watersheds near the proposed Project Area".	Potential groundwater or surface water intakes and receptors in the vicinity of the site are identified in Sections 4.4.2 and 4.5.2 of the Application.	Addressed in Sections 4.4.2 and 4.5.2 of the Application.
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Terrestrial vegetation, including plant species at risk, First Nation culturally important species, and invasive plant species	BC MFLNRORD noted that the Terrestrial Vegetation VC should address plant species at risk, First Nation culturally important species, and the potential for transplant of rare and important species found.	Plant species at risk and First Nation culturally important species have been considered in Sections 4.6.2.1, 4.6.3, and 4.6.4 of the Application. Mitigation procedures to rare and First Nation culturally important plant species have been addressed in the Application.	Addressed in Sections 4.6.2.1, 4.6.3, and 4.6.4 of the Application.
	BC MECCS asked what data collection has been completed to date to determine if the vegetation in the receiving environment has been exposed to contaminants during existing operations.	Surface water is tested before being released to the environment. Stressed vegetation around the landfill will be noted by operations staff and measures will be taken to investigate the source.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Terrestrial vegetation, including plant species at risk, First Nation culturally important species, and invasive plant species (cont'd)	BC MECCS noted that the AAIR needs to ensure that if air quality emissions and dust concentrations are over a predetermined threshold, then potential impacts to vegetation and other interrelated VCs are evaluated.	Tervita has taken BC MECCS's comment into consideration and revised the AAIR to address potential effects of dust on vegetation and wildlife. Section 4.2.4 (Air Quality Potential Effects), Section 4.6 (Terrestrial Vegetation Key Indicators), Section 4.6.4 (Terrestrial Vegetation Potential Effects), Section 4.8 (Wildlife and Wildlife Habitat Key Indicators), and Section 4.8.4 (Wildlife and Wildlife Habitat Potential Effects) have been edited accordingly. Tervita performed a soil sampling program as requested by the Working Group to address the PDMA. To mitigate dust impacts, Tervita progressively caps cells as they reach capacity and will actively water waste to prevent potential dispersion during dry periods. Tervita can work with BC MECCS on a potential Air Monitoring Plan during the *EMA* Permit amendment. Tervita would like to note that Silverberry Landfill is in an active oil and gas production area, and that it would be difficult to delineate contamination and contaminant migration between operations.	Addressed in Sections 4.2.4, 4.6, 4.6.4, 4.8, and 4.8.4 of the Application.
	BC MECCS noted the Landfill Criteria for Municipal Solid Waste. BC MOE 1993. Section 7.15. Monitoring. "Monitoring of other environmental media such as vegetation and soils should be assessed and a program developed as the site-specific situation warrants".	There may be some applicable information from the Landfill Criteria for Municipal Solid Waste, 1993, that can be applied to Secure Landfills; however, it should be noted that the HWR should be used as the regulation for operations of Secure Landfills. There is a substantial difference in which wastes are landfilled at a Secure Landfill and a Municipal Solid Waste Landfill. There is no direction in the HWR that directs vegetation sampling for Secure Landfills.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Terrestrial vegetation, including plant species at risk, First Nation culturally important species, and invasive plant species (cont'd)	BC MECCS noted that dust from construction and operation needs to be added to potential effects and requested vegetation tissue sampling downwind from the landfill to evaluate the efficacy of existing mitigation for preventing the contamination of vegetation offsite.	Potential effects of dust have been expanded in the Environmental Affects Assessment, Section 4.2 Air Quality of the Application. Tervita has committed to completing soil sampling at the surface water discharge location and in the Project Area adjacent to the existing landfill to determine if contamination is present. If contamination is discovered, mitigation will be implemented to reduce the risk that contaminants will reach receptors. In addition, Tervita has committed to conducting air quality monitoring to determine if emissions are being produced by the landfill, and NORMs are monitored twice a year to determine if atmospheric levels are within regulatory standards. Since the possible pathways for contamination are being studied, it would be duplicative to sample vegetation tissue to determine if contamination is being spread through air, water or soil; therefore, Tervita is not proposing a tissue sampling program at this time.	Addressed in Section 4.2 of the Application.
	PRRD expressed concerns about occurrence and spread of Noxious weeds in disturbed construction soil and possible impacts with the washing of equipment.	Tervita reseeds all soil stockpiles and new berms to prevent Noxious weeds, erosion, and soil loss after construction. The Peace Forage Association website and seeding tool will be passed onto Tervita's construction contractor as part of contractor requirements. Currently, construction equipment has to be steamed/washed prior to mobilizing and demobilizing from the site to control the spread of Noxious weeds. This practice will continue. After soil stockpiles are seeded they will be monitored and Noxious weeds will be controlled, as needed. Mitigation measures to prevent and manage the spread of Noxious weed are described in Section 4.6.4 of the Application.	Addressed in Section 4.6.4 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Fish and fish habitat	BC MFLNRORD noted that drainages may be regulated under the *Water Act* and the *Water Sustainability Act* if they meet the definition of a stream, regardless of fish presence or value; therefore, the proponent needs to ensure that drainages are not streams, as defined under water legislation.	Tervita has reviewed the *Water Sustainability Act* and the *Water Act*, and has addressed applicable mitigation measures in Section 4.7.4 of the Application.	Addressed in Section 4.7.4 of the Application.
	In addition to Aboriginal interests, BC MECCS wanted to see health of the aquatic ecosystem considered rather than just a few key food fish species. Smaller and more localized species, such as sculpin, are better sentinels for contaminants than many food fish. A few species should be considered when looking at effects to the habitat.	Tervita has worked with its consultant and BC MECCS on potential indicator species to be used in Sections 4.7.2 and 4.7.4 of the Application.	Addressed in Sections 4.7.2 and 4.7.4 of the Application.
	BC MECCS noted that it is important that the change in habitat incorporates water quality, as well as the physical changes, such as loss of habitat types or invertebrates.	Tervita recognizes the interrelated nature of certain VCs and has conducted a comprehensive assessment of each VC with this in mind.	Addressed in the response.
	BC MECCS noted that the immediate receiving environment is an ephemeral creek. BC MECCS asked whether the creek gets used during the season by fish and if there are times that are critical to the fish lifecycle, such as spawning or rearing.	The creek has not been identified as suitable for fish habitat. As per the Fisheries Habitat Assessment completed during the original EAC application, "A nonfish-bearing, ephemeral tributary along the northwest corner of the existing facility offers seasonal connectivity to the downstream fish habitat from an area immediately adjacent to the north property boundary".	Addressed in the response.
	BC MECCS suggested that a Water Quality Management Plan should be included. This should identify both the ongoing groundwater sampling and a surface water sampling plan, including some basic biological sampling to confirm that the receiving environment is fine.	Tervita's Operations Plan will include the following management plans for monitoring and protection of water quality: • Groundwater Monitoring Plan • Leachate Management Plan • Stormwater Management Plan • Landfill Leak Detection Monitoring Plan	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Community infrastructure	PRRD noted that surrounding municipalities are being consulted and asked whether there will be additional notices, signage posted, radio ads etc. during the construction to make those traveling back and forth on Beatton River Airport Road aware.	As part of the consultation process of this Application, Tervita has been consulting local residents, posting ads, open houses etc. Depending on resident concern and feedback, Tervita will consider posting a notice during construction. Mitigation has been addressed in the Application (Table 6.1-2)	Addressed in Table 6.1-2 of the Application.
	PRRD would like to echo the concerns raised by BRFN regarding the status of the road in front of the facility. The PRRD sees that there are issues not only with rock damage to windshields, but also dirt tracked from the site onto the Beatton River Airport Road. The PRRD asked Tervita to provide more clarity around how they perform road maintenance to prevent the tracking of the dirt/foreign material onto the public road.	All trucks leaving the landfill site must try to clear tires and tire wells of as much mud as possible. Tervita checks the roadway daily for the tracking of dirt onto Beatton River Airport Road. During wet conditions, a skid steer is used to blade off any mud on the public roadway and brings it back to the landfill. When it is dry out, the skid steer has a sweeper bucket attachment to sweep any gravel and mud from the roadway. There is also an exit grid in place at Silverberry Landfill that trucks must drive over to remove excess mud from tires. Swamp/rig mats are also used in the landfill cells during wet conditions.	Addressed in the response.
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Human health	BC MECCS noted that the statement, "NORM waste has a low potential to affect human health", should not be made in advance of a radiological risk assessment. NORMs are recognized by the Canadian Association of Petroleum Producers as having both long-term and short-term human health effects. Exposure to NORMs is one of the key risks associated with this Project and a thorough radiological risk assessment that includes appropriate public and First Nations consultation will be necessary.	NORM has been assessed under the Health pillar and details on NORM monitoring and health and safety programs have been discussed in Section 8.4.8 and Appendix 11 (SLHHRA) of the Application. The SLHHRA indicates that possible receptors to NORMs include construction workers and facility operators. Concentrations of NORMs will diminish rapidly with increasing distance from the proposed Project; therefore, land use receptors, including First Nations, are not likely to experience exposure. BMPs, such as the use of personal dosimeters for onsite staff and air monitoring for NORMs in dust, will mitigate receptor exposure.	Addressed in Section 8.4.8 and Appendix 11 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Human health (cont'd)	BC MECCS is concerned about impacts to workers, the public, and biota from elevated radiation due to the exposure of NORMs. BC MECCS noted that a radiological risk assessment on human and environmental health, including a summary of the current monitoring program with methods and data representing worker and fence-line exposures (comparisons should be made to the relevant national and international standards and guidelines).	As discussed in the January 27 2016 Working Group meeting, Tervita has shared information regarding their RPP at Silverberry. BC MECCS was going to review applicable material and propose a scope for a Radiological Risk Assessment.	Addressed in the response.
	BC MECCS suggested a BACT review for leachate minimization and full treatment with a surface discharge.	Leachate disposal has been discussed in the Application. Tervita will continue to work with MECCS to address concerns around stormwater, surface water discharge, leachate treatment, and other potential discharges to the environment.	Addressed in the response and in Section 4.5.2.3 and Table 8.5-1 of the Application.
	BC MECCS requested a review of secure landfill facilities operated by Tervita and/or others with full landfill leachate treatment and surface discharge. The BACT review should explain why full leachate treatment is, or is not, appropriate for the Silverberry Landfill.	Leachate disposal has been discussed in the Application. Tervita will continue to work with MECCS to address concerns around stormwater, surface water discharge, leachate treatment, and other potential discharges to the environment.	Addressed in the response and in Section 4.5.2.3 and Table 8.5-1 of the Application.
	BC MECCS asked how much leachate is discharged and whether there are ways to minimize leachate volumes, including the implementation of the free liquid test rather than the paint filter test and containing or covering the leachate storage facilities to prevent dilution by rain.	Relevant information regarding leachate characterization, volumes, and minimization has been provided in the Application (Section 4.4 and 4.5).	Addressed in Sections 4.4 and 4.5 of the Application.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Human health (cont'd)	Northern Health asked which section traffic-related injuries will be captured in. The potential for traffic-related injuries should be also considered as part of the assessment and should encompass the traffic corridors associated with the Project.	Traffic-related injuries has been captured via the Accidents and Malfunctions section and via the Health Pillar under Human Health.	Addressed in Sections 8.5 and 9 of the Application.
	Northern Health asked Tervita to provide justification for exclusion of landfill gas generation and potential for the volatilization of chemicals from contaminated groundwater, surface water, and soils, and to consider inhalation exposures from assessment.	Rationale for exclusion was elaborated on in Table 3 of Section 4.2 of the VC Document. Silverberry does not accept municipal solid waste; therefore, landfill gas generation is minimal. Hydrocarbons associated with the waste tend to be heavier end and do not rapidly volatilize.	Addressed in the response and the Application.
	Northern Health asked Tervita if other indicators for the HHRA should include pathways for human consumption of contaminated foods, hazard quotients, and incremental lifetime cancer risk.	Health risks have not changed since the original application, except a permit amendment to accept NORM material. Health risks will be addressed under the Health Pillar of the VCs. Regulatory guidance has been reviewed and considered when drafting the Application.	Addressed in Section 8.5 of the Application.
	KIs listed are ambient air. Northern Health asked Tervita to provide a rational on how concentrations of PM and NO_x were selected as KIs. Northern Health expects the HHRA to be completed in accordance with Health Canada's guidelines.	Emissions from the site will largely be from internal (diesel) combustion engines. According to BC Air Quality - pollutant vehicles emit, NO_x and fine PM ($PM_{2.5}$) are found in larger amounts in emissions from diesel engines than gasoline engines. Most of the combustion at the site will be associated with the diesel engines of Silverberry's heavy equipment.	Addressed in the response.
	Northern Health asked that Tervita to consider health service impacts under the community services VC.	Tervita has incorporated health service impacts under the community services VC.	Addressed in Section 6.2 of the Application.
	Northern Health asked Tervita to provide rationale for spatial boundaries of Human Health VC subcomponents.	Rationale for spatial boundaries for assessment has been provided in the Application.	Addressed in Section 8.2.1 of the Application.
	Northern Health asked Tervita to provide justification that "ongoing management measures" would be sufficient to "ensure potential waterborne contaminants do not enter the environment" (into groundwater), or consider extending the groundwater LSA.	Tervita has provided justification in Section 8.5 of the Application that mitigation measures prevent waterborne contaminants from entering the environment.	Addressed in Section 8.5 of the Application.

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Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Rationale for selection of draft VC and VC indicators and details in the AAIR for: • Human health (cont'd)	Northern Health recommended that indicators of potential health affects related to noise should include noise complaints and long-term high annoyance.	Tervita has reviewed the Health Canada guidance document provided by Northern Health and applied applicable criteria. Appropriate indicators for noise impacts on human health have been used in assessment.	Addressed in Section 8.4.7 of the Application.
	Northern Health asked Tervita to consider that drinking water intakes might be outside of the surface and groundwater LSAs (500-m radius), and may be the point where receptors are at the greatest risk of exposure.	Considerations suggested by Northern Health have been addressed in the Application (Section 4.2).	Addressed in Section 4.2 of the Application.
	Northern Health suggested that data collection methods to characterize existing conditions also include data collection to characterize potential receptors, nearby water sources, and historic usage of land.	Tervita has added these methods of data collection to the AAIR and Section 8.4 of the Application.	Addressed in Section 8.4 of the Application.
	Northern Health noted that a detailed quantitative HHRA may be necessary to understand health effects associated with the Project. This should be clearly indicated in the AAIR.	Once the results of the SLHHRA are shared with the Working Group and feedback is received, Tervita will work with Northern Health to address concerns on the SLHHRA before determining whether a detailed quantitative HHRA will be completed.	Addressed in the response.
	Northern Health asked that the potential for the uptake of contaminants into the food chain (from soil, air, and water) be further discussed based upon the findings of the surface water and soil quality assessments (as well as other relevant assessments).	Considerations suggested by Northern Health have been addressed in Sections 8.4 and 8.5 of the Application.	Addressed in Sections 8.4 and 8.5 of the Application.
	Northern Health asked that the Screening Level Risk Assessment in the Application includes the potential for wildlife to enter the Project vicinity (such as, floating on ponds or grazing). We ask for information to also be provided in the Application on the controls that will be implemented to prevent wildlife, birds, and people from entering the waste storage areas (to prevent direct contaminant exposures or uptake into the food chain).	Considerations suggested by Northern Health have been addressed in Table 4.8-2 of the Application.	Addressed in Table 4.8-2 of the Application.
	Northern Health asked how potential dust impacts will be captured in the air quality study, considering that the Site may be a source of contaminant laden dust. Would soil sampling methodology be able to capture dust impacts or would this require specific sampling methodology?	Dust is not captured in the air quality study. The air quality study focuses on landfill gas emissions. However, PM is captured under the Air Quality VC and has been looked at in the Application as having the potential to impact air quality.	Addressed in Sections 4.2 and 8.4.6 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Inclusion of economic benefit information in the Application	BC MECCS suggested including Financial Security Requirements, *EMA* Section 14(1)(b).	Economic benefit information has been incorporated in the Application.	Addressed in Sections 1.2.5 and 5.1 of the Application.
Inclusion of existing landfill in cumulative effects assessment	BC MECCS asked if existing landfill would be considered in cumulative effects assessment.	The existing landfill was considered in the CEA as an existing development.	Addressed in Section 3.9.1 of the Application.
Consultation	BC MECCS noted that it is not clear whether recent (within the last 2 years) and relevant First Nations, public, and agency input was solicited to inform the list of candidate VCs for the Application. Tervita's extensive experience operating Secure Landfills is a benefit in refining VCs, but it does not replace independent review by individuals and organizations that may have more extensive knowledge and understanding of regional sensitivities.	Tervita has had an ongoing relationship with many First Nations and government agencies throughout the operation of Silverberry Landfill. Through the comment period on the draft VCs and the amendment process, Tervita has been working with First Nations, agencies, and the public to understand and address regional sensitivities (refer to Appendix 13 of the Application).	Addressed in the response and Appendix 13 of the Application.
Alternative Means	The PRRD noted that Section 1.5 indicates that no feasible alternative locations were identified, therefore qualitative assessment was not considered. While there is no assessment, 1.4 provides a rationale. The PRRD does not see this as a deterrent to the Application process, as good landfill practices include maximizing capacity on an existing site prior to siting on a new greenfield. If this were not possible, then an assessment should be undertaken and documented.	Tervita thanks PRRD for their input. Tervita's goal is to maximize current capacity on our privately-owned land at Silverberry before pursuing alternate locations.	Addressed in the response.
Terrain and Soils	BC MECCS states that in Appendix 1 and Section 4.1, the samples collected, parameters analyzed and information documented in the report are reasonable as a “reference” data set to which potential future soil sampling and field testing can be compared.	Tervita can work with BC MECCS to develop any future soil monitoring plans that may be required, during the *EMA* Amendment process.	Addressed in the response.
Terrain and Soils Cumulative Effects	BC MECCS suggested that the long-term monitoring program include annual sampling of surface stormwater (prior to discharge to the environment) for analysis of the same analytical parameters as the soil and groundwater samples (Section 4.1.4). The near surface materials would be expected to have low permeability based on geological descriptions (Section 2.2.3), which was also evidenced by lack of groundwater at two of the monitoring wells following purging (monitoring wells 03-4 and BH-104(R)). Site data presented in the report suggests relatively low aquifer vulnerability to releases of contaminants at the ground surface, subject to spill response and remedial efforts.	Tervita can work on amending the Surface Water Monitoring Plan during the *EMA* application process.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Terrain and Soils Follow up Strategy	BC MECCS indicated that the proponent must provide a rationale for this statement.	Tervita referred to sections where no residual effect is discussed in Section 4.1.5.	Addressed in the response and in Section 4.1.5 of the Application.
Air Quality	BC MECCS noted that KIs should be quantitative in nature. "Visible" is qualitative and subject to interpretation by different people. BC MECCS recommended an alternate measure to ensure that this KI is adequately addressed. For example, air quality instruments can quantify the concentration of particles in the coarse fraction. Other instruments can provide a measure of visual range.	Tervita recognizes the subjectivity of visible dust and has proposed quantitative KIs, such as ambient air concentrations of PM, NO_x, VOCs, and GHG emissions. These quantitative KIs are expanded upon in Section 4.2 of the Application.	Addressed in Section 4.2 of the Application.
	BC MECCS noted that if monitoring data were collected as specified in the second bullet in 4.2.2 these should be presented in the Application, along with analysis. There are references to biannual monitoring data but there are no data in this section. Some data and analysis are required for this bullet, or at the very least, a reference to a different section in the report where these data are presented and analyzed.	Tervita will append the most recent monitoring information to the Application in Appendix 2.	Addressed in Appendix 2 of the Application.
	BC MECCS noted that there is reference to the VOC sampling that was conducted but no data is presented (only a reference to an appendix). Data should be presented in this section of the report, accompanied with analysis if warranted.	To keep the document readable to the general public, Tervita summarized findings of the report in the Application, but the whole report and corresponding information is provided in Appendix 2.	Addressed in the response and in Appendix 2 of the Application.
	Northern Health notes that comments from BC MECCS regarding the dAAIR made reference to other data that can be used to inform a baseline (ambient air quality monitoring at Blueberry River from July 2016 - November 2017, and at Buick Creek from February 2015 to July 2016.)(In addition to ambient concentrations at BC monitoring stations, the desktop review should look for ambient CAC measurements on/at/near other landfills.) A discussion regarding these other data sources is not included and there is not enough information regarding current air quality conditions. Page 4-12 "The ambient air quality in the region, as measured at the Key Learning Center monitoring station, is well below provincial criteria for all contaminants measured." This statement is not representative of local conditions, which change throughout the season. Fort St. John often experiences dust advisories in the spring. The PM_{10} values are not well below provincial criteria.	Tervita acknowledges that conditions change throughout the season. During the dryer times of year, Tervita through its mitigation measures such as watering the roads, is able to minimize dust impacts. Language has been added to Section 4.2.4.	Addressed in the response and in Section 4.2.4 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Air Quality (cont'd)	BC MECCS notes that in Table 4.2-2 there is a column titled $PM_{10}/PM_{2.5}$. and asks if this denotes the ratio of these two pollutants? If yes, it would have no units (that is, would not be t/y). If it is not a ratio and only intended to represent a quantity of emissions for both pollutants, please change this for the final submission.	Both $PM_{2.5}$ and PM_{10} have values of 0.4. Tervita has edited Table 4.2-2 in the Application to clarify the data presented.	Addressed in Table 4.2-2 of the Application.
	Ministry of the Environment notes that the VOC sampling was insufficient to be called a baseline monitoring program and should not be referenced as though it has adequately characterized existing conditions. This sampling program consisted of two discrete samples and is of insufficient quantity to be relied on for using in conclusions of an Environmental Assessment. Either more monitoring is required to adequately achieve stated objectives or this sampling should be recharacterized accordingly.	If an air monitoring program is required Tervita will work with BC MECCS during the *EMA* Application process to develop one.	Addressed in the response.
	Northern Health states that The VOC air sampling activities are very limited. The air study report stated: "*The sampling program provides a snapshot of the VOCs at the time the measurements were recorded. It does not provide a method to estimate the quantity or rate of landfill gas emissions*." This study does not provide sufficient data to justify the exclusion of VOCs from further assessment. An important conclusion of the study was that a number of VOCs were identified at detectable levels at the site.	Tervita acknowledges the presence of VOCs at the landfill, but through mitigation measures such as progressive capping, Tervita is able to minimize landfill surface area and the interactions with VOCs.	Addressed in the response.
	BC MECCS noted that different CACs in Table 4.2-3 have different achievement metrics and reporting the 98th percentile of 24-hour averages is without meaning for all pollutants but $PM_{2.5}$ and requested that Tervita reanalyze accordingly for final submission. Refer to footnotes in: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/air/reports-pub/aqotable.pdf for appropriate statistics. For PM_{10} please report # of hours and days which exceed the 24-hour objective.	Tervita has reviewed the reference provided and updated the numbers in Table 4.2-3.	Addressed in Table 4.2-3 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Air Quality (cont'd)	Northern Health noted that despite there being documented concern regarding odour from a nearby community (page 4-12, section 4.2.3 Traditional Knowledge Shared), odour conditions have not been explained. Unpleasant or annoying environmental odours may result in negative mood, 'environmental worry', or 'environmental stress' (i.e., perceiving the odour as a health risk), which in turn, may result in stress-related illnesses (Alberta Health, Odours and Human Health, 2017 - https://open.alberta.ca/publications/9781460131534). Please provide more information regarding odour conditions and proposed mitigations.	The Air Quality Monitoring Plan and the Dust and Odour Control Plan identified in Section 4.2.4 include mitigation measures to address odour effects.	Addressed in Section 4.2.4 of the Application.
	Northern Health noted that the recommendations for ongoing monitoring are sparse. Please provide more information regarding the rationale for the scope and frequency of ongoing air quality monitoring.	An Air Quality Monitoring Plan and Dust and Odour Control Plan are included as part of the proposed Project's Operating Plan that will be submitted to BC MECCS for approval, during the *EMA* Application process.	Addressed in the response.
	Northern Health requested that Tervita provide more information regarding how the increase in Project-related traffic (to and from the site) will influence local and nearby dust conditions (both PM_{10} and $PM_{2.5}$). Even short-term increases in PM can cause acute health effects such as asthma exacerbations (for workers and nearby residents).	During the dryer times of year and times of increased traffic (construction), Tervita is able to minimize dust impacts through mitigation measures such as watering the roads.	Addressed in the response.
	Northern Health noted that there is not a lot of detail provided regarding the air quality management plans and how they will be used to verify existing and proposed conditions or how air quality complaints will be follow-up. Measures to reduce emissions to as low as reasonably achievable and the use of best available technologies should be explained. Compliance with the BC AAQOs should not be the sole purpose of the management plans - health effects can occur below provincial air quality objectives. Please explain the monitoring frequencies identified (for example, bi-annually) in the management plans.	The effects of the proposed Project on air quality are assessed qualitatively as emission estimation and modelling of fugitive emissions from sources associated with landfills are very uncertain. An Air Quality Monitoring Plan and Dust and Odour Control Plan are included as part of the proposed Project's Operating Plan that will be submitted to BC MECCS for approval.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Surface Water	BC MECCS provided comments on items listed in Table 4.4-1: • There is no information discussing why there is no expected change to the volume of treated stormwater runoff. This Environmental Assessment covers all phases and information about the current volumes. Rationale for why this is not expected to increase needs to be provided as required by the AAIR. There is no comparison to BC WQGs or CCME WQGs. The use of BC CSR and HWR standards in Appendix 3 is for a different purpose and results need to be compared to the BC WQGs as required by the AAIR to properly assess the potential for adverse effects to Fish and Fish Habitat, which includes aquatic organisms living in an ephemeral stream.	Table 4.4-1 was reviewed, and surface water quantity should be expected to increase as the capped portion of the landfill increases. Information will be revised accordingly. Tervita's current approved Surface Water Monitoring Plan does not require analysis for comparison to WQG. Tervita can work with a new surface water monitoring program during the *EMA* Application process.	Addressed in the response and in Table 4.4-1 and Section 4.4.2 of the Application
Surface Water Temporal Boundaries	BC MECCS indicated that the wording is basically the same as what is in the AAIR. No new information is provided on these boundaries	The temporal boundaries used for the assessment are consistent for all VCs and include Project stages from construction to postclosure.	Addressed in the response
Surface Water Technical Boundaries	BC MECCS stated that there were no technical boundaries as "Information on existing conditions was based on a desktop review, site investigations, and field data collection, including results of surface water sampling activities for the existing landfill". Other than six sampling events for stormwater runoff over a one-year period under existing permit requirements, no other information on a desktop review, site investigation or field data was provided. There is no discussion about how often leachate might be discharged to land and no assessment of its potential to effect surface water quality.	Tervita's current approved Surface Water Monitoring Plan does not require analysis for comparison to WQG. If any of our current analyses can be compared to drinking water guidelines, they will be and the Application updated. Tervita can work with a new surface water monitoring program during the *EMA* Application process. Tervita does not intentionally discharge leachate to land. Any spills are immediately contained and cleaned up.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Surface Water Existing Conditions	BC MECCS states that under Section 3.3 it says "To gather pertinent background data for each VC, the assessment team used relevant legal frameworks (for example, *EMA*) and information gathered from a literature review" which included maps, scientific papers, information letters, factsheets. Typically, this type of review on background information gathers data from other sources such as nearby sampling sites as a starting point for a database and then identifies gaps where more field work is needed. It can include water quality results from nearby sites and from reports of other projects in the area. Although reports were one source of information in the literature review, the types of reports were not specified. There also needs to be a summary of their findings on the information specific to water quality and a list of references identifying exactly what the sources were to develop this information. There is no information describing the pathway and location of any releases to the environment, for both leachate and stormwater runoff. Therefore, it is not possible to evaluate the assessment on potential adverse effects to the environment.	Tervita's current approved Surface Water Monitoring Plan does not require analysis for comparison to WQG. Tervita can work with a new surface water monitoring program during the *EMA* Application process. Tervita will update the Application with surface water quantity (volumes). Tervita added water quality parameters measured by Stantec in August 2017 for the nearby Westcoast Spruce Ridge Program. Pathways are described in Section 4.4.4.1. The potential effects to water quality are addressed through the effective operations of the existing surface water and leachate management systems. In the unlikely event of spills or system failures, potential effects to water quality are assessed in Section 9, Accidents and Malfunctions. Location of/options for release to the environment: added details in Section 4.4.2.2 based on information in the draft Operations Plan. Tervita added current runoff volumes in 2016, 2017, and 2018, and reworded the rationale in Table 4.4-1.	Addressed in the response and in Table 4.4-1 and Section 4.4.2 of the Application.
	There is limited information on water quality to evaluate the assessment of potential adverse effects to the environment. Receiving water bodies have not been sampled and the existing conditions repeats the wording of the AAIR but adds no new information under Section 4.4.2.	See above	See above
	BC MECCS mentioned that information was not provided about what was researched and what the results were. There may have been some confusion about the intention of this review, which was to glean information from other projects, either by government agencies such as water quality monitoring in the area or by other proponents for projects nearby who have published reports. There needs to be a list of references cited for any information that was used to support the assessment of impacts and a summary of the information from those references.	Tervita identified local information and incorporated it and referenced it in Section 4.4.2.	Addressed in Section 4.4.2 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Surface Water Existing Conditions (cont'd)	BC MECCS stated that the use of HWR and CSR standards is not appropriate and the AAIR specified the use of the BC WQGs. Appendix 3 is a 2018 Annual Report developed for compliance with the permit and does not meet the AAIR language without some additional interpretation, which has not been provided.	If any of our current analyses can be compared to drinking water guidelines they will be, and the Application updated. Tervita added a reference to the Water Quality Criteria (from the Nichols report) in Section 4.4.2.	Addressed in the response.
Potential Effects to Surface Water	BC MECCS stated that information has been provided for the stormwater runoff only. However, the Application says in Section 4.4.4.1: The proposed Project expansion is anticipated to interact with the Surface Water VC during the following construction, operations, and closure/reclamation, and postclosure activities: • Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure • Leachate management • Stormwater management • Cell capping • Postclosure maintenance and monitoring No mitigation or discussion of adverse effects has been given for the other bullets.	Information regarding mitigation measures and adverse effects regarding the bullets was incorporated into Section 4.4.4.	Addressed in Section 4.4.4 of the Application.
Surface Water Mitigation Measures	BC MECCS stated that mitigation measures provided are only for stormwater runoff. See previous comment on Potential Effects to Surface Water	If Tervita needs to remove sediment from out of the surface water pond, it will be dredged and the sediment dewatered in an appropriate containment. The dewatered sediment will be tested and the appropriate disposal location found.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Groundwater Existing Conditions	BC MECCS stated that bedrock groundwater at the proposed expansion area has not been characterized. This is a key groundwater deficiency. Vertical hydraulic gradients at the landfill are much larger than horizontal, which means that the dominant groundwater flow direction is downward towards the bedrock. BC MECCS and Tervita discussed this deficiency in 2018, although the focus at that time was on the routine groundwater monitoring program at the Silverberry Landfill. In the end, Tervita committed to install bedrock monitoring wells in summer of 2019. This remaining deficiency now also relates to the adequacy of the baseline characterization for the proposed expansion. Finally, excluding the compromised monitoring well (BH-103) that was installed in 2001, no baseline hydrogeological information was collected within the proposed expansion area.	The current expansion area was characterized by Clifton Associates Ltd. in 2002. Tervita reviewed and incorporated information from this response in Section 4.5.2 of the Application. Once the groundwater network is upgraded this summer, Tervita will be able to share the changes with the Working Group.	Addressed in the response and in Section 4.5.2 of the Application.
Groundwater Residual Effects and Followup Strategy	BC MECCS stated that despite the landfill siting and design, there is still potential for the landfill to impact groundwater and surface water quality. This potential residual effect is acknowledged in the Application under the SLHHRA. Therefore, Section 4.5.4.2 of the Application should be updated to evaluate the significance of potential for leachate migration from the landfill to groundwater and surface water during operation and/or closure.	Tervita updated Section 4.5.4 of the Application.	Addressed in Section 4.5.4 of the Application.
Terrestrial Vegetation	BC MECCS stated that the highlighted subcomponent regarding vegetation uptake of contaminants from air quality and dust dispersion and deposition is not about the loss of vegetation. The loss of vegetation is captured with other subcomponents. This is about assessing the effect of plant uptake of contaminants on wildlife consumption and human use. Similar to soil effects, this has the potential to cause an adverse effect if there is plant collection for country foods or wildlife browsing within the dust or air impact zone. If the predictions for dust and air quality impacts are low outside the fenced area, then this subcomponent should not see adverse effects.	Vegetation uptake of contaminants from air quality and dust dispersion and deposition was considered as an effect in Section 4.6.4 of the Application.	Addressed in the response and in Section 4.6.4 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Terrestrial Vegetation Existing Conditions	BC MECCS stated that under Section 4.6.2 it says "The following methods of data collection have been used to inform the description of existing conditions for the Terrestrial Vegetation VC: • Desktop review of provincial and regional information sources • Information from site investigations and data collection efforts • Noxious weed information received from PRRD • Soil sampling program for the PDMA A summary of the soil sampling findings is not provided in this section and there is nothing directing the reader to another section for this information.	Tervita added a summary of soil sampling results to Section 4.6.2 and referred the reader to Section 4.1.2 for a fulsome discussion of the soil sampling program.	Addressed in Section 4.6.2 of the Application.
Terrestrial Vegetation Potential Effects	BC MECCS stated that the potential effect is loss or alteration of native vegetation, but this does not describe any changes in the chemical content of plants.	Tervita will not address the chemical composition of plants in the Application; although, the pathway of contaminant uptake has been considered in the Application.	Addressed in the response.
Terrestrial Vegetation Residual Effects	BC MECCS stated that there is no explanation of what the air and dust deposition section found and why it is expected to be negligible. The statement on Page 4-37 under Table 4.6-3 is a conclusion, but there is no support provided for this assessment other than a reference to another section.	Tervita considered air and dust deposition in Section 4.2 of the Application and did not repeat this information in this section. This section refers to Section 4.2 for more information.	Addressed in the response.
Health Effects Assessment	Northern Health indicated that as per the Proponent's response to NH-72a, we understood that a statement of qualifications indicating the risk assessor's qualifications and experience in conducting HHRAs relevant to the purposes of supporting an Environmental Assessment would be included in the SLHHRA. This does not appear to have been included.	The Application will be updated to include the assessor's qualifications in Appendix 11.	Addressed in Appendix 11 of the Application.
Health Effects Assessment Temporal Boundaries	Health risks during closure and postclosure have not been assessed. What will health effects be in the long-term due to disintegration of the liner system, particularly with regards to persistent contaminants?	Disintegration of the liner is beyond the scope of this assessment.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Health Effects Assessment Existing Conditions	Northern Health has provided all of the following comments: On Page 8-9, Section 8.4.6, the discussion regarding the health effects of air contaminants focuses on respiratory conditions and neglects other health effects such as cardiovascular effects, etc. Please include an explanation of other potential health effects. See joint ERS/ATS policy statement: what constitutes an adverse health effect of air pollution? An analytical framework: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5751718/	The article referred to by Northern Health was reviewed and a brief description of other health effects from air contaminants was added to Section 8.4.6 of the Application.	Addressed in Section 8.4.6 of the Application.
	The BC OGC noise guidelines are not indicators of health effects. For the purposes of assessing health effects associated with noise, health-based indicators and guidelines need to be used (such as, change in percent highly annoyed, sleep disturbance, interference with speech comprehension, etc.). This includes those summarized in Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise*. As per Health Canada guidance, noise related effects to temporary receptors should be assessed, including harvesting and ceremonial sites, recreational areas, etc.	The Application will be edited to incorporate Health Canada's guidelines when assessing noise effects.	Addressed in Section 8.5.3 and Appendix 11 of the Application.
	On Page 8-9, Section 8.4.6 - "Tervita conducts air monitoring for NORM activity levels bi-annually to determine if dust being carried in the air has NORM activity levels above regulatory restrictions." Please explain how the frequency (bi-annually) is arrived at? Justification is required that this frequency is sufficient to understand effects.	The RPP was developed with BC MECCS. When the new one is developed with BC MECCS, Tervita can also share it with Northern Health for input.	Addressed in the response.
	Insufficient characterization has been included about nearby receptors/susceptible populations. This should include identification of potential temporary receptors in the area (such as, harvesting and ceremonial sites, work sites) as well as potential future receptors. Where is the closest location to the site that a residence could be established?	Temporary receptors have been added to the discussion in Section 8.4.7.	Addressed in Section 8.4.7 of the Application.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Health Effects Assessment Existing Conditions (cont'd)	The following exposure pathways have been excluded without a detailed rationale: Air: The lack of adequate landfill gas sampling and assessment, without sufficient justification for exclusion of this pathway is a significant gap (see previous comments on the air pathway). Groundwater: Insufficient rationale has been provided for the exclusion of the groundwater pathway from the assessment. Does affected groundwater have a potential to daylight and become surface water (especially when considering persistent COPCs)? Also, if future groundwater wells could be constructed in the area, it should be ensured that these potential receptors will be protected from health effects. Please identify the closest aquifers to the site. Groundwater should be assessed regardless of existing or proposed operating permits or 'remoteness' if a viable aquifer could supply one household with drinking water. According to CSR Protocol 21 (Section 3.2), "Future drinking water use applies to all drinking water aquifers below a site whether or not current drinking water use applies." The Application should indicate how hydraulic conductivities compare to those identified in Section 3.2.1 of Protocol 21 considered capable of supporting a single-family domestic water supply. Table 3-5 of the SLHHRA, groundwater data shows detectable levels of petroleum hydrocarbons. An explanation for this finding is needed, given that the health assessment is based on the assumption that the liner and leachate collection system prevents Project emissions to groundwater. Soil: Insufficient justification has been provided for the exclusion of the soil exposure pathway.	Tervita is able to mitigate exposure pathways to landfill gas, therefore no further sampling or characterization is required at this time. There were no hydrocarbons present during the 2018 monitoring cycle and showing pathways to groundwater are limited. Due to the larger number of industrial emitters in the region, Tervita is unable to differentiate or delineate any potential public areas and related exposure to dust caused from landfill operations. There has been limited soil sampling outside of the landfills fence line. Tervita would be unable to delineate impacts from other industrial users. Further investigation is required to determine the Barium impacts.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Health Effects Assessment Existing Conditions (cont'd)	Table 4-6 identifies soil COPCs above applicable guidelines. While public receptors will not have access to the site, it is not clear how soil in neighbouring areas that are publicly accessible may be affected through dust deposition. As per previous comments, is background soil data available for areas outside the Project footprint (for example, from the original EAC Application)? If so, this should be included to understand whether incremental/cumulative changes in COPCs in soil are occurring due to Project activities in areas that are accessible to the public, and therefore understand potential effects in the future. As per comments provided previously by Northern Health, the detection of barium concentrations greater than guidelines in the PDMA study indicates potential concern about dust migration beyond the Project footprint.	See above	See above
Health Potential Effects	Northern Health noted that the assessment of potential Project effects focuses on baseline information, based on an assumption that future effects associated with the Project will be similar to those currently occurring. A scientifically based rationale has not been provided to support this assumption, which has a significant effect on the assessment of health effects across all pathways. For certain pathways, could effects be additive (for example, effects to soil quality as a result of dust deposition)?	Tervita will explore the possibility of additive effects and update the Application as necessary.	Addressed in the response and in Section 8.5.1 of the Application.
	Northern Health noted that an assessment and discussion of the risks associated with exposures to Project-related road dust should be included.	Road dust was added to the sources of dust in Section 8.5.1. Mitigation measures for road dust are effective, thus limiting exposure.	Addressed in the response.
Health Effects Assessment Mitigation Measures	Northern Health noted that the health effects of the range of potential air contaminants associated with this Project may extend well beyond respiratory health.	The article referred to by Northern Health was reviewed and a brief description of other health effects from air contaminants was added to Section 8.4.6 of the Application. Based on the air sampling study conducted, no COCs (VOCs which would have other health effects aside from cardiovascular and vascular) were identified based on ambient air quality criteria. The other contaminants are not present at levels that would cause an effect. See 3.1.5 of the HHRA.	Addressed in Section 8.4.6 of the Application and in response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Accidents and Malfunctions	Northern Health noted that the potential health effects associated with failure of the liner system have not been adequately characterized. Table 3-6b of the SLHHRA identifies numerous COPC concentrations in leachate that are many magnitudes higher than guidelines, including for highly persistent contaminants. Further assessment is required of what a potential leak would mean for human health, in a manner consistent with the direct effects assessment: • How would groundwater be impacted? • What would the geographic scope be? • What would the migration time of contaminants be? • How would this be mitigated? • How long would it take for this leak to be identified? • Would it be possible to completely remediate contaminated soil and groundwater or would irreversible effects occur? • What communication strategy would be used to notify water users? This is of particular concern given the persistence and toxicity of several identified COPCs, even at trace concentrations.	A Leachate Monitoring Plan will be part of the Operations Plan approved by BC MECCS during the *EMA* permitting process. This will include action measures if a leak is identified.	Addressed in the response.
Effects of the Environment on the Project	PRRD noted a typo in the last sentence of the 2nd paragraph of Section 10.1.3. In the description of the wildfire effect from May 2016, the proponent notes "operations recommencing after the 'wildlife' was contained and extinguished". The proponent likely meant 'wildfire,' but should confirm.	Tervita changed the wording in Section 10.1.3 to "wildfire".	Addressed in Section 10.1.3 of the Application.
Public Consultation	PRRD noted that an open house planned by Tervita for the community of Buick will be forthcoming.	An open house is planned in the Community of Buick in November 2019.	Addressed in the response
Appendices - 2018 Groundwater Monitoring Program - Silverberry Secure Landfill, Block A-18-088-20 W6M	BC MECCS noted that the Application and the referenced Groundwater Monitoring Plan do not propose to expand the existing groundwater monitoring network. The existing network, which is already considered deficient as outline under AAIR Section/Sub-Section 4.5.5, is inadequate for monitoring the proposed expansion.	Tervita will work with BC MECCS on an expanded monitoring network during the *EMA* permitting process.	Addressed in the response.

Table 2.1-1. Summary of Key Issues raised by Government Agency Working Group and Tervita Responses

Key Issue	Specific Issues Raised by Government Agency Working Group	Tervita Response	Status of Resolution
Appendices - Hydrogeological Siting Suitability Investigation	BC MECCS noted that the referenced investigation report does not consider whether the HWR siting requirement (Section 28) of waste separation from groundwater is met. That requirement states that there must be a minimum separation depth of 3 m of unsaturated soil material with low permeability (10-8 m/s) above a seasonally high water table. The Application reports that shallow groundwater (i.e. water table) at the landfill is found between 1.8 to 3.8 mbgs and the depth to water table at the expansion area is unknown.	Tervita has a Section 51 under the HWR from BC MECCS for depth to groundwater. Tervita can supply this to BC MECCS as required.	Addressed in the response.

Notes:

AAQO = Ambient Air Quality Objective
BMP = best management practice
CAC = criteria air contaminant
CEA = Canadian Environmental Assessment
CH_4 = methane
COPC = contaminants of potential concern
BACT = Best Available Control Technology
dAAIR = draft Amendment Application Information Requirements
GHG = greenhouse gas
HHRA = Human Health Risk Assessment
KI = Key Indicator
LAA = Local Assessment Area
LSA = Local Study Area
m/s = metre(s) per second
mbgs = metre(s) below ground surface
NO_x = nitrogen oxide
PDMA = Potential Dust Migration Area
PM = particulate matter
PM_{10} = particulate matter less than 10 micrometres in aerodynamic diameter
$PM_{2.5}$ = particulate matter less than 2.5 micrometres in aerodynamic diameter
RAA = Regional Assessment Area
RPP = Radiation Protection Plan
SLHHRA = Screening Level Human Health Risk Assessment
Stantec = Stantec Consulting Ltd.
U.S. EPA = United States Environmental Protection Agency
VOC = volatile organic compound
WQG = Water Quality Guidelines
Westcoast = Westcoast Energy Inc., doing business as Spectra Energy Transmission

2.1.1.1 Application Review Stage

Upon submission of this Application to the BC EAO, the Application will be reviewed against the information requirements specified in the AAIR for completeness. If the Application does not include all of the required information, the BC EAO may return the Application or request that the missing information be provided.

Once the Application is deemed complete and is accepted, the BC EAO will determine if the amendment is simple, typical or complex. Review period timing varies depending on the complexity of the amendment, and ranges from less than 3 months for simple, 3 to 6 months for typical, and 6 months or more for complex amendments. The BC EAO will also determine the need for and extent of consultation and engagement with the public, Working Group members, and Aboriginal groups. Tervita may be required to take an active role in public and Aboriginal consultation and Working Group meetings to resolve outstanding issues.

The BC EAO will then prepare an Assessment Report of the Application, including revised or new conditions as necessary. For typical and complex amendments, the report will also be reviewed by Tervita, relevant Working Group members and Aboriginal groups. Upon completion of the review of the Assessment Report, documents will be finalized and referred to the BC EAO's Executive Director for a decision whether to issue the amendment.

2.1.1.2 Overview of Amendment Application Process

An overview of key milestones during the pre-application and Application Review stages is provided in Table 2.1-2.

Table 2.1-2. Key Milestones during the Provincial Environmental Assessment Process

Key Milestones	Dates	Action	Document Link on BC EAO e-PIC Website
Project Description	February 24, 2014	Tervita submitted a Project Description for the proposed Project expansion to the BC EAO for review.	https://projects.eao.gov.bc.ca/api/document/5886ea9eeed3c0016f856f6c/fetch/Project_Description_for_the_proposed_Silverberry_Secure_Landfill_Amendment_dated_Feb_24_14
Section 19 Order	August 6, 2015	Tervita received letter from BC EAO that an amendment to EAC WD02-01 is required pursuant to Section 19 of the act.	https://projects.eao.gov.bc.ca/api/document/5886eac9eed3c0016f856f6e/fetch
Working group meeting No. 1	January 27, 2016	A Working Group meeting for the proposed Project expansion was held to review and comment on the draft VCs.	Not available
Public Consultation Plan	February 10, 2016	Tervita submitted the Public Consultation Plan for the proposed Project expansion to the BC EAO.	https://projects.eao.gov.bc.ca/api/document/5886ead0eed3c0016f856f6f/fetch/Public_Consultation_Plan
First Nations Consultation Plan	March 10, 2016	Tervita submitted the First Nations Consultation Plan for the proposed Project expansion to the BC EAO. proposed Project expansion	https://projects.eao.gov.bc.ca/api/document/5886eae1eed3c0016f856f71/fetch
Working group meeting No. 2	March 22, 2018	A Working Group meeting for the proposed Project expansion was held to review and comment on the draft AAIR.	Not available

Table 2.1-2. Key Milestones during the Provincial Environmental Assessment Process

Key Milestones	Dates	Action	Document Link on BC EAO e-PIC Website
Selection of VCs	April 20, 2017	Tervita submitted the draft Selection of VCs document to the BC EAO. The comment period began on May 18, 2017 and ended on June 7, 2017.	https://projects.eao.gov.bc.ca/api/document/58f9456e759d1b001983a8d0/fetch
Final Selection of VCs	July 31, 2018	Tervita submitted the final Selection of VCs document to the BC EAO.	https://projects.eao.gov.bc.ca/api/document/5b61d6fc6952ca0024cf674f/fetch
Final AAIR	January 23, 2019	BC EAO issued the approved AAIR.	https://projects.eao.gov.bc.ca/api/document/5c48b0a12da7200024c8c9ea/fetch
Application for an EAC filed	To be determined	Tervita files the Application for an EAC with the BC EAO.	To be determined
Application evaluation for completeness	To be determined	BC EAO evaluates the Application for completeness.	To be determined
Application for an EAC accepted	To be determined	BC EAO accepts the Application for an EAC.	To be determined
Application Review period	To be determined	BC EAO will start the Application Review period, typically between 3-6 months (depending on complexity of the amendment).	N/A
Public comment period for Application	To be determined	Public comment period will be held on the Application during the review period.	To be determined
Working Group meeting No. 3	To be determined	A Working Group meeting will be held to review the Application during the review period.	N/A
Draft Assessment Report	To be determined	The BC EAO will prepare and distribute the draft Assessment Report during the review period and distribute to Tervita, the Working Group and Aboriginal groups for input.	To be determined
Assessment Report	To be determined	The BC EAO will submit the final Assessment Report to the BC EAO Executive Director.	To be determined
Executive Director referral to Ministers	To be determined	The BC EAO Executive Director will submit the EAC package to the Minister of Environment and Climate Change Strategy.	To be determined
Issuance of Conditional Certificate	To be determined	Once approved, a conditional certificate will be issued and the proposed Project expansion will be authorized to proceed to the permitting stage.	To be determined

Table 2.1-2. Key Milestones during the Provincial Environmental Assessment Process

Key Milestones	Dates	Action	Document Link on BC EAO e-PIC Website
Ministers' decision posted on e-PIC	To be determined	The BC EAO will post the responsible Ministers' decision, Assessment Report, the Executive Director's reasons and recommendations, and the EAC on e-PIC.	To be determined

[a] This table describes the key milestones that have occurred during the Pre-Application stage and those expected to occur during the Application Review and Project Decision stages, and is not inclusive of all consultation activities conducted during the Pre-Application stage. Detailed summaries of consultation activities with the public and Aboriginal groups are provided in Parts C and D.

Note:

e-PIC = electronic Project Information Centre

2.2 Federal Environmental Assessment Process

On April 4, 2016, the CEA Agency determined that a federal Environmental Assessment is not required for the proposed Project expansion pursuant to the *CEA Act, 2012*. In making this determination, the CEA Agency considered the following factors as indicated in section 10 of *CEA Act, 2012*:

- The Project Description provided by the proponent on February 8, 2016
- The possibility that the carrying out of the proposed Project expansion may cause adverse environmental effects
- Comments received within the 20-day comment period

The CEA Agency was satisfied that the environmental effects of the proposed Project expansion are well-understood and adequately characterized in the Project Description, and that there is little potential for the proposed Project expansion to cause adverse environmental effects on areas of federal jurisdiction as defined in *CEA Act, 2012*.

Part B: Assessment of Environmental, Economic, Social, Heritage, and Health Effects

Part B of the Application provides information on the assessment methodology (Section 3) used to identify and characterize residual adverse effects and cumulative adverse effects related to the various environmental, economic, social, health, and heritage-related VCs for the proposed Project expansion. Sections 4 to 8 provide the effects assessments for each VC identified in Sections 4 to 8 of the AAIR. Sections 9 and 10 provide an assessment of Accidents and Malfunctions and Effects of the Environment on the Project, respectively.

The information provided in Part B follows the requirements set out in the AAIR for the proposed Project expansion issued January 23, 2019 by the BC EAO.

3. Assessment Methodology

This section provides information on how environmental, economic, social, heritage, and health effects of construction, operations, closure/reclamation, and postclosure have been assessed for the proposed Project expansion. In addition, information on the determination of assessment boundaries, identification of environmental, economic, social, heritage, and health pillars, as well as associated potential adverse effects has been provided. Technically and economically practical mitigation measures have been developed leading to the identification of potential residual adverse effects. Any residual adverse effects have been characterized and then evaluated for significance. In circumstances where potential residual adverse effects of the proposed Project expansion may interact with other reasonably foreseeable developments, these residual adverse effects have been considered in the cumulative effects assessment and evaluated for significance.

This effects assessment methodology has been developed based on:

- AAIR for the proposed Project expansion (BC EAO 2019a)
- *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (BC EAO 2013)
- BC *EAO User Guide* (BC EAO 2018b)
- CEA Agency's *Cumulative Effects Assessment Practitioners Guide* (Hegmann et al. 1999)
- CEA Agency's *Incorporating Climate Change Considerations in Environmental Assessment: General Guidance for Practitioners* (CEA Agency 2003)
- CEA Agency's *Operational Policy Statement: Assessing Cumulative Environmental Effects under the Canadian Environmental Assessment Act, 2012* (CEA Agency 2015)

3.1 Issues Scoping and Selection of Valued Components

VCs refer to specific attributes of environment, economy, social, heritage and health that may be affected by the proposed Project expansion. The value of a component not only relates to its role in the ecosystem, but, also to the value placed on it by people and communities. In early 2017, Tervita prepared a preliminary VC selection document outlining the rationale and methods used for the selection of VCs for review by the BC EAO and members of the Working Group. The VC selection document was posted to the BC EAO e-PIC website on April 20, 2017, and is available at the following address: https://projects.eao.gov.bc.ca/api/document/58f9456e759d1b001983a8d0/fetch.

The Project team considered the original EAC Application (CCS 2002), information collected during the operation of the existing landfill and the BC EAO *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (BC EAO 2013) in selecting VCs. In addition, the BC EAO *Secure Landfills Common Issues and Commitments Report* (BC EAO 2009) was used to identify potential VCs and pathways of potential effects. The original EAC Application included a literature review, desktop studies, and field studies done for the assessment of VCs selected at that time. The original EAC Application filed in 2002 included information gathered for climate, soils, terrain, vegetation, wildlife, surface water, fisheries, hydrogeology, air, noise, archaeology, socio-economics (including land and resource use), and health.

The VCs considered in this Application were selected based on the known interactions of landfill activities, and were refined through input from Aboriginal groups, the public, and government agencies. Tervita's understanding of VCs is founded on the legacy of having owned and operated 19 engineered landfills in Western Canada, including the existing landfill. Potential VCs were refined in consideration of the following factors (as stated in BC EAO 2013):

- Relevance to the five pillars (environmental, economic, social, heritage and health) and the proposed Project expansion

- Engagement with Aboriginal groups and the public through implementation of Tervita's First Nations Consultation Plan and Public Consultation Plan, as well as BC EAO Working Group meetings
- Representation of Important Features in the proposed Project expansion area
- Responsiveness to potential effects that may result from the proposed Project expansion
- Conciseness to clearly show Project-VC interaction while avoiding the redundancy of analyzing effects accounted for under other VCs
- Comprehensiveness when considering all of the VCs combined to identify important potential effects of the proposed Project expansion

The Project team followed a three-step process to identify the VCs for the proposed Project expansion by scoping the anticipated issues and effects pathways:

Step 1 - Compiling a list of potential issues and potential effect pathways. The list was developed through a preliminary assessment of the proposed Project expansion location, current condition data collection, and environmental information previously collected for the existing landfill (such as the approved PAC Application).

Step 2 - Determining whether the potential issues and effect pathways identified in Step 1 had the potential to interact with the proposed Project expansion, and, if so, whether the interaction could result in an adverse effect. If the candidate VC had no clear interaction or effect pathway, it was not carried forward for the purpose of the Environmental Assessment. If the candidate VC was expected to have a clear interaction with the proposed Project expansion that could result in an adverse effect on the environment, it was carried forward to Step 3.

Step 3 - Evaluating the candidate VCs in closer detail. Candidate VCs were considered against the factors presented above as identified by the BC EAO. The following questions are examples of some of the topics that were considered.

- Is there a strong, clear, and measurable effect pathway between the candidate VC and the proposed Project expansion?
- Is the VC present in the proposed Project expansion area and does it have the potential to interact with the proposed Project expansion?
- Is the VC a priority of local, provincial or federal governments, Aboriginal groups, or the public?

Whether or not the candidate VC was selected was generally based on:

- Experience from operating the existing landfill and previous data collection efforts
- Legislation and guidance documents
- Professional experience and judgment

KIs are used to measure the potential adverse effects of the proposed Project expansion on the VCs. KIs have been identified for each VC based on: regulatory guidelines; experience gained during previous projects with similar conditions or potential issues; feedback from regulatory agencies, Aboriginal groups and public stakeholders; public issues; and professional judgment of the assessment team.

Each assessment of potential environment, economic, social, health and heritage effects (Part B, Sections 4 to 8) describes how the VCs and KIs were selected for the Application. A quantitative or qualitative threshold of significance was established for each VC assessed.

Table 3.1-1 provides a list of the KIs for each VC that are identified in Part B, Sections 4 to 8, under each pillar related to environmental, economic, social, health and heritage topics.

Table 3.1-1. Valued Components and Key Indicators

VC	Subcomponents	KI(s)
Environment Pillar		
Terrain and Soils	• Terrain • Soils	• Soil quality • Erosion
Air Quality	• Dust • Odours • Emissions from combustion • Emissions from other sources, (for example, volatilization)	• Visible dust • Detectable odour at sensitive receptor • Ambient air concentrations of PM, NO_x, and other landfill gases • VOCs • GHG emissions
Acoustic Environment	• Wildlife • Land and resource use	• Noise levels
Surface Water	• Water quality • Water quantity	• Water quality parameters (for example, sediment, metals, and hydrocarbons, perceived taste and smell) • Water volume and movement
Groundwater	• Water quality • Water quantity	• Water quality parameters (for example, inorganic parameters, ions, dissolved metals, perceived taste and smell and other contaminants) • Water volume and movement
Terrestrial Vegetation	• Plant species of concern, including rare plant species and plant species used for traditional purposes • Vegetation communities of concern • Invasive plant species	• Loss of plant species of concern, including rare plant species and plant species used for traditional purposes • Loss of vegetation communities of concern • Introduction or spread of Noxious weeds
Fish and Fish Habitat	• Fish species of management interest and their habitat, including fish species of concern to Aboriginal groups	• Change in habitat (including possible effects to the food chain, such as effects to invertebrates through contamination or loss of habitat that have an effect on fish species of management interest and fish species of concern to Aboriginal groups) • Change in mortality risk
Wildlife and Wildlife Habitat	• Moose • Other ungulates • Black bear • Furbearers (including species of importance to Aboriginal groups such as porcupines and beavers) • Mature and old-forest birds • Early seral forest birds • Western toad	• Change in habitat (for example, including usage of mineral licks and changes to diet) • Change in movement and distribution • Change in mortality risk

Table 3.1-1. Valued Components and Key Indicators

VC	Subcomponents	KI(s)
Social Pillar		
Land and Resource Use	• Agriculture • Oil and gas activity • Trapping • Aboriginal land and resource use including, but not limited to, hunting and trapping, as well as travel to Aboriginal land and resource use sites • Logging/forestry	• Area of grazing tenures and ALR affected • Oil and gas infrastructure and pipeline tenures affected • Viability of trapping tenures • Viability of identified Aboriginal land and resource use sites
Community Services	• Community utilities and services	• Community and utility services capacity and demand • Accommodation capacity and demand • Health service impacts
Community Infrastructure	• Traffic and transportation infrastructure	• Traffic volumes • Transportation infrastructure disturbance
Heritage Pillar		
Cultural and Heritage Resources	• Archaeological sites • Historic sites	• Characteristics, conditions, and location of archaeological and heritage sites, if any
Health Pillar		
Human Health	• Soil quality • Air quality • Water quality • Leachate quality • Visual quality • Noise • NORM • Quality of vegetation, fish, wildlife, and water consumed as country foods, including consumption of Aboriginal-specific foods	• See indicators under the Air Quality, Terrain and Soils, Acoustic Environment, Terrestrial Vegetation, Fish and Fish Habitat, Wildlife and Wildlife Habitat, and Surface Water VCs, as applicable • NORM levels • Traffic-related injuries • Radiological risk assessment • Community Health • Indicators to be further developed through HHRA and consultation on social/cultural determinants of health
Economy Pillar		
Economy	• Resource-based economy • Barter economy • Employment	• Economic activity levels in the LAA and RAA • Employment levels

3.2 Assessment Boundaries

The Application considers the potential effects of the proposed Project expansion on the VCs in the context of defined spatial and temporal boundaries and for some VCs, administrative and technical boundaries. These boundaries vary by VC and reflect:

- The construction, operations and decommissioning phases of the proposed physical works and activities
- The natural variation of a VC

- The timing of sensitive lifecycle phases in relation to the scheduling of the proposed physical works and activities
- The time required for a VC to recover from an effect and return to a natural condition
- The area directly affected by proposed physical works and activities
- The area in which a VC functions and within which a proposed Project expansion effect may be felt

3.2.1 Spatial Boundaries

Spatial boundaries were determined by the distribution, movement patterns and potential geographic area within which there is some interaction between a VC and the proposed Project expansion. The spatial boundary of a VC may be limited to the footprint of the work conducted or extend beyond the physical boundaries of the area of the proposed Project expansion component, since the distribution or movement of a VC can be local, regional, provincial or national in extent.

The spatial boundaries are considered as follows:

- Project footprint: The land area directly disturbed by proposed Project expansion construction and cleanup activities, including associated physical works and activities.
- LAA: The LAA varies with the VC being considered. The LAA includes the Project footprint and extends beyond it to incorporate the area within which the VC is most likely to be affected by the proposed Project expansion.
- RAA: The RAA varies with the VC being considered and includes the Project footprint and LAA, and the area extending beyond the LAA where there is potential for the proposed Project expansion to have regional effects on the VC.
- Provincial: The area extending beyond regional or administrative boundaries but confined to BC.
- National: The area extending beyond BC, but confined to Canada.
- International: The area extending beyond Canada.

Each VC has specific definitions and rationale for spatial and temporal boundaries described in Sections 4 to 8. The spatial boundaries of the various VCs are provided in Figures 3.2-1 to 3.2-4.

TERVITA
EARTH MATTERS

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FIGURE 3.2-1

PROJECT OVERVIEW
LAA AND RAA BOUNDARIES
(100 M, 500 M, AND 1 KM)

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Resource Road
- Road
- Railway
- Project Footprint
- 100m Assessment Area
- 500m Assessment Area
- 1km Assessment Area
- Discharge Area

SCALE: 1:20,000

0 150 300 450 600
Metres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Imagery: DigitalGlobe 2015; Project Footprint, Discharge Area: Tervita 2016; Road: BC MFLNRO 2012; Railway: NRCan 2012; LAA and RAA Boundaries: CH2M 2016; Grid: TERA 2010.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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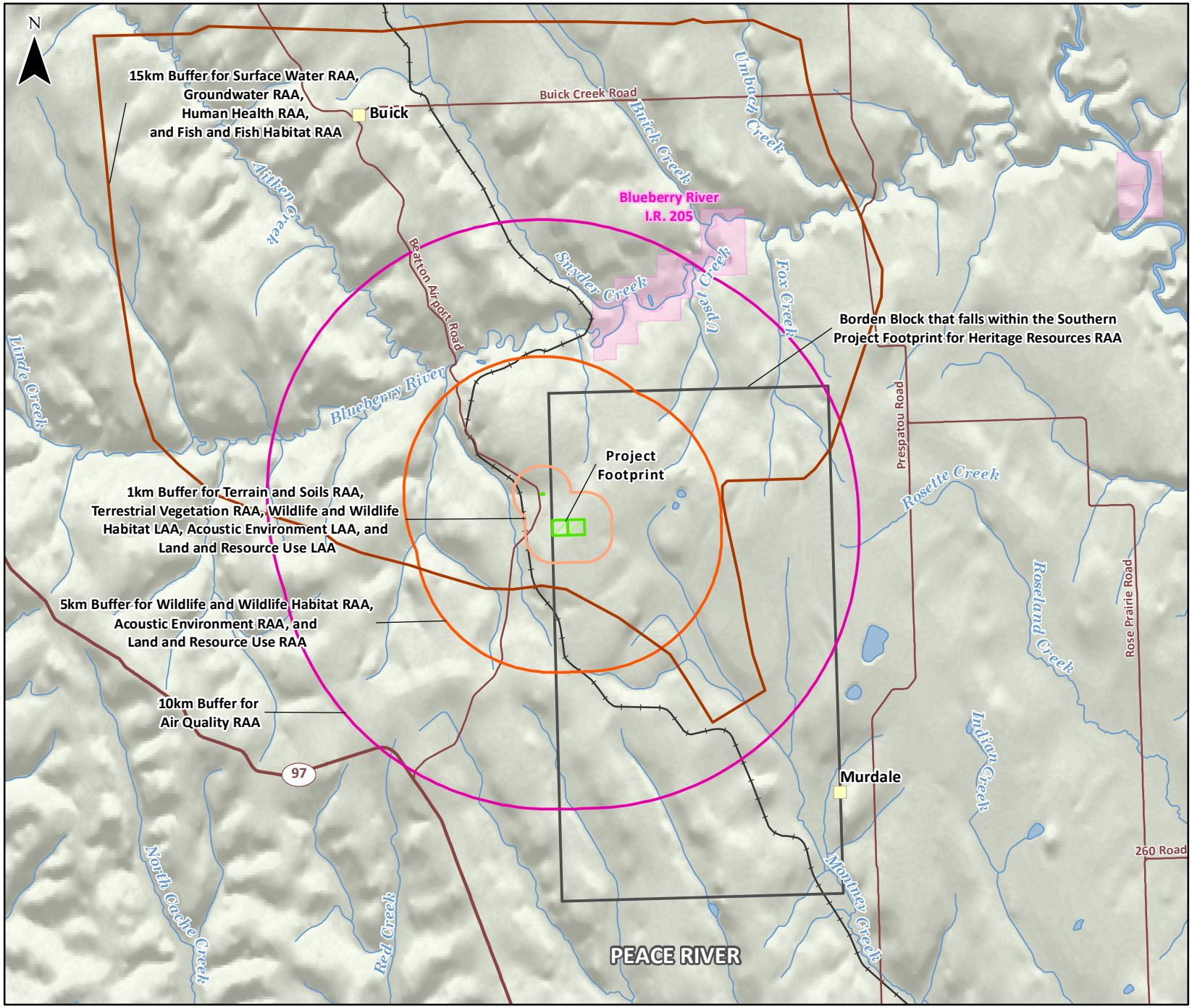

TERVITA
EARTH MATTERS

October 2019

FIGURE 3.2-2

PROJECT OVERVIEW
LAA AND RAA BOUNDARIES
(1 KM, 5 KM, 10 KM, AND 15 KM)

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- City/Town/Village
- Road
- 892 Highway
- Railway
- Watercourse
- Project Footprint
- Intersecting Borden Block
- 1km Assessment Area
- 5km Assessment Area
- 10km Assessment Area
- 15km Assessment Area
- Water Body
- Indian Reserve/ First Nation Settlement

SCALE: 1:200,000

0 2 4 6
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Project Footprint: Tervita 2016; Road: NRCan 2015; Railway: NRCan 2012; Hydrography: NRCan. 2009, NRCan. 2007-2011; Regional District: BC MFLNRO 2007; City/Town/Village: NRCan 2003; Indian Reserve: Government of Canada 2018; LAA and RAA Boundaries: CH2M 2016; Hillshade: TERA 2008.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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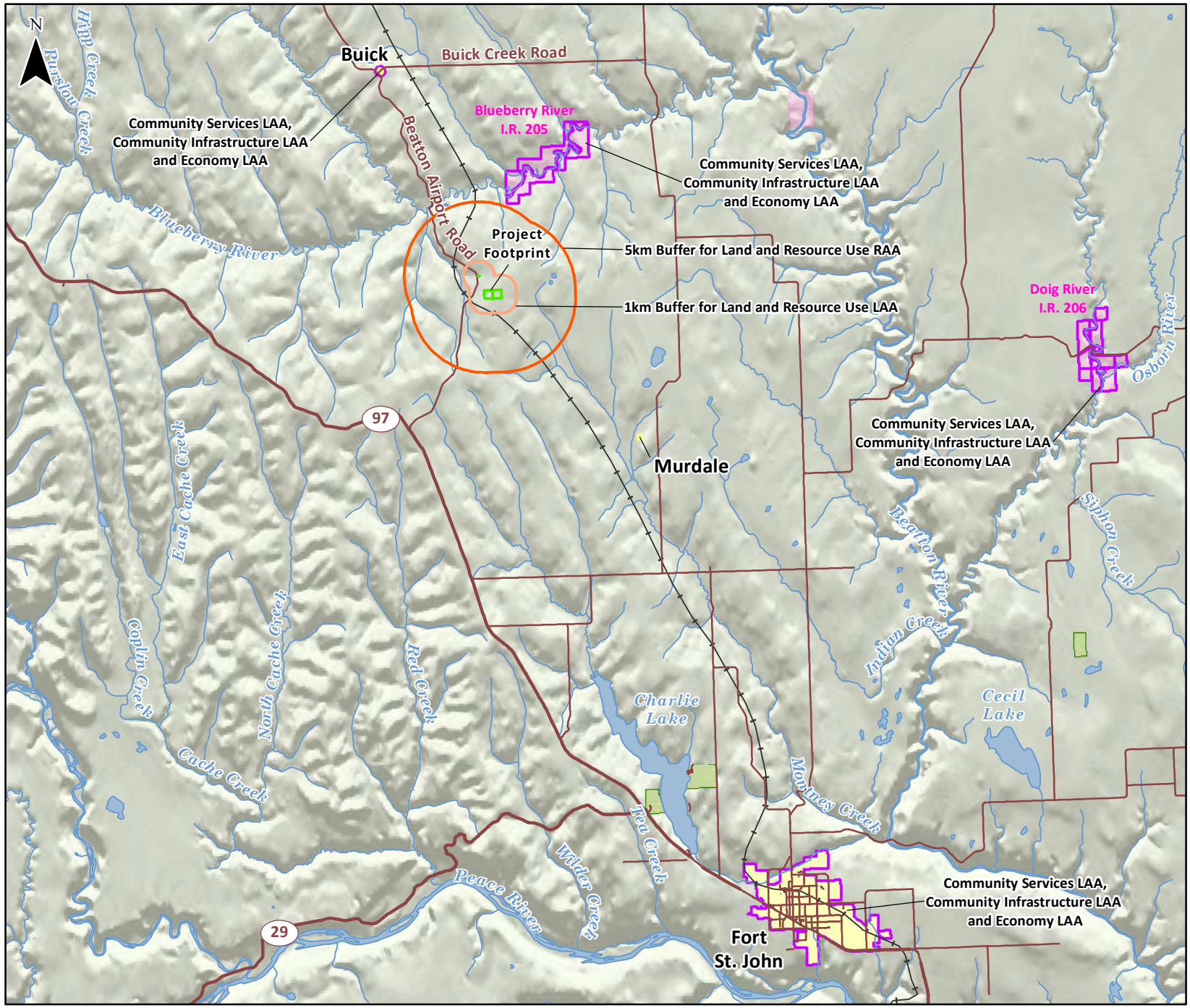

TERVITA
EARTH MATTERS

October 2019

FIGURE 3.2-3

PROJECT OVERVIEW SOCIAL BOUNDARIES

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Road
- Highway (892)
- Railway
- Watercourse
- Project Footprint
- 1km Assessment Area
- 5km Assessment Area
- Community Services LAA, Community Infrastructure LAA and Economy LAA
- Park/Protected Area
- Water Body
- City/Town/Village
- Indian Reserve/ First Nation Settlement

SCALE: 1:370,000

0 4 8 12
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Project Footprint: Tervita 2016; Road: NRCan 2015; Railway: NRCan 2012; Hydrography: NRCan. 2009, NRCan. 2007-2011; Regional District: BC MFLNRO 2007; City/Town/Village: NRCan 2003; Indian Reserve: Government of Canada 2018; LAA and RAA Boundaries: CH2M 2016; Hillshade: TERA 2008.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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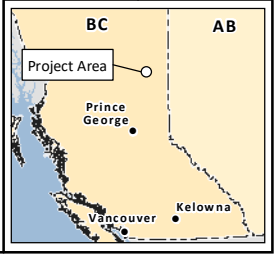

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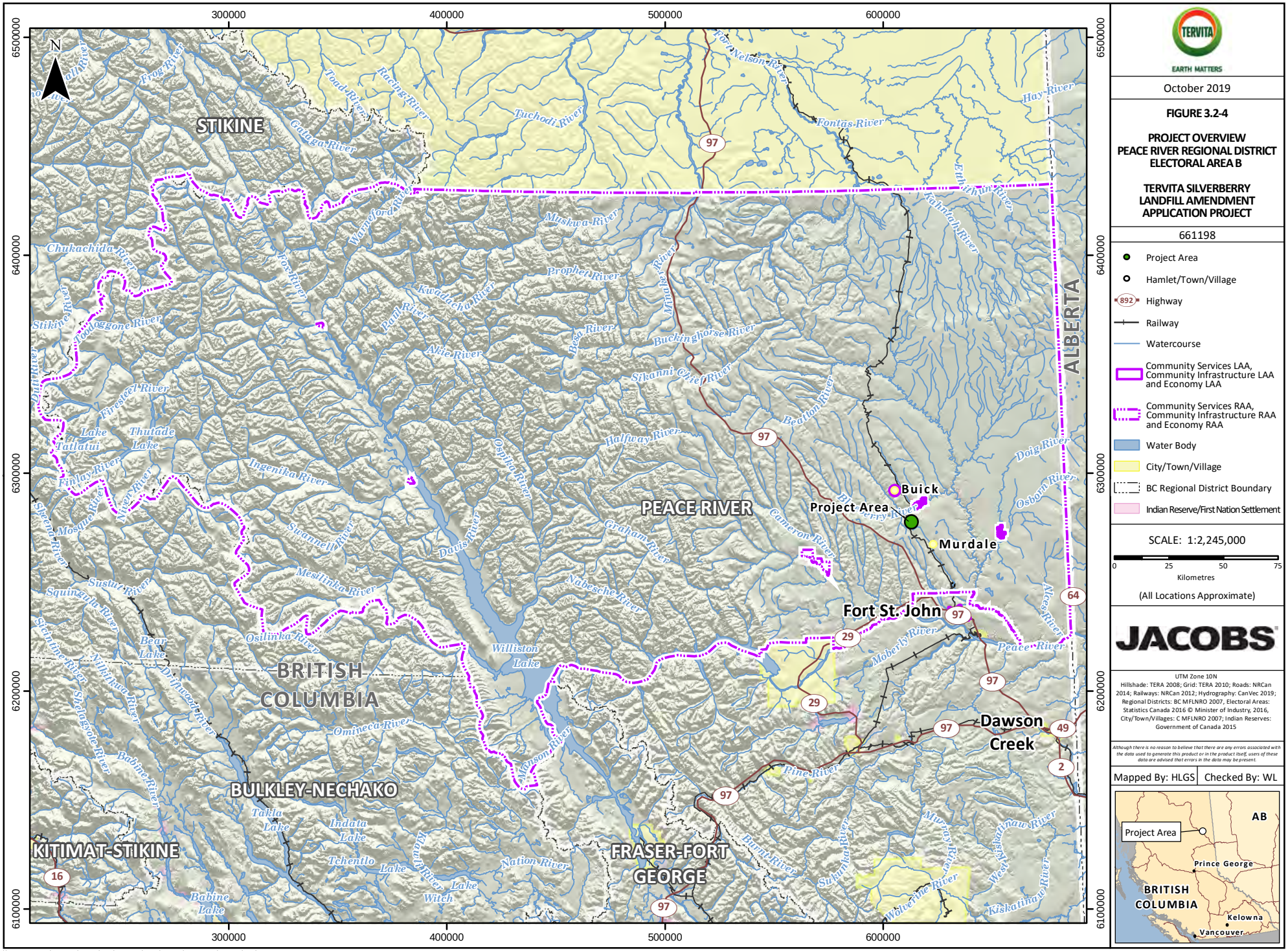

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3.2.2 Temporal Boundaries

The temporal boundaries identified for the proposed Project expansion include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

3.2.3 Administrative Boundaries

Administrative boundaries refer to effects of political, economic or social boundaries influencing an Environmental Assessment. These may include existing datasets collected on the basis of regional or provincial boundaries that are not the same as the spatial boundaries of the selected VCs, and could influence the assessment of the potential effects. Where administrative boundaries may affect the identification or assessment of potential effects on a VC, the nature of the administrative boundaries and their influence on the assessment have been included in this Application under the appropriate assessment in Part B, Sections 4 to 8.

3.2.4 Technical Boundaries

Technical boundaries refer to potential limitations in the Proponent's ability to predict effects of the proposed Project expansion. Where technical boundaries may affect the identification or assessment of potential adverse effects on a VC, the nature of the technical boundaries and their influence on the assessment has been described in this Application under the appropriate assessment in Part B, Sections 4 to 8.

3.3 Existing Conditions

Information on existing conditions is necessary to facilitate an effective assessment. The assessment team carried out baseline studies to establish the conditions of the VCs for the proposed Project expansion. Baseline data collection includes information on current environmental, economic, social, health and heritage conditions as well as existing disturbances and land uses. To gather pertinent background data for each VC, the assessment team used relevant legal frameworks (for example, *EMA*) and information gathered from a literature review including: topographic maps; aerial photography; scientific papers; reference books; municipal, provincial and federal government maps and registries; reports; interactive websites; guides; information letters; fact sheets; databases; previous similar projects; and Aboriginal, public, stakeholder and regulatory feedback, and expert opinion.

The assessment team drew on the support of consultants and subcontractors in the compilation of desktop research and field study data for Part B of the Application.

For each VC, the following information is provided on existing conditions in Part B, Sections 4 to 10:

- A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities

- Reference to natural and/or human-caused trends that may alter the environmental, economic, social, heritage and health setting, irrespective of the changes that may occur as a result of the proposed Project expansion or other Project and/or activities in the area
- An explanation of if and how other past and present projects and activities in the study area have affected or are affecting each VC
- Documentation of the methods and data sources used to compile information on existing (or baseline) conditions, including any standards or guidelines followed
- Where additional Project and VC-specific field studies are conducted, the scope and methods to be used will follow published documents pertaining to data collection and analysis methods, where available. Where methods used for the assessment deviate from applicable published guidance, the rationale for the variance will be provided in the Application
- Description of what Aboriginal Traditional Knowledge was used in the VC assessment

Gathering of baseline information and identification of potential issues relied on an understanding of known interactions identified through operation of the existing landfill, and were refined through input from Aboriginal groups, the public, and the government agencies, as well as Project-specific field surveys. The following technical reports contain baseline information for the proposed Project expansion and are provided in Appendices 1 to 11:

- Soil Sampling Report (Appendix 1)
- Volatile Organic Compound Air Sampling Report (Appendix 2)
- 2018 Surface Water Discharge Report (Appendix 3)
- 2018 Groundwater Monitoring Program (Appendix 4)
- Hydrogeological Siting Suitability Investigation (Appendix 5)
- Vegetation Survey Report (Appendix 6)
- Early Summer Wildlife Survey Report (Appendix 7)
- Early-mid Winter Snow Tracking Survey Report (Appendix 8)
- Late-Winter Snow Tracking Survey Report (Appendix 9)
- Spring Breeding Bird and Amphibian Survey Report (Appendix 10)
- Screening Level Human Health Risk Assessment (Appendix 11)

Tervita conducts quarterly groundwater monitoring and annual surface water discharge monitoring and NORM surveys for existing operations**.** These annual reports are referenced where applicable to inform the assessment of the proposed Project expansion.

3.4 Potential Effects

The Application includes an assessment of the potential environmental, economic, social, health and heritage effects of the proposed Project expansion on the VCs identified in the AAIR. The potential adverse effects of the proposed Project expansion on a particular VC were identified through: engagement with Aboriginal groups, the Working Group, the public, and government and regulatory agencies; experience gained during operations of the existing landfill; and the professional judgement of the assessment team.

The assessment methods followed in Part B, Sections 4 to 10 include:

- Identification of the potential interactions of the proposed Project expansion and the selected VCs
- Identification and description of the potential adverse effects resulting from the proposed Project expansion, using existing knowledge of potential effects identified through the literature review, knowledge gained from ongoing operations of the existing landfill, and field studies
- Identification of mitigation measures that avoid, reduce or otherwise address potential adverse effects using the tiered approach described in the BC Ministry of Environment (MOE) Environmental Mitigation Procedures (2014a)
- Determination of potential residual adverse effects (that is, effects after mitigation)

- Characterization of the potential residual adverse effects
- Determination of significance of potential residual adverse effects
- Evaluation of the potential for residual adverse effects associated with the proposed Project expansion to interact with similar effects of other past, present or reasonably foreseeable projects or activities
- Identification of any cumulative effects
- Identification of mitigation measures that avoid, reduce or otherwise address potential cumulative effects (if any)
- Identification of residual cumulative adverse effects
- Characterization and determination of significance of residual cumulative adverse effects
- Feedback from Aboriginal groups, the public, stakeholders and government agencies, as appropriate

3.5 Mitigation Measures

Mitigation measures are implemented to avoid, reduce, or control a project's adverse environmental, economic, social, heritage or health effects. Mitigation is developed on a project-specific basis for identified potential effects. A proponent or third party must accept responsibility for implementation of the mitigation and there must be certainty that the mitigation will be carried out (BC MOE 2014a). Mitigation measures are implemented to reduce the impact of any residual adverse effects which may occur including the reduction of the magnitude of the effect, the limitation of the extent of the effect and the shortening of the reversibility of the effect (that is, time to alleviate the residual effect). For some VCs (such as, Economy), the potential effects of the Project are considered positive; therefore, mitigation measures identified for positive effects are enhancement measures.

The BC MOE *Policy for Mitigating Impacts on Environmental Values (Environmental Mitigation Policy)* must be considered in BC EAO assessments. The Environmental Mitigation Policy (BC MOE 2014b) enables the Province to meet its goals for economic prosperity and environmental sustainability and requires consideration of environmental, social, and economic values. The Environmental Mitigation Policy is intended to support the environmental portion of informed, integrated, transparent decision-making in the Province's natural resource sector. It is supported by the Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) (BC MOE 2014a) which are intended to improve the quality, transparency and consistency of information to support existing decision-making processes for mitigating impacts on environmental values and associated components in four areas:

- Identification of environmental values and associated components
- Assessment of impacts on environmental values and associated components
- Application of the mitigation hierarchy to develop mitigation measures
- Preparation of mitigation plans

3.5.1 Mitigation Hierarchy

The types of mitigation measures outlined below are applied in a tiered approach consistent with the Environmental Mitigation Procedures published by the BC MOE (2014a).

- Avoidance: Measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: Measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): Measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.

Offset or compensation: measures taken to offset or compensate for (a) any residual adverse effect that cannot be avoided, reduced or restored, and (b) any residual adverse effects where there is a time-lag between the residual adverse effects and the effectiveness of the mitigation. One step should be considered before moving to the next, and a rationale should be provided for the approach that is taken. The general principle is that the higher the risk to the VC, the more protective the mitigation measures should be and the more likely that offset or compensation measures will also need consideration for any residual adverse effects remaining after restoration (onsite) (BC MOE 2014a). Considerations for rationale to move through the mitigation hierarchy include:

- Avoidance: Rationale for avoidance mitigation would address the question of to what degree or extent has the preliminary design of the proposed Project avoided potential effects, to what degree or extent can the impacts of the proposed Project or activity be avoided and whether the impacts on the environmental values and associated components can be fully avoided (“avoid”) or only partially avoided (“minimized”). Procedures to avoid impacts would consider location, means, timing and not proceeding with a particular activity.

  Part A, Section 1.4 provides information on the site selection criteria which helped frame the initial mitigation approach for the proposed Project expansion design.

- Minimization: Measures to minimize should consider the scope, scale, and duration of the impacts on environmental values and associated components within the footprint and area of influence. Although avoid and minimize are two distinct steps within the mitigation hierarchy, they are often considered at the same time. These same considerations generally apply when considering ways to minimize (i.e., partially avoid impacts). Guidance may be available in the form of land-use plans and other higher-level plans, park plans, strategic restoration plans, or BMPs. Same procedures and considerations as outlined for avoid (location, means, and timing) generally apply when considering ways to minimize impacts (that is, partially avoid impacts).

- Restoration (onsite): Rationale for restoration mitigation would address the question of why it was deemed not practicable to minimize impacts on environmental values and associated components to a greater extent.

- Offset or Compensation: Rationale for offset or compensation as mitigation would address the question of why it was deemed not practicable to restore environmental values and associated components on the site of the impacts to a greater extent.

  No offset or compensation measures are considered warranted as the proposed Project expansion is located adjacent to the existing landfill and on previously cleared land that is on private land owned by Tervita.

3.5.2 Mitigation Effectiveness

Effectiveness of mitigation measures to reduce or eliminate potential adverse effects are characterized using the following criteria:

- High effectiveness: The mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.

- Moderate effectiveness: The mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

- Low effectiveness: The mitigation measure may result in no or little change in the effect on a VC, the effectiveness of the mitigation measure is unknown or unproven, or no improvement to the condition of the VC.

Mitigation measures are implemented prior to, during or following Project activities and are expected to be effective immediately in alleviating or reducing potential Project effects on the VC. Some mitigation measures may not be effective immediately and require time before they function as intended or predicted such as implementation of seeding for erosion control.

To ensure that the severity of potential adverse effects is reduced during all phases of the proposed Project expansion, general and site-specific mitigation measures are recommended based upon current industry-accepted standards, professional judgement, engagement with regulatory agencies, interested groups and individuals including Aboriginal groups, as well as lessons learned during operations of the existing landfill. If in the future, regulatory changes occur, Tervita will adhere to these changes.

A summary of the mitigation measures for potential adverse effects of the proposed Project expansion by phase and any mitigation measures that will be in management plans is provided in Part B, Sections 4 to 10. The proposed mitigation measures take into consideration the technical and economic feasibility of the measures and their suitability for the Project, general and site-specific application as well as the degree to which the proposed mitigation measures have been considered effective in the same or similar applications elsewhere.

Experienced and qualified environmental professionals will be retained by Tervita, as required, to help ensure that the mitigation measures within this Application are understood and properly implemented. In addition, it is expected that through the Aboriginal and public engagement program, additional issues related to the proposed Project expansion may be identified and further mitigation measures determined. These measures will be incorporated in the management plans and the Silverberry Operations Plan, where appropriate.

3.6 Characterization of Residual Effects

Residual adverse effects are characterized in order to inform the determination of significance (Section 3.7). The criteria used to characterize the residual effects are identified below and their definitions are presented in Table 3.6-1:

- Context (that is, the extent to which the area in which a residual adverse effect may occur has already been adversely affected by existing conditions, as well as ecological thresholds and levels of existing disturbance, providing an indication of the sensitivity and resilience of the VC to effects)
- Spatial boundary (that is, Project footprint, LAA, RAA, Provincial, National, International)
- Temporal context (that is, duration and frequency of the event causing the residual effect, reversibility of the residual effect)
- Magnitude (that is, severity of the residual adverse effect in relation to environmental, social or regulatory standards)
- Level of confidence or uncertainty (that is, availability of data to substantiate the assessment conclusion, previous success of mitigative measures, etc.)
- Probability or likelihood of occurrence of the residual effect

All criteria (for example, temporal context, magnitude, etc.) were considered by the assessment team for each residual effect. Where appropriate, the key or most influential assessment criteria used to inform the determination of significance for each residual effect are noted.

A summary of the characterization of residual adverse effects arising from the construction and operations of the Project is identified in Part B, Sections 4 to 10.

Table 3.6-1. Characterization of Residual Effects for Evaluation of Significance

Assessment Criteria	Definition	
Spatial Boundary		
Footprint	The land area directly disturbed by proposed Project expansion construction and cleanup activities, including associated physical works and activities.	
LAA	The LAA varies with the VC being considered. The LAA includes the Project footprint and extends beyond it to incorporate the area within which the VC is most likely to be affected by the proposed Project expansion. The VC-specific LAAs are described in Sections 4 to 8 and are illustrated on Figures 3.2-1 and 3.2-3.	
RAA	The RAA varies with the VC being considered and includes the Project footprint and LAA, and the area extending beyond the LAA where there is potential for the proposed Project expansion to have regional effects on the VC. The VC-specific RAAs are described in Sections 4 to 8 and are illustrated on Figures 3.2-1 and 3.2-4.	
Provincial	The area extending beyond regional or administrative boundaries but confined to BC.	
National	The area extending beyond BC, but confined to Canada.	
International	The area extending beyond Canada.	
Temporal Context		
Duration – (period of the predicted residual effect)	Immediate	Residual effect is limited to less than or equal to 2 days.
	Short-term	Residual effect is limited to the initial construction phase, or any 1 year during the life of the proposed Project expansion.
	Medium-term	Residual effect extends into the operations phase for up to 10 years.
	Long-term	Residual effect extends into the operations phase for more than 10 years, but ceases during the operational life of the proposed Project expansion or upon closure/reclamation.
	Extended-term	Residual effect extends beyond the closure/reclamation phase.
Frequency (how often the predicted residual effect would occur)	Single/Rare	Residual effect occurs one time or rarely occurs.
	Infrequent	Residual effect occurs infrequently at multiple times.
	Frequent/Regular	Residual effect occurs frequently, at regular intervals.
	Continuous	Residual effect occurs continuously.
Reversibility	Reversible	Residual effect is reversible to pre-construction or equivalent conditions.
	Irreversible	Residual effect is permanent.
Magnitude - Residual Effects on the Environment, Social, Economic, and Health Pillars		
Negligible	There is no detectable change from baseline conditions.	
Low	The effect results in conditions that differ from the average value for baseline conditions but remain within the range of natural variation and below a guideline or threshold value, where applicable.	
Medium	The effect results in conditions that differ measurably from the average value for baseline conditions and are equal to or slightly above the limits of natural variation, and/or are equal to or slightly above a guideline or threshold value, where applicable.	
High	The effect results in conditions that differ substantially from baseline conditions, resulting in a clearly detectable change beyond the range of natural variation, and/or are measurable beyond a guideline or threshold value or at a regional population level, where applicable.	

Table 3.6-1. Characterization of Residual Effects for Evaluation of Significance

Assessment Criteria	Definition
Magnitude - Residual Effects on the Heritage Pillar	
Negligible	No detectable changes to heritage or archaeology sites.
Low	There are detectable changes to heritage or archaeology sites, but limited to small portions of sites of low significance, or portions of sites of higher significance that are already substantially disturbed.
Medium	Changes to small, but intact portions of heritage or archaeological sites of moderate or high significance, or substantial and intact portions of sites of low significance.
High	Changes to substantial and intact heritage or archaeology sites of moderate or high significance.
Magnitude - Residual Effects on GHG Emissions	
Negligible	No measurable contribution to provincial or national emissions. Very little or no measurable change based on comparison with national and provincial inventories.
Low	Emissions represent a small contribution to provincial or national emissions.
Medium	Emissions represent a moderate contribution to provincial or national emissions but are within regulatory limits and objectives.
High	Emissions cause exceedances of provincial or national emissions objectives or standards.
Likelihood of Residual Effect Occurring	
Low	The effect is unlikely to occur (as in a malfunction or accident or other low probability event).
Medium	The effect may occur, depending on the effectiveness of mitigation measures.
High	The effect will occur should the Project proceed.

The assessment period for the effects assessment includes construction, operations, closure/reclamation, and postclosure phases for the proposed Project expansion. In addition to the phases included in the assessment period of the effects assessment, the assessment period for the cumulative effects assessment includes the planning, construction, and operations phases of activities or projects that have previously occurred and those that are planned (publicly disclosed).

3.7 Proponent's Determination of Significance

A determination of significance was completed for all identified potential residual adverse effects. Thresholds of significance have been defined to provide a transparent basis for the determination of whether a potential residual effect is expected to be significant. Where practical, a quantitative threshold was defined for the significance determination for VCs based on published data, as well as environmental standards and guidelines. Due to a lack of regulatory standards, guidelines or objectives, a significance determination based on qualitative thresholds was used for all other VCs. Definitions are provided when qualitative thresholds were used. For some subjects, the evaluation of significance benefited from an understanding of similar issues or interactions associated with operation of the existing landfill. A conclusion of significance of residual adverse effects was determined and is provided for each VC.

The extent to which professional judgement of the assessment team was used in the evaluation of significance of potential residual adverse effects is indicated for each VC. For the proposed Project expansion, the assessment team consisted of discipline experts, the Jacob's Project Management Team, experienced assessment practitioners and senior reviewers.

3.8 Confidence and Risk

Section 3.9 of the AAIR indicates that additional risk analysis may be required to fully characterize the potential risk associated with uncertain outcomes, where there is a high degree of uncertainty with the possibility of a significant adverse effect, and follow-up programs are not considered sufficient to manage the potential risk. In the assessment of potential adverse effects of the proposed Project expansion in Part B, Sections 4 to 8, no situations like this arose, and therefore, the assessments do not contain additional information on risk. An assessment of risk was completed in the assessment of potential adverse effects resulting from Accidents and Malfunctions (Part B, Section 9).

Level of confidence in the determination of significance of potential residual adverse effects was determined by the availability of data, precedents, and degree of scientific uncertainty or other factors beyond the control of the assessment team. A conclusion will be based on either a low, moderate or high level of confidence for each residual adverse effect. These determinations will be made on the basis of the following factors.

- Low – prediction is based on incomplete understanding of cause-effect relationships and incomplete data pertinent to the proposed Project expansion area.
- Moderate – prediction is based on good understanding of cause-effect relationships using data from outside the proposed Project expansion area or incompletely understood cause-effect relationships using data pertinent to the proposed Project expansion area.
- High – assessment is based on good understanding of cause-effect relationships and data pertinent to the proposed Project expansion area.
- Where uncertainty exists in the significance determination, the Application provides recommended follow-up and monitoring programs (Part B, Sections 4 to 10).

3.9 Cumulative Effects Assessment

Cumulative effects are changes to the environment that are caused by an action in combination with other past, present and reasonably foreseeable human actions (Hegmann et al. 1999). The scope of the cumulative effects assessment is a Project-specific cumulative effects assessment as required under the BC *EA Act*. Hegmann et al. (1999) states an assessment must determine that a project is incrementally responsible for adversely affecting a given VC. Therefore, the total cumulative adverse effect on a given VC due to many actions must be identified, and the cumulative effects assessment specifies to what degree the proposed Project expansion under review is contributing to that total effect.

The cumulative effects assessment was conducted in accordance with the AAIR for the proposed Project expansion and BC EAO guidance, which states that the assessment of cumulative adverse effects is to be completed for VCs where potential residual adverse effects are evaluated as likely to occur and will interact with other past, present, or reasonably foreseeable projects (BC EAO 2013, 2018b).

Section 3.9.3 outlines the methodology for conducting the cumulative effects assessment.

3.9.1 Identification of Past, Present, and Reasonably Foreseeable Projects or Activities

Past, present or reasonably foreseeable projects and activities that were considered to have potential interaction with the proposed Project expansion met the following criteria:

- The project or activity may result in a residual adverse effect on a selected VC.
- The project-specific residual adverse effect on a VC is likely to act in a cumulative fashion with the residual adverse effects of other past, present or reasonably foreseeable developments in the area.

The following development categories of projects and activities were identified:

- Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project expansion (that is certain).
- Projects that are either proposed (public disclosure) or have been approved to be built, but are not yet built, for which the environmental effects overlap the proposed Project expansion (that is reasonably foreseeable).

Existing activities and disturbances or reasonably foreseeable developments that are likely to interact with the predicted residual effects of the proposed Project expansion vary depending upon the spatial boundaries identified for the specific environmental or socio-economic element, and temporal overlap with proposed Project expansion activities. Future projects considered in the assessment do not include proposed or hypothetical projects where formal plans have not been disclosed.

For each cumulative effects assessment, information will be provided on the adequacy of existing data in conducting the assessment.

Reasonably foreseeable developments included in the assessment were identified prior to June 1, 2019, and are summarized in Section 3.9.1.3. Only those reasonably foreseeable developments with identified footprints outside of urban disturbed areas are mapped and included in Figure 3.9-2.

Sources reviewed to identify any projects or activities that could have cumulative interactions with the proposed Project expansion include: CEA Agency Environmental Assessment Registry, Major Projects Management Office, National Energy Board (NEB), BC OGC, BC EAO Project Information and Collaboration System (EPIC), BC Major Projects Inventory, BC Ministry of Transportation and Infrastructure, BC Utilities Commission, and local government agencies.

The projects identified in Table 3.9-1 and shown on Figure 3.9-2 were identified as reasonably foreseeable in the AAIR and include some projects which are now complete and/or in operation (and, therefore, are now a part of existing activities identified in Section 3.9.1.2). Table 3.9-1 also includes additional reasonably foreseeable projects identified after the AAIR was finalized.

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
Aeolis Wind Power Corporation	Hackney Hills Wind Park	Wind Energy	Proposed	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
Aley Corporation Limited, a subsidiary of Taseko	Aley Niobium Project	Niobium Mine	Proposed	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
AuRico Metals Inc.	Kemess Underground Copper-Gold Mine	Copper/ Gold Mine	Under construction Expected to be operating by 2022	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
Secure Energy Services Inc.	Wonowon Landfill	Hazardous Waste Facility	Proposed Provincial Environmental Assessment process started in January 2019	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
Enbridge Inc. (formerly Westcoast Energy Inc.)	Spruce Ridge Program	Pipeline Expansion	Approved by NEB in December 2018 Construction schedule not yet determined	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
NGTL	North Montney Mainline Pipeline	Natural Gas Transmission Pipeline	Construction began in August 2018, and facilities will be phased into service over a 2-year period, beginning September 2019	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
The Station at Fort St. John	Station 44 Town Centre	Urban Residential/ Retail Development	Under construction Project completion forecasted for Q4 2023	Community Services LAA Community Infrastructure LAA Economy LAA	Reasonably Foreseeable
Enbridge Inc. (formerly Spectra Energy)	Westcoast Connector Gas Transmission Project	LNG Pipeline	EAC issued in 2014 – EAC extension granted in December 2018	Community Services RAA Community Infrastructure RAA Economy RAA	Reasonably Foreseeable
Blue Fuel Energy Corp.	Sundance Low Carbon Gasoline Refinery	Petrochemical Manufacturing	Current status unknown – construction completion was forecasted for early 2019	None - Outside Assessment Area Boundaries	Existing
Canadian Methanol Corp.	Sundance Clean Methanol Refinery	Petrochemical Manufacturing	Permitting stage – construction planned to start in late 2017, and production planned to begin in 2020	None - Outside Assessment Area Boundaries	Existing
Wartenbe Wind Project Limited Partnership	Wartenbe Wind Energy Project	Wind Energy	Current status unknown	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Canadian Dehua International Mines Group Incorporated	Gething Coal Project	Coal Mine	Proposed – BC EAO Pre-Application Phase	None - Outside Assessment Area Boundaries	Reasonably Foreseeable
Taylor Wind Project Limited Partnership, a subsidiary of EDF EN Canada Inc.	Taylor Wind Project	Wind Energy	Proposed – BC EAO Pre-Application Phase No activity on BC EAO EPIC since 2015	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Zero Emission Energy Developments Inc.	Septimus Creek Wind Power Project	Wind Energy	Under Construction (latest information available is from 2018)	None - Outside Assessment Area Boundaries	Existing
BC Hydro	Site C Clean Energy Project	Hydro-Electric	Construction of the project started in summer 2015, and will be completed in 2024	None - Outside Assessment Area Boundaries	Existing

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
Cardero Coal Ltd.	Carbon Creek Mine	Coal Mine	Withdrawn from BC EAO process in 2016, due to inactivity on application	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Air Liquide Canada Inc.	Air Liquide Liquid Nitrogen Plant	Industrial	Operating	None - Outside Assessment Area Boundaries	Existing
Bear Mountain Wind Limited Partnership	Bear Mountain Wind Park	Wind Energy	Operating	None - Outside Assessment Area Boundaries	Existing
Conuma Coal Resources Limited	Brule Mine	Coal Mine	Postoperation – project is in care and maintenance phase	None - Outside Assessment Area Boundaries	Existing
Keyspan Energy Canada Company (now Keyera Corp.)	Caribou Gas Processing Plant	Natural Gas Processing Facility	On hold	Community Services RAA Community Infrastructure RAA Economy RAA	Not Existing or Reasonably Foreseeable
Ferus Incorporated	Dawson Creek Liquid Nitrogen Plant	Industrial	Operating	None - Outside Assessment Area Boundaries	Existing
Spectra Energy Midstream Corporation	Dawson Liquids Extraction Project	Natural Gas Liquids Extraction	Operating	None - Outside Assessment Area Boundaries	Existing
Encana Corporation	Debolt Saline Water	Groundwater Extraction	Operating	None - Outside Assessment Area Boundaries	Existing
Encana Corporation	Encana 4-26 Refrigeration	Natural Gas Processing Facility	Current status unknown	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Encana Corporation	Encana 8-21 Refrigeration	Natural Gas Processing Facility	Current status unknown	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Slocan Forest Products Limited	Fibreco Pulp Mill Expansion	Pulp Mill	Operating	None - Outside Assessment Area Boundaries	Existing
BC Hydro	GM Shrum Generating Station Upgrade	Power Plant	Completed	None - Outside Assessment Area Boundaries	Existing
BC Hydro	GM Shrum Units 1 to 5 Turbine Rehabilitation Project	Power Plant	Completed	None - Outside Assessment Area Boundaries	Existing
City of Prince George	Hart Water Supply Improvements Fishtrap Island Collector Well	Groundwater Extraction	Completed	None - Outside Assessment Area Boundaries	Existing
Conuma Coal Resources Limited	Hermann Mine	Coal Mine	Under construction – production targeted for end of 2019	None - Outside Assessment Area Boundaries	Existing

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
Westcoast Gas Services Incorporated	Highway Gas and Liquids Plant and Pipeline	Natural Gas Processing Facility & Pipeline	EAC issued in 1997 Current status unknown – assumed to be in operation	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Westcoast Gas Services Incorporated	Jedney Gas Plant & Pipeline Expansion	Natural Gas Processing Facility & Pipeline	EAC issued in 1997 Current status unknown – assumed to be in operation	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Westcoast Gas Services Incorporated	Jedney Gas Processing Plant and Pipeline Facilities	Natural Gas Processing Facility & Pipeline	EAC issued in 1996 Current status unknown – assumed to be in operation	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Paramount Resources Limited	Maxhamish Pipeline	Natural Gas Transmission Pipeline	EAC issued in 1999 Current status unknown – assumed to be in operation	None - Outside Assessment Area Boundaries	Existing
Westcoast Power Incorporated (now owned by ATCO Power and Spectra Energy)	McMahon Co-Generation	Power Plant	Operating	None - Outside Assessment Area Boundaries	Existing
Meikle Wind Energy Limited Partnership	Meikle Wind Energy Project	Wind Energy	Operating	None - Outside Assessment Area Boundaries	Existing
HD Mining International Limited	Murray River Coal Project	Coal Mine	EAC issued Unable to confirm status; appears to be preparing for construction	None - Outside Assessment Area Boundaries	Existing
NorskeCanada (now Catalyst Paper)	NorskeCanada's Crofton De-Inking Plant	Paper De-Inking Facility (Pulp & Paper Industry)	Current status unknown	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Plateau Pipe Line Limited, a subsidiary of Pembina Pipeline Corp.	Northeast BC Expansion	Condensate & NGL Transmission Pipeline	Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
CCS (now Tervita)	Northern Rockies Secure Landfill	Landfill	Operating	None - Outside Assessment Area Boundaries	Existing
Louisiana-Pacific OSB Limited Partnership	Peace Valley Oriented Strand Board	Oriented Strand Board Plant (Engineered Lumber)	Operating	Community Services LAA Community Infrastructure LAA Economy LAA	Existing

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
Petrowest GP Limited	Peejay Secure Landfill	Landfill	Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Petronas Canada	Progress Energy Lily Dam	Dam	Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Petronas Canada	Progress Energy Town Dam	Dam	Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Capital Power L.P.	Quality Wind Project	Wind Energy	Operating	None - Outside Assessment Area Boundaries	Existing
Red Willow Wind Limited Partnership	Red Willow Wind Project	Wind Energy	Proposed – BC EAO Pre-Application Phase No activity on BC EAO EPIC since 2015	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Canadian Hunter Exploration Limited (now ConocoPhillips Canada Resources Corp.)	Ring Border Gas Plant Expansion	Natural Gas Processing Facility	Completed/Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Peace River Coal Inc.	Roman Coal Mine	Coal Mine	Postoperation – project is in care and maintenance phase	None - Outside Assessment Area Boundaries	Existing
Encana Corporation	Saturn 15-27 Sweet Gas Plant	Natural Gas Processing Facility	Operating	None - Outside Assessment Area Boundaries	Existing
Glencore PLC	Sukunka Coal Mine	Coal Mine	Proposed – BC EAO Review Phase	None - Outside Assessment Area Boundaries	Reasonably Foreseeable
Sundance Wind Project Limited Partnership, a subsidiary of EDF EN Canada Inc.	Sundance Wind Project	Wind Energy	Proposed – BC EAO Pre-Application Phase No activity on BC EAO EPIC since 2015	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable
Novagas Canada Limited	Taylor Straddle Plant	Natural Gas Liquids Extraction	EAC issued in 1997 Current status unknown – assumed to be in operation	None - Outside Assessment Area Boundaries	Existing
Thunder Mountain Wind Limited Partnership (now Brookfield Renewable Energy Group)	Thunder Mountain Wind Project	Wind Energy	On hold EAC issued; Section 18 extension granted – expires December 10, 2019	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable

Table 3.9-1. Projects Identified for the Proposed Project Expansion Cumulative Effects Assessment

Proponent	Project Name	Type of Development	Status/Schedule (as of June 2019)	Relevant Project Spatial Boundaries[a]	Existing or Reasonably Foreseeable
NGTL	Towerbirch Expansion	Natural Gas Transmission Pipeline and Related Facilities	Operating	None - Outside Assessment Area Boundaries	Existing
Novagas Canada Limited (now Canadian Natural Resources Limited)	West Stoddart Gas Processing Facility	Natural Gas Processing Facility	Operating	Community Services RAA Community Infrastructure RAA Economy RAA	Existing
Conuma Coal Resources Limited	Willow Creek Coal Mine	Coal Mine	Operating	None - Outside Assessment Area Boundaries	Existing
Conuma Coal Resources Limited	Wolverine Coal Mine	Coal Mine	Operating	None - Outside Assessment Area Boundaries	Existing
Taylor Gas Liquids Limited Partnership	Younger NGL Plant Expansion	Natural Gas Processing Facility	Completed/Operating	None - Outside Assessment Area Boundaries	Existing
Coastal GasLink Pipeline Ltd.	Coastal GasLink Pipeline Project	Natural Gas Transmission Pipeline	Under construction	None - Outside Assessment Area Boundaries	Existing
Prince Rupert Gas Transmission Ltd.	Prince Rupert Gas Transmission Pipeline	Natural Gas Transmission Pipeline	On hold	None - Outside Assessment Area Boundaries	Not Existing or Reasonably Foreseeable

[a] Definitions and rationale for proposed Project expansion spatial boundaries are provided for each VC in Sections 4 to 8.

Notes:

NGTL = NOVA Gas Transmission Ltd.
Taseko = Taseko Mines Ltd.

3.9.1.1 Historical Conditions

Approximately 10,000 years ago, the last glacial ice sheets retreated from the northern parts of the Canadian prairies, leaving behind fertile soils, thick deposits of gravel, boulders, innumerable shallow lakes and large areas of swamp and muskeg. For thousands of years nomadic hunters struggled to adapt to the rigors of a harsh northern climate and an uncertain food supply. Over time, distinctive groups developed their own cultures and tool kits to make survival possible, passing knowledge and wisdom over generations to present day (Clare 1998).

The understanding of existing activities and disturbances on the landscape is based on disturbance since settlers began to arrive to the northeastern BC area in the early 1900s using the Athabasca, Edson and Hinton trails. After 1912, large areas of bushland in the Peace area were turned into cropland (Clare 1998). The Northern Alberta Railway reached the village of Dawson Creek in 1931 (Lord and Green 1986). In the early 1940s, the BC, Canadian and American governments developed a plan to secure land transportation between the continental states to Alaska by building the Alaska Highway. In 1942, Dawson Creek was developed at the confluence of Highway 97 from southern and western BC, Highway 2 from Alberta and the start of the Alaska Highway. After World War II ended in 1945, the area was left with better connections by land and by air. Exploration for oil and natural gas brought new interest, prosperity and transportation links to the region. Energy extraction in the region began in the

1960s. Since then, lands have been cleared for further settlement, agriculture, forestry, recreation, transportation infrastructure, and oil and gas activities (Clare 1998).

The surrounding land of the proposed Project expansion is generally undeveloped forest, but a number of oil and gas facilities operate within the immediate vicinity of the site, and oil and gas production is generally the predominant commercial activity within the area. Based on historical areal imagery the landfill site has been subject to a history of natural and man-made disturbances including wildfire scarring in the 1950s and oil and gas activity in the 1970s. Most of the landfill site was cleared of trees in the 1980s for agricultural use prior to being developed as a secure landfill.

3.9.1.2 Existing Activities

Existing activities and disturbances in the proposed Project expansion assessment areas include the following:

- Forestry (for example, TSAs and Tree Farm Licenses [TFLs])
- Oil and gas developments (for example, wells, pipelines, and oil or gas facilities)
- Agriculture (for example, crop and pasture lands)
- Mineral resources (for example, exploration activities)
- Energy transmission (for example, electricity transmission lines and electric power substations)
- Recreation and tourism (for example, canoeing, cross-country skiing, hiking, horseback riding, hunting, fishing, and snowmobiling)
- Settlement and rural and urban development (for example, cities, towns, counties, population growth/decline, residential and commercial development, utilities [distribution lines, sewer/water], landfills, museums, and hospitals)
- Transportation and infrastructure (for example, traffic, highways, roads, railways, and airports)

Natural disturbances within the proposed Project expansion assessment areas, such as wildfires, are discussed in Section 10 Effects of the Environment on the Project.

Existing activities are further described in the following subsections. Locations of specific projects are shown on Figure 3.9-1. (Note: only select projects are mapped).

Forestry

The proposed Project expansion is located in the Fort St. John TSA, which is the sixth largest TSA in BC. The volume of timber harvested in the TSA provides an indication of current forestry activity in the proposed Project expansion assessment areas. Effective May 10, 2018, the current AAC in the TSA is 2,115,000 m^3, consisting of 1.2 million m^3 coniferous and 915,000 m^3 deciduous (Province of BC 2018d). The AAC has largely remained unchanged over the last 15 years and is expected to remain at current rates over the next decade (BC MFLNRORD 2018b).

Along with oil and gas and agriculture, forestry (that is, timber harvesting) is the dominant land use activity in the proposed Project expansion assessment areas. Current and ongoing forestry activities in the proposed Project expansion assessment areas include forest harvesting in TSAs, as well as TFLs. A vegetation field survey conducted in June 2015, and a site visit in 2017 for the proposed Project expansion observed patches of forest harvesting (logging) in the northeast portions of the Terrestrial Vegetation RAA and the Land and Resource Use LAA (that is, 1-km radius extending outwards from the proposed Project expansion footprint boundary).

Oil and Gas Developments

Oil and gas activity in the proposed Project expansion assessment areas has been ongoing since the 1960s. Numerous oil and gas exploration and development companies are currently active in northeast BC and are considered vital to the economy. With the recent discovery of the Montney Shale field in the region, expansion in the natural gas industry is growing quickly. Over 5 years, from 2011 to 2016, annual production has increased 24 percent. Recently, however, exploration and development have declined, with only 353 gas wells drilled in northeast BC in 2016, compared to 531 in 2015 (BC OGC 2017).

The proposed Project expansion is located in the oil and gas development area of the Montney basin, which remains the major place for drilling activity, production and reserves growth in northeast BC (BC OGC 2017). Oil and gas companies currently operating and with proposed oil and gas activities in the RAA of various VCs include, but are not limited to, AltaGas Holdings Inc., ARC Resources Ltd., Baytex Energy Ltd., Bonavista Energy Corp., Canadian Natural Resources Ltd., Kelt Exploration Ltd., Pembina Pipeline Corp., NGTL, and Westcoast (IHS 2019a, 2019b, 2019c).

In October 2017, Plateau Pipe Line Ltd., a subsidiary of Pembina Pipeline Corp., completed and put into operation the Northeast BC Expansion Project. The project included the construction of 147 km of pipeline to transport natural gas liquids, running from northwest of Wonowon, BC, to an existing terminal near Taylor, BC (see Figure 3.9-1). It has a transmission capacity of approximately 75,000 barrels per day and is expected to be in operation for a minimum of 25 years (BC EAO 2016; Pembina Pipeline Corp. 2019).

In January 2018, AltaGas Ltd. completed construction of the North Pine Natural Gas Liquids Facility project, located approximately 5 km south of the proposed Project expansion (see Figure 3.9-1). The 10,000 barrels per day facility is connected to existing AltaGas Ltd. infrastructure. Natural gas liquids such as butane, propane and natural gas condensate will be delivered to the facility by truck and by pipeline, and will then be separated, processed to meet sales specifications for each of the components and then shipped to sales destinations by rail, with some product being trucked to local markets. The facility will also receive condensate that has been processed at upstream gas plants. This condensate will flow into storage at the facility then be transported by rail or trucks to sales destinations (AltaGas Ltd. 2018).

Existing oil and gas activities expected to take place in the proposed Project expansion assessment areas include operations and maintenance activities for wells, pipelines, and facilities (for example, gas plants, pump stations, compressor stations, and meter stations).

Agriculture

The Peace River region is a crucial agricultural production area of BC. The PRRD contains approximately 1.4 million ha of land within the ALR, comprising approximately 27 percent of ALR lands in BC. Approximately 825,000 ha of land are currently farmed in the region, producing forage seed, grain (that is, barley, oats and wheat), alfalfa, canola and honey. Cattle ranching and game farm production are also common agricultural activities in the region (PRRD 2013, 2014). Most of the land in the proposed Project expansion assessment areas is designated as ALR (Province of BC 2018a). Current and ongoing agricultural activities in the proposed Project expansion assessment areas predominantly consist of field crop production, managed and unmanaged pasture, and other livestock and associated activities (PRRD 2014).

Utilities and Energy Transmission

Current and ongoing utility activities in the proposed Project expansion assessment areas include maintenance on transmission lines, fibre optic line and gas distribution rights-of-way (for example, BC Hydro, Telus Communications Corp., Spectra Energy Corp.). There are currently no independent power projects identified as operating within the proposed Project expansion assessment areas (BC Hydro 2018a).

Other ongoing and current utility activities in the proposed Project expansion assessment areas include operation and maintenance activities associated with public utilities and services (for example, water and

sewer lines, landfills) and electrical infrastructure (for example, substations, power lines) serving local communities and rural residences, as well as the oil and gas industry.

In addition, BC Hydro recently completed two projects associated with one of its largest generating facilities (that is, Gordon M. Shrum) as part of their plan to invest approximately $2 billion a year over the next decade in BC's electric system (BC Hydro 2018b). These projects, while identified in the AAIR as reasonably foreseeable, are now considered a part of existing activities and are located outside of the proposed Project expansion assessment area boundaries (see Table 3.9-1).

Mineral Resources

At present, there are no operating mines or other mineral resource developments identified in any of the proposed Project expansion assessment areas (Clarke et al. 2019). However, given the importance of mineral resources for BC, it is expected that ongoing exploration activities may overlap with the proposed Project expansion assessment areas.

Recreation and Tourism

Current and ongoing recreational use of lands in the proposed Project expansion assessment areas may include camping, hiking, canoeing/kayaking, fishing, hunting, boating, snowmobiling and ATV use. However, the remote setting of the proposed Project expansion may limit the number of recreational users. The closest designated park, recreation area, or natural area is Beatton Provincial Park, located approximately 34 km south of the proposed Project expansion.

Settlement and Rural and Urban Development

The proposed Project expansion is located in a remote, predominantly forested, Crown land setting. No residences are located within 1.5 km of the Project footprint.

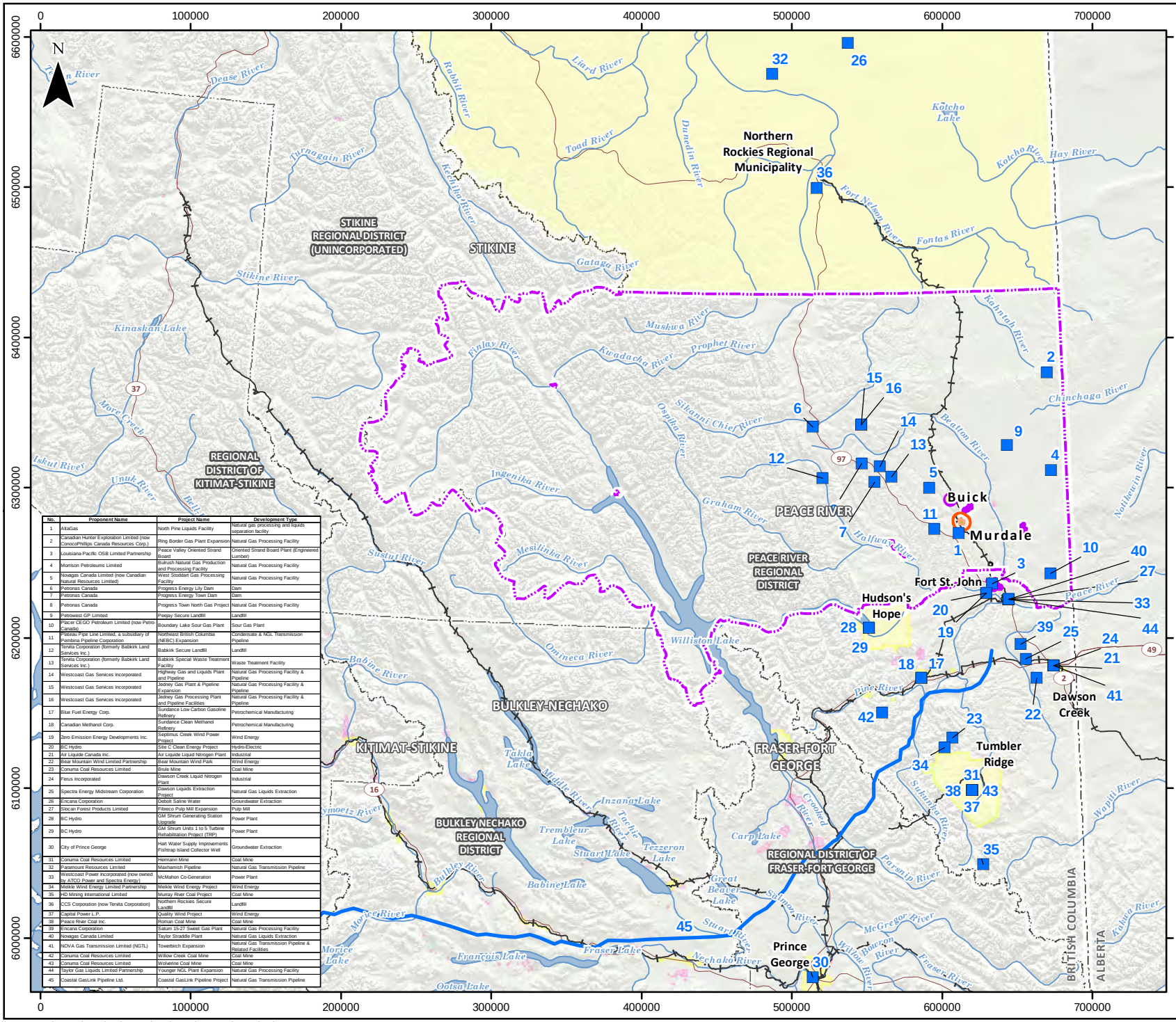
There are a number of existing landfill and waste treatment facilities in the Community Services RAA, Community Infrastructure RAA, and Economy RAA including the Tervita Silverberry Secure Landfill, Tervita Babkirk Secure Landfill, Tervita Babkirk Special Waste Treatment Facility, and the Petrowest GP Ltd. Peejay Secure Landfill (see Figure 3.9-1).

In 2016, PRRD Electoral Area B had a population of 5,628, an increase of 1.4 percent from 2011 (Statistics Canada 2018). The nearest communities with services to the proposed Project expansion are the City of Fort St. John (approximately 50 km southeast), the District Municipality of Taylor (approximately 60 km south), and the Community of Wonowon (approximately 40 km northwest), which provide accommodation, restaurants, groceries, gas, and diesel. The Community of Buick, which consists of several houses, a community hall and a small store, is located approximately 16 km north.

In 2016, the City of Fort St. John had a population of 20,155, an increase of 8.3 percent from 2011. In 2016, the District Municipality of Taylor had a population of 1,469, an increase of 7.0 percent from 2011 (Statistics Canada 2018).

Transportation and Infrastructure

Current and ongoing transportation activities in the proposed Project expansion assessment areas may include regular and commercial vehicle traffic, as well as maintenance activities on roads, bridges, highways, railways and airports. Access to the proposed Project expansion is via local highways (for example, Highway 97) and Beatton River Road (also referred to as the Buick Creek Road, Highway #151, or the Beatton River Airport Road). The nearest major airport is the North Peace Regional Airport (YXJ) located in Fort St. John, where the Canadian National Railway Company has the nearest railway stop.



No.	Proponent Name	Project Name	Development Type
1	AltaGas	North Pine Liquids Facility	Natural gas processing and liquids separation facility
2	Canadian Hunter Exploration Limited (now ConocoPhillips Canada Resources Corp.)	Ring Border Gas Plant Expansion	Natural Gas Processing Facility
3	Louisiana-Pacific OSB Limited Partnership	Peace Valley Oriented Strand Board	Oriented Strand Board Plant (Engineered Lumber)
4	Morrison Petroleums Limited	Buffalo Natural Gas Production and Processing Facility	Natural Gas Processing Facility
5	Novagas Canada Limited (now Canadian Natural Resources Limited)	West Stoddart Gas Processing Facility	Natural Gas Processing Facility
6	Petronas Canada	Progress Energy Lily Dam	Dam
7	Petronas Canada	Progress Energy Town Dam	Dam
8	Petronas Canada	Progress Town North Gas Project	Natural Gas Processing Facility
9	Petrowest GP Limited	Peejay Secure Landfill	Landfill
10	Placer CEGO Petroleum Limited (now Petro Canada)	Boundary Lake Sour Gas Plant	Sour Gas Plant
11	Plateau Pipe Line Limited, a subsidiary of Pembina Pipeline Corporation	Northeast British Columbia (NEBC) Expansion	Condensate & NGL Transmission Pipeline
12	Tervita Corporation (formerly Babkirk Land Services Inc.)	Babkirk Secure Landfill	Landfill
13	Tervita Corporation (formerly Babkirk Land Services Inc.)	Babkirk Special Waste Treatment Facility	Waste Treatment Facility
14	Westcoast Gas Services Incorporated	Highway Gas and Liquids Plant and Pipeline	Natural Gas Processing Facility & Pipeline
15	Westcoast Gas Services Incorporated	Jedney Gas Plant & Pipeline Expansion	Natural Gas Processing Facility & Pipeline
16	Westcoast Gas Services Incorporated	Jedney Gas Processing Plant and Pipeline Facilities	Natural Gas Processing Facility & Pipeline
17	Blue Fuel Energy Corp.	Sundance Low Carbon Gasoline Refinery	Petrochemical Manufacturing
18	Canadian Methanol Corp.	Sundance Clean Methanol Refinery	Petrochemical Manufacturing
19	Zero Emission Energy Developments Inc.	Septimus Creek Wind Power Project	Wind Energy
20	BC Hydro	Site C Clean Energy Project	Hydro-Electric
21	Air Liquide Canada Inc.	Air Liquide Liquid Nitrogen Plant	Industrial
22	Bear Mountain Wind Limited Partnership	Bear Mountain Wind Park	Wind Energy
23	Conuma Coal Resources Limited	Brule Mine	Coal Mine
24	Ferus Incorporated	Dawson Creek Liquid Nitrogen Plant	Industrial
25	Spectra Energy Midstream Corporation	Dawson Liquids Extraction Project	Natural Gas Liquids Extraction
26	Encana Corporation	Debolt Saline Water	Groundwater Extraction
27	Slocan Forest Products Limited	Fibreco Pulp Mill Expansion	Pulp Mill
28	BC Hydro	GM Shrum Generating Station Upgrade	Power Plant
29	BC Hydro	GM Shrum Units 1 to 5 Turbine Rehabilitation Project (TRP)	Power Plant
30	City of Prince George	Hart Water Supply Improvements Fishtrap Island Collector Well	Groundwater Extraction
31	Conuma Coal Resources Limited	Hermann Mine	Coal Mine
32	Paramount Resources Limited	Mashamish Pipeline	Natural Gas Transmission Pipeline
33	Westcoast Power Incorporated (now owned by ATCO Power and Spectra Energy)	McMahon Co-Generation	Power Plant
34	Meikle Wind Energy Limited Partnership	Meikle Wind Energy Project	Wind Energy
35	HD Mining International Limited	Murray River Coal Project	Coal Mine
36	CCS Corporation (now Tervita Corporation)	Northern Rockies Secure Landfill	Landfill
37	Capital Power L.P.	Quality Wind Project	Wind Energy
38	Peace River Coal Inc.	Roman Coal Mine	Coal Mine
39	Encana Corporation	Saturn 15-27 Sweet Gas Plant	Natural Gas Processing Facility
40	Novagas Canada Limited	Taylor Straddle Plant	Natural Gas Liquids Extraction
41	NOVA Gas Transmission Limited (NGTL)	Towerbirch Expansion	Natural Gas Transmission Pipeline & Related Facilities
42	Conuma Coal Resources Limited	Willow Creek Coal Mine	Coal Mine
43	Conuma Coal Resources Limited	Wolverine Coal Mine	Coal Mine
44	Taylor Gas Liquids Limited Partnership	Younger NGL Plant Expansion	Natural Gas Processing Facility
45	Coastal GasLink Pipeline Ltd.	Coastal GasLink Pipeline Project	Natural Gas Transmission Pipeline

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FIGURE 3.9-1

EXISTING PROJECTS IN THE PROPOSED PROJECT EXPANSION ASSESSMENT AREA BOUNDARIES

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Existing Development
- Existing Development
- Hamlet/Town/Village
- Highway
- Railway
- Watercourse
- Project Footprint
- 1km Assessment Area
- 5km Assessment Area
- Community Services LAA, Community Infrastructure LAA and Economy LAA
- Community Services RAA, Community Infrastructure RAA and Economy RAA
- Water Body
- City/Town/Village
- BC Regional District Boundary
- Indian Reserve/First Nation Settlement

SCALE: 1:3,500,000

0 25 50 75
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Hillshade: TERA 2008; Grid: TERA 2010; Roads: NRCan 2014; Railways: NRCan 2012; Hydrography: CanVec 2019; Regional Districts: BC MFLNRO 2007, Electoral Areas: Statistics Canada 2016 © Minister of Industry, 2016, City/Town/Villages: C MFLNRO 2007; Indian Reserves: Government of Canada 2015

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

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3.9.1.3 Reasonably Foreseeable Projects

Reasonably foreseeable projects considered in the cumulative effects assessment will vary depending on the spatial boundaries identified for specific VCs. Refer to Table 3.9-1 and on Figure 3.9-2.

In general, reasonably foreseeable activities in the proposed Project expansion assessment areas may include: forestry, oil and gas development, agriculture, utilities and energy transmission projects, mineral resource exploration/extraction, settlement and rural and urban development, and transportation and infrastructure projects.

Forestry

As described in Section 3.9.1.2, the proposed Project expansion is located in the Fort St. John TSA. Reasonably foreseeable forestry activities within the TSA are expected to continue at a harvest rate consistent with the current AAC of 2,115,000 m^3, effective May 10, 2018 (Province of BC 2018d). Although spatial disturbance data for future cutblocks was not available, the Application considers that forest harvesting is expected to continue into the foreseeable future and incorporates this foreseeable development qualitatively in the assessment of cumulative effects.

Oil and Gas Development

In May 2018, the NEB approved NGTL's request for variances to Condition 4 of their existing NEB Certificate and Condition 4 of their existing NEB Order to enable the company to proceed with construction of specific components of the approved North Montney Mainline Project. In the original and previously approved NEB application, the North Montney Project was a proposal to build and operate approximately 301 km of pipeline in the PRRD, along with associated metering facilities, valve sites and possible compression facilities. The proposed natural gas pipeline would connect with the existing Groundbirch Mainline (Saturn Section), located approximately 35 km southwest of Fort St. John, and would continue approximately 187 km northwest of Fort St. John. Among other changes associated with the variances, the originally proposed 301 km pipeline has since been shortened to 206 km. The pipeline will be located approximately 40 km northwest of the Project footprint, within the Community Services RAA, Community Infrastructure RAA, and Economy RAA (see Figure 3.9-2). The anticipated 1,400 to 1,800 workers are planned to be housed in local accommodations and two work camps. Construction of the North Montney Mainline Project is expected to overlap with construction of the proposed Project expansion and is expected to be completed by spring 2020 (EnergeticCity.ca 2018; NEB 2018a).

Enbridge Inc. (formerly Westcoast Energy Inc.) received NEB approval in December 2018, to construct and operate the Spruce Ridge Program to expand its existing natural gas transmission system in the PRRD (NEB 2018b). The Spruce Ridge Program comprises two new pipeline loops, expansions at two compressor stations and modifications at a third compressor station. There are two components of the program within the assessment boundaries of the proposed Project expansion (specifically the Community Services RAA, Community Infrastructure RAA, and Economy RAA; see Figure 3.9-2): the Aitken Creek Loop and the Compressor Station N5 Expansion. Located approximately 60 km northwest of the proposed Project expansion, the Aitken Creek Loop is an approximately 13 km nominal pipe size (NPS) 24 pipeline looping of Westcoast's Aitken Creek Pipeline northwest of Wonowon, BC. Located approximately 70 km southwest of the proposed Project expansion, the Compressor Station N5 Expansion involves increasing compression capacity at Westcoast's existing compressor station. The Compressor Station N5 Expansion will include the necessary utilities to support a new 30,000-horsepower unit, as well as piping tie-ins to connect the compressor unit to the mainline pipeline entering and exiting the station. The Compressor Station N5 Expansion will be located on forested and previously cleared Westcoast-owned lands situated immediately south of the existing compressor station facilities. The project is currently in the preconstruction phase, and the proponent is evaluating when to start construction (Enbridge Inc. 2019).

Westcoast Connector Gas Transmission Ltd. (on behalf of Spectra Energy Corp. and BG International Ltd.) applied to the BC EAO in May 2014, to construct and operate the Westcoast Connector Gas Transmission Project from northeast BC to the Prince Rupert area. The project would involve the

construction of a pipeline system, consisting of up to two 914-1,219-millimetre (mm) (NPS 36-48) pipelines approximately 854-862 km in length, three metering stations, and five compressor stations. The project is expected to provide in the range of 3,000 to 3,600-person years of employment during construction, and approximately 50 to 60 permanent jobs for the life of the project. The capital cost of the project is estimated between $6 and $8 billion. Although the EAC for the project was issued by the BC EAO in November 2014, construction has not yet started on the proposed pipeline, which received certificate extension in December 2018 (BC OGC 2018b; Province of BC 2018c). For the purposes of this Application, construction of the proposed pipeline is assumed to overlap with construction of the proposed Project expansion. At its nearest point to the proposed Project expansion, the proposed pipeline would be located approximately 50 km west of the Project footprint, within the Community Services RAA, Community Infrastructure RAA, and Economy RAA (see Figure 3.9-2).

In addition, several reasonably foreseeable oil and gas developments, specifically facilities, are identified within the proposed Project expansion assessment areas (see Table 3.9-2 and Figure 3.9-2). No other reasonably foreseeable oil and gas developments, such as pipelines and wells, were identified within the assessment boundaries for the proposed Project expansion (IHS 2019a, 2019b, 2019c).

The oil and gas companies listed in Section 3.9.1.2 with currently operating activities are expected to continue operations and maintenance activities, which will potentially interact temporally with the construction and operations phases of the proposed Project expansion. Some of these companies also have proposed oil and gas activities within the spatial boundaries of the proposed Project expansion. Although the development schedules for these projects are unknown, many are of limited scope and short anticipated construction times and, therefore, for the purposes of the cumulative effects assessment, it was assumed that most would be constructed prior to construction of the proposed Project expansion but ongoing operations and maintenance activities could interact with those of the proposed Project expansion. Other reasonably foreseeable activities in the proposed Project expansion assessment areas that are not listed in Table 3.9-2 may include ongoing oil and gas exploration, as well as upgrades and maintenance activities.

Table 3.9-2. Number of Reasonably Foreseeable Oil and Gas Pipelines, Wells, and Facilities Identified Within the Spatial Boundaries of the Proposed Project Expansion

Development Type	Spatial Boundary[a]					
	Terrain and Soils RAA, Terrestrial Vegetation RAA (1-km Assessment Area)	Wildlife and Wildlife Habitat RAA, Acoustic Environment RAA, Land and Resource Use RAA (5-km Assessment Area)	Air Quality RAA (10 km Assessment Area)	Cultural and Heritage Resources RAA (Borden Block)	Surface Water RAA, Groundwater RAA, Fish and Fish Habitat RAA, Human Health RAA (15-km Assessment Area)	Community Services RAA, Community Infrastructure RAA, Economy RAA (PRRD Electoral Area B)
Pipeline	0	0	3	1	11	412
Facility	0	0	2	1	2	308
Well	0	0	0	0	0	1,031

Source: IHS 2019a, 2019b, 2019c.

[a] Definitions and rationale for proposed Project expansion spatial boundaries are provided for each VC in Sections 4 to 8.

Agriculture

A Regional Agricultural Plan is currently being prepared by the PRRD. The purpose of the plan is to provide guidance to the District for encouraging and supporting agricultural activity both within and outside of the ALR. Guiding principles identified for the Regional Agricultural Plan are to:

- Contain a vision for the future of agriculture that will include a permanent role for agriculture as an essential component of the physical, ecological, social and economic well-being of the PRRD
- Identify changes in farm business management, which could be implemented by farmers or farm organizations
- Identify strategies to enhance agriculture in the context of competition with other land uses such as oil and gas, and forestry and mining (PRRD 2013)

As an increasingly valued resource, agriculture and related activities within the proposed Project expansion assessment areas (as discussed in Section 3.9.1.2) are expected to continue into the future and will act cumulatively with the proposed Project expansion. No specific future developments such as feedlots, meat processing facilities, or agriculture facilities have been identified.

Utilities and Energy Transmission

The BC Hydro Site C Clean Energy project is located approximately 7 km southwest of Fort St. John. The Environmental Impact Statement for the proposed hydroelectric development was submitted to the BC EAO in January 2013, and was approved in December 2014 under a joint provincial-federal panel review. Construction of the project started in summer 2015 and will be completed in 2024. The project consists of the construction and operations of a dam and a 1,100-megawatt (MW) hydroelectric generating station on the Peace River in northeast BC. The project would be the third in a series of dams on the Peace River. Components include an earthfill dam (1,050 m long and 60 m high), up to 1,100-MW generating station and associated structures, an 83-km long reservoir, realignment of four sections of Highway 29 and two 77-km long transmission lines along existing transmission line rights-of-way connecting Site C to Peace Canyon. Approximately 10,200 direct jobs will be created during construction, with 1,600 of those located in northeast BC. Most workers are accommodated at the dam site, with other workers housed offsite and in the region. Approximately 58 direct jobs will be created during operation. The capital cost of the project is estimated at $7.9 billion and construction is anticipated to take 7 to 8 years (BC Hydro, 2018c; Province of BC 2018c). The project was identified in the AAIR; however, it is located outside of the proposed Project expansion assessment area boundaries (see Table 3.9-1 and Figure 3.9-2).

No other reasonably foreseeable utility or energy transmission developments with the potential to interact with the proposed Project expansion were identified within the proposed Project expansion assessment areas. For all proposed Project expansion assessment areas, it is expected that the existing utility and energy transmission activities described in Section 3.9.1.2 will continue into the foreseeable future.

Wind Energy

Aeolis Wind Power Corporation is proposing to construct and operate the Hackney Hills Wind Park, located approximately 100 km west of Fort St. John within the Community Services RAA, Community Infrastructure RAA, and Economy RAA (see Figure 3.9-2). The proposed 380-MW wind energy project is currently in the pre-application stage with the BC EAO (approved Terms of References submitted to the BC EAO in November 2008). Additional information on the project status is limited and the construction schedule could not be determined. Based on a review of available information including the BC EAO EPIC and proponent website (http://aeoliswind.ca/chapter-links/hackney-hills/), the wind project appears to be progressing over a longer regulatory timeline than the proposed Project expansion, where construction is assumed to take place well after proposed Project expansion construction is complete (Aeolis Wind Power Corporation 2018; Province of BC 2018c).

No other reasonably foreseeable wind energy projects were identified within the proposed Project expansion assessment areas.

Mineral Resources

Taseko is proposing to develop the Aley Niobium Project located in northern BC, 140 km north of Mackenzie (see Figure 3.9-2). Niobium is primarily used in the manufacturing of high strength, light-weight, and corrosion resistant steel found in turbines, aerospace and automobile machinery, and oil and gas pipelines, among other end-products. The site covers approximately 433 square km and consists of 104 mineral claims. With a capital cost of $870 million, the mine is expected to produce 9 million kg of niobium per year over a 24-year mine life. The project is currently in the pre-application stage with the BC EAO (Project Description accepted in September 2014). In November 2014, the Federal Minister of the Environment approved Substitution under the *CEA Act, 2012* to the Province of BC. Additional information on the project status is limited and the construction schedule could not be determined. Based on a review of available information including the BC EAO EPIC and proponent website (https://www.tasekomines.com/properties/aley), the mining project appears to be progressing over a longer regulatory timeline than the proposed Project expansion, where construction is assumed to take place well after proposed Project expansion construction is complete (Taseko 2018; Province of BC 2018c).

In March 2017 AuRico Metals Inc. (AuRico) was issued an EAC (#M17-01) to construct and operate the Kemess Underground Project, an underground copper-gold mine with an average production of approximately 24,650 tonnes of ore per day over a 13-year mine life. Kemess Underground is located approximately 250 km north of Smithers, and 430 km northwest of Prince George in the PRRD, and is approximately 6 km north of the existing infrastructure from the past-producing Kemess South mine (BC EAO 2018a). It is approximately 340 km from the Project footprint and is within the Community Services RAA, Community Infrastructure RAA, and Economy RAA (see Figure 3.9-2). Construction on the AuRico Kemess Underground Project began in 2018, and the mine is expected to be operational by 2022 (Clarke et al. 2019).

No other reasonably foreseeable mineral resource developments were identified within the proposed Project expansion assessment areas.

Recreation and Tourism

No reasonably foreseeable recreation and tourism developments with the potential to interact with the proposed Project expansion were identified within the proposed Project expansion assessment areas. For all proposed Project expansion assessment areas, it is expected that the existing recreation and tourism activities described in Section 3.9.1.2 will continue into the foreseeable future.

Settlement and Rural and Urban Development

The Station 44 Town Centre is a proposed $500 million (phase I only) mixed development project that comprises 220 acres located on the Alaska Highway near Fort St. John. The project includes a power centre with big box stores over 80 acres. A hotel, truck centre and mixed density residential units will comprise the remainder of the development. Estimated completion of the entire project is forecasted for Q4 2023 (Province of BC 2018b).

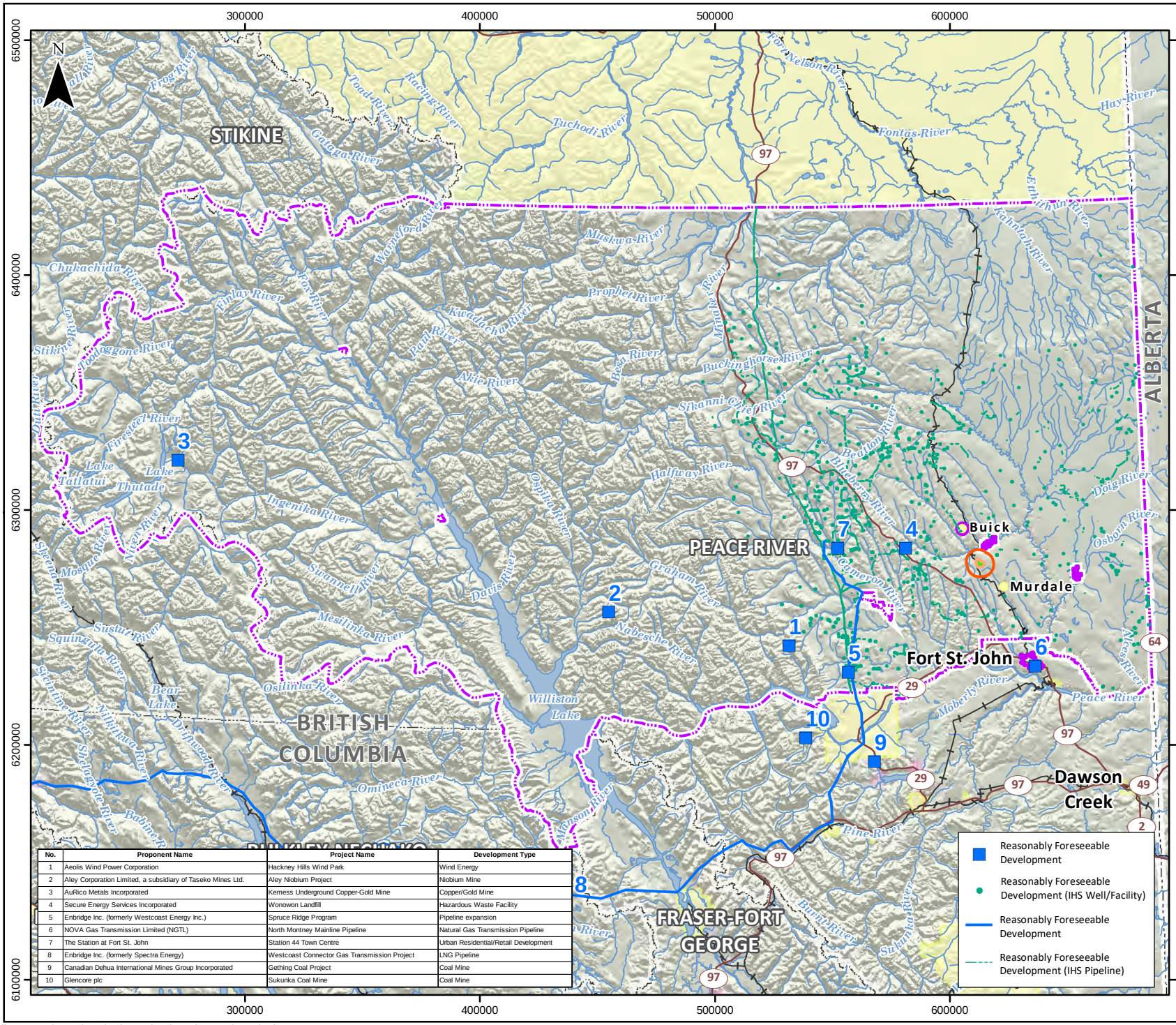
Secure Energy Services Inc. submitted a project description to the BC EAO for the proposed Wonowon Landfill in December 2018, and the BC EAO issued an order under Section 10(1)(c) of the *EA Act* on January 18, 2019, stating the project requires an EAC and may not proceed without an assessment (BC EAO 2019b). The proposed landfill would be located on Crown land approximately 9 km southeast of the community of Wonowon in the PRRD, approximately 32 km from the Project footprint and within the Community Services RAA, Community Infrastructure RAA, and Economy RAA (see Figure 3.9-2). The proposed landfill is being developed to meet existing and increasing industry demand from oilfield and industrial waste generators in northeast BC. The proposed landfill would be designed to accept contaminated soils from spill clean-ups and site remediation, drilling waste from oil and gas exploration

and production, industrial waste, and forestry waste (Secure Energy Services Inc. 2018). Since the Wonowon Landfill project is only in the early stages of the Environmental Assessment process, it is not anticipated that proposed Project expansion construction will overlap with the construction of the Wonowon Landfill, however, it can be expected that future operational activities at both the proposed Project expansion and the Wonowon Landfill will temporally overlap.

No other reasonably foreseeable settlements and rural/urban developments with the potential to interact with the proposed Project expansion were identified within the proposed Project expansion assessment areas. For all proposed Project expansion assessment areas, it is expected that the existing settlement and rural and urban development activities described in Section 3.9.1.2 will continue into the foreseeable future.

Transportation and Infrastructure

Current and reasonably foreseeable transportation activities within the proposed Project expansion assessment areas include regular and commercial vehicle traffic and rail traffic, as well as maintenance and upgrade activity on roads, bridges, and highways. No other reasonably foreseeable transportation projects with potential to interact with the proposed Project expansion were identified within the proposed Project expansion assessment areas.



No.	Proponent Name	Project Name	Development Type
1	Aeolis Wind Power Corporation	Hackney Hills Wind Park	Wind Energy
2	Aley Corporation Limited, a subsidiary of Taseko Mines Ltd.	Aley Niobium Project	Niobium Mine
3	AuRico Metals Incorporated	Kemess Underground Copper-Gold Mine	Copper/Gold Mine
4	Secure Energy Services Incorporated	Wonowon Landfill	Hazardous Waste Facility
5	Enbridge Inc. (formerly Westcoast Energy Inc.)	Spruce Ridge Program	Pipeline expansion
6	NOVA Gas Transmission Limited (NGTL)	North Montney Mainline Pipeline	Natural Gas Transmission Pipeline
7	The Station at Fort St. John	Station 44 Town Centre	Urban Residential/Retail Development
8	Enbridge Inc. (formerly Spectra Energy)	Westcoast Connector Gas Transmission Project	LNG Pipeline
9	Canadian Dehua International Mines Group Incorporated	Gething Coal Project	Coal Mine
10	Glencore plc	Sukunka Coal Mine	Coal Mine

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FIGURE 3.9-2

REASONABLY FORESEEABLE DEVELOPMENTS IN THE PROPOSED PROJECT EXPANSION ASSESSMENT AREA BOUNDARIES

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Hamlet/Town/Village
- 892 Highway
- Railway
- Watercourse
- Project Footprint
- 1km Assessment Area
- 5km Assessment Area
- Community Services LAA, Community Infrastructure LAA and Economy LAA
- Community Services RAA, Community Infrastructure RAA and Economy RAA
- Water Body
- City/Town/Village
- BC Regional District Boundary
- Indian Reserve/First Nation Settlement

SCALE: 1:2,245,000

0 25 50 75
Kilometres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Hillshade: TERA 2008; Grid: TERA 2010; Roads: NRCan 2014; Railways: NRCan 2012; Hydrography: CanVec 2019; Regional Districts: BC MFLNRO 2007, Electoral Areas: Statistics Canada 2016 © Minister of Industry, 2016, City/Town/Villages: C MFLNRO 2007; Indian Reserves: Government of Canada 2015

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3.9.2 Determining the Need for a Cumulative Effects Assessment

The cumulative effects assessment was conducted in accordance with the AAIR for the proposed Project expansion and with BC EAO guidance which is consistent with evolving best practice and the federal approach under the *CEA Act, 2012* (BC EAO 2013). The guidance provided by the BC EAO states that the assessment of cumulative adverse effects is to be completed for VCs where potential residual adverse effects are evaluated as likely to occur and will interact with effects of past, present or reasonably foreseeable projects or activities.

According to BC EAO (2013) guidance, only those VCs that will be directly affected by the proposed Project expansion, as well as other projects or activities, need to be included in the Project-specific cumulative effects assessment.

The cumulative effects assessment evaluates the potential residual adverse effects predicted to result from the proposed Project expansion (as identified in Part B, Sections 4 to 8) in combination with the likely residual adverse effects arising from other projects and activities that have been or will be carried out in the VC-specific LAA or RAA. Reasonably foreseeable projects considered in the assessment do not include proposed or hypothetical projects where formal plans have not been disclosed.

For potential residual adverse effects that do not have an interaction with effects of past, present and reasonably foreseeable activities, an evaluation of significance was not conducted in the cumulative effects section.

3.9.3 Cumulative Effects Assessment Methodology

The cumulative effects assessment of the proposed Project expansion entailed the following steps:

- Determination of spatial and temporal boundaries for each VC where potential residual adverse effects have been identified for the proposed Project expansion.
- Identification of potential residual adverse effects of the proposed Project expansion that may interact with effects of past, present and reasonably foreseeable activities.
- Identification of past, present and reasonably foreseeable projects and activities with potential residual adverse effects that may act in combination with the potential residual adverse effects of the proposed Project expansion.
- Identification of potential cumulative adverse effects.
- Development, if warranted, of additional technically and economically practical mitigation measures.
- Identification of any potential residual adverse cumulative effects.
- Determination of the significance of the proposed Project expansion’s contribution to the potential residual cumulative adverse effects.

If an environmental, social, economic, heritage or health VC evaluated in the effects assessment had no residual adverse effects predicted, then no further analysis of that VC is required in the cumulative effects assessment. The potential residual adverse effects that were not considered to be likely in the Project-specific effects assessment did not form a part of the cumulative effects assessment.

3.9.4 Identification of Residual Effects of the Proposed Project Expansion

Potential residual adverse effects identified in Part B, Sections 4 to 8 that were considered likely to occur and were determined to have the potential to interact with past, present and reasonably foreseeable projects or activities have been evaluated for potential cumulative adverse effects. A rationale will be provided for likely potential residual adverse effects that were determined not to interact with reasonably foreseeable projects or activities and, therefore, did not form a part of the cumulative effects assessment.

3.9.5 Spatial and Temporal Boundaries

3.9.5.1 Spatial Boundaries

The spatial boundaries used in the cumulative effects assessment for the proposed Project expansion were determined to be the areas where potential cumulative adverse effects have been identified. The spatial boundaries for each VC as well as the rationale for the boundaries are presented in the respective subsection for each VC in Part B, Sections 4 to 8.

Spatial boundaries were designed to include the largest RAA for all VCs in order to determine whether existing activities and projects were to be included in the cumulative effects assessment. The following outlines the criteria for screening projects and activities for the cumulative effects assessment:

- A project or activity was included if it is within the RAA for the VC
- A project or activity was excluded if it was outside the RAA for the VC

3.9.5.2 Temporal Boundary

A project or activity was included if it was in the provincial or federal Environmental Assessment regulatory process or otherwise reasonably expected to proceed (for example, logging).

A project or activity was excluded from the inclusion list of reasonably foreseeable projects or activities and included as existing disturbance if it was known that it will be in development or operation prior to construction of the proposed Project expansion.

3.9.6 Identification of Cumulative Effects Mitigation Measures

Section 3.5 provides information on mitigation that is implemented to reduce the impact of any residual effects which may occur including the reduction of the magnitude of the effect, the limitation of the extent of the effect and the shortening of the reversibility of the effect (that is, time to alleviate the residual effect).

In order to ensure that potential cumulative adverse effects are reduced during construction and operations of the proposed Project expansion, additional mitigation measures are provided, where warranted.

3.9.7 Characterization of Residual Cumulative Effects

The characterization of residual cumulative adverse effects is determined in a manner similar to that employed in the characterization of potential residual adverse effects as previously outlined in Section 3.6.

3.9.8 Significance of Cumulative Effects

The significance of the proposed Project expansion's contribution to cumulative adverse effects is determined in the manner used to determine the significance of residual adverse effects as previously outlined in Section 3.7 and summarized in Table 3.6-1, with the exception of spatial and temporal boundaries, which are discussed in Section 3.9.5.

3.10 Follow-up Strategy

Where a residual adverse effect and/or cumulative effect has been identified for a specific VC, the Application will include a description of a follow-up strategy, where appropriate, that:

- Identifies the measures to evaluate the accuracy of the original effects prediction
- Identifies the measures to evaluate the effectiveness of proposed mitigation measures
- Proposes an appropriate strategy to apply in the event that original predictions of effects and mitigation effectiveness are not as expected. This includes reference to further mitigation, involvement of key stakeholders, Aboriginal groups, government agencies and any other measures deemed necessary to manage the issue

4. Environmental Effects Assessment

This section of the Application presents the assessment of the potential adverse effects of the proposed Project expansion on the environmental VCs during the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion.

The following subsections explain the selection process for each of the environmental VCs, the associated subcomponents, and the KIs. The assessment boundaries for each VC are described and existing conditions are summarized, including the results of field studies, where applicable. The potential adverse effects of the proposed Project expansion on each of the VCs have been identified, as measured with reference to the KIs. Proposed measures to mitigate the potential adverse effects on the VCs are also identified. Any residual adverse effects on the VCs have been characterized using the criteria set out in Section 3 of the AAIR and a determination of significance has been made. Any cumulative adverse effects likely to result from the residual adverse effects of the proposed Project expansion interacting with the residual adverse effects of past, present, and reasonably foreseeable developments have also been assessed.

4.1 Terrain and Soils

Table 4.1-1 shows the subcomponents and KIs for the Terrain and Soils VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.1-1. Terrain and Soils Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Terrain • Soils	• Soil quality • Erosion	• *Guideline for the Selection of Valued Components and Assessment of Potential Effects* (BC EAO 2013), *Secure Landfills Common Issues and Commitments Report* (BC EAO 2009), and the original Silverberry Secure Landfill PAC Application (CCS 2002). • Leaching of materials from the waste collected into salvaged soil can impact soil quality which affects health and water quality, as well as soil productivity and reclamation suitability of the salvaged material. • Potential impacts to soils include loss or mixing of topsoil and subsoil during construction and closure activities, loss of stockpiled soil through wind and/or water erosion, and contamination during construction and operations. • Accelerated erosion from precipitation and surface water runoff can reduce soil productivity impacting vegetation growth and hydrologic characteristics.

4.1.1 Assessment Boundaries

The following assessment boundaries have been defined for the Terrain and Soils VC.

4.1.1.1 Spatial Boundaries

The spatial boundaries for the Terrain and Soils VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint, as well as the following:

- LAA (same as Project footprint): As potential proposed Project expansion effects are expected to take place on the Project footprint and not extend past it, the area of direct proposed Project expansion effects (that is, the LAA) is the Project footprint.
- RAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities: The RAA is the area in which cumulative effects to soils or terrain could occur (that is, proposed Project expansion effects in combination with the effects of existing or reasonably foreseeable future projects). As the proposed Project expansion site is

located in relatively flat terrain, potential cumulative effects to soil quality or erosion would not travel past 1 km.

4.1.1.2 Temporal Boundaries

The temporal boundaries identified for the Terrain and Soils VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.1.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Terrain and Soils VC.

4.1.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Terrain and Soils VC. Information on existing conditions was based on a desktop review, site investigations, and field data collection, including results of soil sampling activities conducted for the proposed Project. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on terrain and soils are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review and available field data, meant that there was a complete technical understanding for conducting the assessment.

4.1.2 Existing Conditions

The following methods of data collection were used to describe the existing conditions for the Terrain and Soils VC:

- Desktop review of provincial and regional information sources
- Hydrogeologic Siting Suitability Investigation (Clifton 2002) (Appendix 5)
- Site investigations and field data collection efforts, including results of soil sampling activities (Appendix 1)
- *Field Manual for Describing Terrestrial Ecosystems*, 2nd Edition (BC MOFR and BC MOE 2010)
- CCME's Environmental Quality Guidelines (CCME 2014) and BC's CSR

Data from these sources provide an appropriate baseline for assessing the effects of the Project on terrain and soils. The Hydrogeological Siting Suitability Investigation (Clifton 2002) provides information on existing soil and topography conditions for the footprint. Although conducted in 2002, it is not anticipated that soil and topography conditions will have changed since the surface of the Project footprint has not been disturbed by the development of the existing landfill. Site investigations, including soil sampling conducted and analysed in 2016 (Appendix 1), provide updated information about soil quality in

the Surface Water Drainage Area (SWDA) and the PDMA of the existing landfill. While not specific to the Project footprint, this data provides information regarding soil conditions for a landfill facility similar to the Project.

4.1.2.1 Environmental Context

The proposed Project expansion is located within the Halfway Plateau Ecosection of the Central Alberta Upland Ecoregion of Canada (Ecological Stratification Working Group 1995) and is not in an area that is subject to permafrost formation (NRCan 1995).

The proposed Project expansion is located in the Boreal White and Black Spruce (BWBS) Biogeoclimatic (BGC) Zone of BC, within the moist, warm subzone (BWBSmw). The BWBS BGC Zone generally experiences long, very cold winters and short growing seasons. The regional climate in the BWBSmw subzone is relatively moist and warm, with a comparatively longer growing season than the dry cool (dk) and wet cool (wk) subzone variants. The forests in the BWBSmw subzone are dominated by white spruce or aspen, and soils are primarily fine-textured Gray Luvisols with some Brunisols (DeLong et al. 1991).

The proposed Project expansion is underlain by flat-lying sedimentary rock of the Upper Cretaceous Dunvegan Formation (BC Geological Survey 2018; Church and Ryder 2010). The Dunvegan Formation is composed of light grey to yellow-grey sandstone interbedded with laminated siltstone and dark grey shale (Prior et al. 2013). The primary soil parent material is glacial till and fine-textured Gray Luvisols are the dominant soil group (Church and Ryder 2010).

4.1.2.2 Agricultural Land Reserve

The proposed Project expansion is located within the ALR in Zone 2 (ALC 2014b). The agricultural capability of the land in the Terrain and Soils RAA (that is, a 1-km radius from the Project footprint) is rated predominantly as Class 6, with some inclusions of land rated as Class 4 and Class 5 (BC MECCS 2018). Lands rated as Class 6 are considered nonarable but are capable of producing native and/or uncultivated perennial forage crops; lands rated as Class 5 have limitations that restrict their capability to producing perennial forage crops or other specially adapted crops; and, lands rated as Class 4 have limitations that require special management practices or severely restrict the range of crops, or both. Limitations on soil capability for agriculture in this area include adverse climate and cumulative, minor adverse conditions (ALC 2013).

The proposed Project expansion will be constructed within Tervita's existing property boundaries on land that is zoned for "Oil and Gas Production" under the PRRD Zoning By-law No. 1000. The land in the Project footprint was approved by the ALC for nonfarm use under the *Agricultural Land Reserve Use, Subdivision, and Procedure Regulation* (BC Reg. 171/2002) on June 3, 2016. The operational permit for the existing landfill requires that postclosure, the end land use be returned to agriculture.

4.1.2.3 Soil Quality

The BC *EMA* (S.B.C. 2003, c. 53) is the primary statute regulating contaminated sites in the Province. According to the *Act*, a site is contaminated if "*the concentration of any substance in soil, groundwater or surface water at the site is greater than or equal to the lowest value of the applicable numerical standard corresponding to the site's use*". Standards for contaminated sites are found in the schedules attached to the CSR. Soil standard values are calculated for five generically defined land uses: agricultural (AL), wildland (WL), urban park (PL), residential (RL), commercial (CL), and industrial (IL). The standard applicable to a particular site will vary according to the site's primary land and water uses. The existing landfill has an industrial use (IL) designation and is surrounded by areas of undeveloped forest supporting natural ecosystems. As the landfill is located within the ALR, the existing operational permit requires that postclosure, the end land use be returned to agriculture (AL).

A soil study (see Appendix 1) was completed to determine how soil quality has been affected by the existing landfill and identify the existing conditions for the proposed Project expansion. There were two areas that were subject to soil sampling investigations. A SWDA located in the northwest corner of the

existing landfill site and a PDMA encompassing areas to the south and southwest of the existing landfill, based on prevailing winds and estimates of area of potential distribution. Figure 4.1-1 provides an overview of the SWDA and PDMA in relation to the Project footprint.

The SWDA drains northwest towards an ephemeral stream located approximately 100 m north of the existing landfill's stormwater retention pond. The SWDA soil sampling investigation assessed the concentration and distribution of potential impact in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the ephemeral stream. Ten soil sampling locations were selected in the field, with eight sampling locations located within the fence line of the existing landfill, and two located within undisturbed native areas offsite.

The PDMA soil sampling investigation assessed the concentration and distribution of potential impact in surficial soils resulting from airborne PM originating from site-related activities. Six sample locations were selected within 200 m upwind and downwind from the existing landfill. Four sample locations were within the fence line of the existing landfill and two were located offsite in undisturbed native areas.

The results of the laboratory analysis of the soil samples were compared to both agricultural (AL) and industrial (IL) use standards under the CSR, in consideration of both the current and end land use. A detailed description of the sampling methodology, soil parameters, and laboratory analytical results is provided in the Soil Sampling Report (Appendix 1). The CSR soils standards have changed from what they were when the soil sampling and analysis was completed in 2016. As such, these results were re-evaluated.

The updated analysis for the soil samples taken within the SWDA indicates that concentrations of all metals parameters in all submitted samples were found to be less than applicable CSR IL or AL standards or BC MECCS Protocol 4 background concentrations at all locations with the exception of:

- **Arsenic**: All samples collected at onsite locations contained concentrations greater than current (IL) and future (AL) land use CSR standards. At offsite locations, one sample contained concentrations greater than AL land use CSR standards and one sample contained concentrations less than applicable CSR standards.
- **Barium**: With the exception of three samples, all onsite samples contained concentrations greater than current (IL) and future (AL) land use CSR standards. All offsite concentrations were less than applicable CSR standards.
- **Beryllium**: All samples collected onsite contain concentrations less than applicable CSR standards, with the exception of five samples, all of which exceeded both current (IL) and future (AL) land use CSR standards. At offsite locations, only one sample exceeded AL land use CSR standards.
- **Mercury**: All samples collected onsite, with the exception of one sample, contained concentrations greater than BC MECCS Protocol 4 Background concentrations, but less than applicable current (IL) and future (AL) future land use CSR standards. All offsite samples contained concentrations less than applicable AL land use CSR standards.
- **Molybdenum**: All samples collected at both onsite and offsite locations contained concentrations greater than BC MECCS Protocol 4 Background concentrations, but less than all other applicable current (IL) and future (AL) land use CSR standards.
- **Selenium**: Four samples at onsite locations contained concentrations greater than current (IL) and future (AL) land use standards. All other onsite samples, as well as offsite samples were less than current (IL) and future (AL) land use standards.

The updated analysis for the soil samples taken within the PDMA indicates that concentrations of all metals parameters in all submitted samples were found to be less than applicable CSR IL or AL standards or BC MECCS Protocol 4 background concentrations at all locations with the exception of:

- **Arsenic**: All samples collected onsite contained concentrations greater than current (IL) land use standards, as well as future (AL) land use standards. Of the samples collected offsite, three samples exceeded AL land use standards.

- **Barium**: All samples collected at onsite locations contained concentrations greater than current (IL) and future (AL) land use standards. Two samples also exceeded BC MECCS Protocol 4 Background concentrations. All samples collected offsite contained concentrations less than applicable AL land use standards.
- **Mercury**: All samples collected on and offsite contained concentrations greater than BC MECCS Protocol 4 Background concentrations, but less than applicable current (IL) and future (AL) land use CSR standards.
- **Molybdenum**: All samples collected at both onsite and offsite locations contained concentrations greater than BC MECCS Protocol 4 Background concentrations, but less than all other applicable current (IL) and future (AL) land use CSR standards.

The results presented above indicate there are exceedances of metal parameters both onsite (within the fenceline) and offsite (outside the fenceline) associated with the SWDA and PDMA. Further investigation of the sources of the exceedances will occur and additional mitigation measures will be developed, if warranted. Tervita will share the results of the investigation with DRFN, and plans for additional mitigation, as warranted. Further soil sampling and analysis would be required at the time of closure/reclamation in order to identify areas requiring remediation.

4.1.2.4 Erosion

Coarse-textured soils are less resilient than medium or fine-textured soils to wind erosion, the loosely consolidated particles make them susceptible to the influence of the wind, especially in dry conditions, whereas finer textured soils are more cohesive (Manitoba Agriculture 2018). Conversely, medium to fine-textured soils are less resilient than coarse-textured soils to water erosion since the smaller pore size between particles does not allow as much water infiltration (that is, water running over finer-textured soils is more likely to cause erosion than in coarse-textured soils that more readily take in water). However, with water erosion, slope is an important consideration, as soils on slopes are more readily eroded than soils on level terrain (Manitoba Agriculture 2018).

The existing landfill and proposed Project expansion are located on relatively flat terrain. The lithology of the soil samples from the SWDA and PDMA show that the soils within the Project footprint and Terrain and Soils RAA are generally composed of a topsoil horizon underlain by a clay and silty clay layer with trace amounts of fine sand and gravel. The fine texture of the soils means they are more resilient to wind erosion, but more susceptible to water erosion, than coarse-textured soils.

4.1.3 Traditional Knowledge Shared

In their review during the screening of the Application, DRFN expressed concerns about exceedances in soil concentrations for arsenic, barium, molybdenum, and mercury that were recorded outside the fence line, and requested that the sources of exceedances be investigated and that additional mitigation measures be included to address these effects. To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, no traditional knowledge related to terrain and soils has been shared by BRFN.

TERVITA
EARTH MATTERS

October 2019

FIGURE 4.1-1

OVERVIEW OF SURFACE WATER DRAINAGE AREA AND POTENTIAL DUST MIGRATION AREA

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Resource Road
- Road
- Railway
- Watercourse
- Project Footprint
- Surface Water Drainage Area
- Potential Dust Migration Area

SCALE: 1:20,000

0 150 300 450

Metres

(All Locations Approximate)

JACOBS

UTM Zone 10N
Road: NRCan 2015; Railway: NRCan 2012;
Hydrography: BC FLNRO 2008;
Project Footprint: Tervita 2016;
Surface Water Drainage,
Potential Dust Migration Areas: CH2M 2016;
Grid: TERA 2010; Imagery: DigitalGlobe 2015.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

Mapped By: DR | Checked By: NP

\\Jacobs.com\common\Shares\CNR\gis_proj2\VECA\661198\MAP_FILES\REPORT\EAC\661198_Report_EAC_Figure4_1_1_SurfaceWaterDrainageArea_PotentialDustMigrationArea_Rev0.mxd

4.1.4 Terrain and Soils Effects Assessment

4.1.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification of the potential effects of the proposed Project expansion on the Terrain and Soils VC is based on the results of the soils assessment performed for the proposed Project expansion. The soils assessment included a desktop review and field studies (see Appendix 1, Soil Sampling Report).

The proposed Project expansion is anticipated to interact with the Terrain and Soils VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Leachate management, stormwater management, and ongoing monitoring
- Cell capping
- Postclosure maintenance and monitoring

Table 4.1-2 identifies the potential effects of the proposed Project expansion on the Terrain and Soils VC, as well as mitigation measures and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. These mitigation measures focus on minimization, except for restoration measures that would be implemented if erosion occurs. As the majority of these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on the Terrain and Soils VC. The seeding measures, as well as those mitigation measures involving inspections, require a time lag before they function effectively in preventing erosion.

Mitigation measures for potential adverse effects on terrain and soils are generally described as having high effectiveness with BMPs and technologies that are widely used in various industries and that are considered to be effective at reducing erosion and reclaiming the landscape. These mitigation measures are also observed to be highly effective at the existing landfill.

In addition to the summary of mitigation provided below, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

The landfill is designed to eliminate the pathway to effects on soil quality. The impermeable liner prevents waste from interacting with soil and thus avoids soil contamination directly through contact with waste. Pathways to changes in soil quality as a result of transportation of contaminants via air and surface water are discussed in Section 4.2 and Section 4.4, respectively. While soil sampling results indicate that there are elevated levels of metal parameters in soils both onsite and offsite that are associated with the SWDA and PDMA of the existing facility, it is not clear whether these exceedances are due to the existing landfill, naturally occurring elevated levels of these elements, or the historic presence of other activities in that location. Further investigation of the sources of the exceedances will occur and additional mitigation measures to prevent effects on soil quality will be developed, if warranted. Since the landfill is designed to eliminate the pathway to effects on soil quality, soil quality is not expected to be affected, unless there is an accidental release or spill of contaminants during proposed Project expansion activities. Potential effects from accidental release or spill of contaminants are assessed in the Accidents and Malfunctions Section (Section 9). If soil sampling is required during closure or reclamation and postclosure phases, Tervita will conduct sampling accordingly.

Table 4.1-2. Terrain and Soils – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure/Reclamation	Loss of surface soil material through wind or water erosion	Project footprint	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Minimization	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion.	Minimization	During all Project phases	High	
			• Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under the following conditions: – Wet or frozen field conditions will result in the admixing, degradation or compaction of topsoil or subsoil – High wind velocities create the potential for the loss of topsoil or subsoil – Any other field conditions will result in the admixing, degradation or loss of topsoil or subsoil	Minimization	Immediate	High	
			• Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event.	Minimization	During all Project phases	High	
			• Erosion occurring on surface water control works will be repaired and mitigated as soon as possible.	Restoration	Immediate	High	
			• Mitigation measures to prevent surface water erosion may include swales, hay bales, rock rip-rap, and/or coconut matting. High erosion areas in ditches may be armored with LLPDE.	Restoration	Immediate	High	
			• The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to provide vegetation cover to minimize erosion.	Minimization	During all Project phases	High	
			• The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible.	Restoration	During all Project phases	High	
			• An Erosion and Sediment Control Plan will be implemented to prevent erosion (see Section 13.1 for summary).	Minimization	During all Project phases	High	
			• A Soil Conservation Plan will be implemented to avoid or reduce potential loss of surface soil material through wind or water erosion (see Section 13.2 for summary).	Minimization	During all Project phases	High	
			• A Dust and Odour Control Plan will be implemented to prevent conditions conductive to dust generation and to suppress dust (see Section 13.9 for summary).	Minimization	Immediate	High	
	Reduction in soil productivity due to loss or mixing of topsoil and subsoil		• Topsoil and subsoil will be stockpiled and re-used for site reclamation. Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under wet or frozen field conditions which can result in the admixing, degradation or compaction of topsoil or subsoil.	Minimization	Construction	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Implement two-lift soil handling for topsoil salvage. In this process, the topsoil material is stripped in the first lift and stored onsite for replacement after the life of the Project. The second lift includes all of the remaining subsoil material.	Minimization	Construction	High	
			• Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion.	Minimization	During all Project phases	High	
			• Maintain an adequate separation between topsoil and subsoil piles.	Minimization	Immediate	High	
			• Replace the topsoil and subsoil in the same manner as it was excavated, avoiding admixing of soils.	Minimization	Immediate	High	

Table 4.1-2. Terrain and Soils – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure/Reclamation (cont'd)	See above	See above	• A Soil Conservation Plan will be implemented to avoid or reduce potential reduction in soil productivity (see Section 13.2 for summary).	Minimization	During all Project phases	High	See above

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (On-site): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC. Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

Note:

LLPDE = Low Density Polyethylene

4.1.4.2 Characterization and Significance of Potential Residual Effects

Construction, operations, closure, and postclosure activities have the potential to effect soil erosion through the loss of surface soil material through wind or water erosion. The construction of the landfill using a phased approach will minimize the disturbed and potentially exposed areas at any given time. Topsoil stockpiles will be contoured, stabilized, and seeded to prevent soil loss by wind and water erosion, and if necessary, stockpiles will be wetted to prevent wind erosion. Surface water works will be inspected weekly and, if necessary, additional mitigation measures such as swale, hay bales, rock, riprap, or coconut matting will be utilized to ensure that soil erosion does not occur. During closure, the final slopes of the landfill cap will not exceed 33 percent and will be seeded as soon as possible to reduce soil erosion. With the implementation of these mitigation measures and the other mitigation measures identified in Table 4.1-2, no residual effects on soil erosion are anticipated; therefore, a characterization of significance of residual effects is not warranted.

Construction, operations, closure, and postclosure activities have the potential to effect soil erosion through a reduction in soil productivity due to loss or mixing of topsoil and subsoil. Tervita will stockpile topsoil and subsoil and re-use these stockpiles for site reclamation. Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under wet or frozen field conditions, which can result in the admixing, degradation, or compaction of topsoil or subsoil. Topsoil stockpiles will be contoured, stabilized, and seeded to prevent soil loss by wind and water erosion, and if necessary, stockpiles will be wetted to prevent wind erosion. During reclamation activities, topsoil and subsoil will be replaced in the same manner as it was excavated avoiding admixing of soils. With the implementation of the mitigation measures identified in Table 4.1-2, no residual effects on soil erosion are anticipated; therefore, a characterization of significance of residual effects is not warranted.

4.1.4.3 Cumulative Effects Assessment

No residual effects have been identified for the Terrain and Soils VC, therefore, a cumulative effects assessment is not required.

4.1.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. As discussed in Section 4.1.4.1 and 4.1.4.3, there are no residual or cumulative effects identified for the Terrain and Soils VC, therefore, a follow-up strategy is not required.

4.2 Air Quality

Table 4.2-1 shows the subcomponents and KIs for the Air Quality VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.2-1. Air Quality Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Dust • Odours • Emissions from combustion • Fugitive emissions • Emissions from other sources, (for example, volatilization)	• Visible dust • Detectable odour at sensitive receptors • Ambient air concentrations of PM, SO_2, NO_x, and other landfill gases • VOCs • GHG emissions	• BC EAO Guidelines and original EAC Application. • Criteria contaminant (PM, SO_2, and NO_x) emissions from emissions of construction, operation and closure, equipment tailpipes, and roadway travel can affect health and wildlife. • Vehicle traffic from the proposed Project expansion will produce small amounts of GHGs, which can cumulatively lead to complex environmental effects.

Table 4.2-1. Air Quality Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
See above	See above	• Perception of odour and dust from construction equipment and wind erosion can affect the ability to use the surrounding environment, such as for traditional purposes. Due to the nature of the landfill materials, landfill gas generation is expected to be minimal. Roads are watered during construction to control dust emissions. • Dust from construction material handling and earth grading can affect terrestrial vegetation and human health. NORM may be contained in dust. Construction material is wetted during handling to suppress dust.

Note:

SO_2 = sulphur dioxide

4.2.1 Assessment Boundaries

The following assessment boundaries have been defined for the Air Quality VC.

4.2.1.1 Spatial Boundaries

The spatial boundaries for the Air Quality VC are shown on Figure 3.2-2 and include the Project footprint as well as:

- RAA – A 10-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

This spatial boundary includes the area in which air emissions associated with the proposed Project expansion are likely to be detectable. The RAA includes consideration of impacts of Project emissions in proximity to the sources (that is, “local” effects) and possible impacts further downwind due to transport and dispersion. Also, the RAA includes the area where direct and indirect influences from other activities could overlap with Project-specific effects from construction and operations and cause cumulative effects on air quality. The expected contaminants of concern for the proposed Project expansion are primarily fugitive dust emissions (PM), and (to a lesser extent) various minor combustion tailpipe emissions. The Air Quality RAA is expected to be sufficient to capture the area of such low lying releases and potential cumulative interactions with other activities not related to the proposed Project expansion. Although no air modeling is planned for the proposed Project expansion, the extent of the study area is consistent with current BC Air Dispersion Modelling Guidance (BC MOE 2015). Traffic corridors that are potentially affected by dust within the 10-km radius will be captured in the assessment of effects.

The effects of GHG emissions are global in scale and, therefore, no separate study area was defined for GHG emissions.

4.2.1.2 Temporal Boundaries

The temporal boundaries identified for the Air Quality VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading, and compaction; as each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).

- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.2.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Air Quality VC.

4.2.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Air Quality VC.

4.2.2 Existing Conditions

The following methods of data collection were used to describe the existing conditions for the Air Quality VC:

- Desktop review of BC MECCS and BC Air Monitoring Station data
- Bi-annual monitoring to determine the effect of NORM waste on air quality at the site (Appendix 2)
- Information from data collection efforts for VOCs at the existing landfill (Appendix 2)
- A review of the nature and number of equipment to be used, and review of the nature of landfill waste and likely construction equipment emissions and odours

Data from these sources provide an appropriate baseline for assessing the effects of the proposed Project on air quality. The desktop review of BC MECCS and BC Air Monitoring Station data provides ambient air quality data to inform the assessment. This station is 46 km southeast of the proposed Project and was chosen because it is the nearest station to the proposed Project that measures a comprehensive list of CACs. The concentration data from this monitoring station may be somewhat different than the data expected onsite or near the site due to differences in nearby air emission sources. However, the station is located in the same air zone as the Project site and in a rural community; as such, the concentration data are regarded as being generally representative of the northeast BC area, including the Project Area. Data from NORM monitoring programs and VOC data collection efforts at the existing landfill were used to identify the potential effects pathways with respect to air quality. These data were intended to provide a short-term "snap-shot" or characterization of the possible species of VOCs emitted from the current landfill, and if possible, to measure the concentrations of those species. For this purpose, and aligned with the precautionary principle, the monitoring was completed at a time and location when worst-case emissions were expected. A portable handheld landfill gas analyzer was used to potentially identify areas in the active cell where emissions may be greater than other areas ("hotspots") to help identify possible locations where summa canister samples were subsequently taken (refer to Appendix 2). The samples taken were not intended to be a comprehensive VOC monitoring program, as this was beyond the scope of the study. The data should be considered as representative of the conditions at the site on that particular day and time.

Industrial emission sources (for example, well sites, flare stacks, and gas plants) are present in the region surrounding the existing landfill. With the exception of Tervita's adjacent TRD facility, none are located within 1 km of the existing landfill (CCS 2002; Tervita 2014).

As part of existing operations, onsite air emissions are generated by heavy machinery and one diesel generator, which supplies power to the existing landfill (CCS 2002; Tervita 2014). The Tervita TRD facility has combustion units (one boiler, one treater, and a flare) that emit small amounts of combustion

products. Table 4.2-2 shows the total maximum annual CAC emissions for the TRD combustion equipment at 100-percent load and utilization (Altus Environmental Engineering 2015).

Table 4.2-2. Total Maximum Criteria Air Contaminant Emissions from Treatment, Recovery, and Disposal Facility

NO_x (t/y)	CO (t/y)	PM_{10} and $PM_{2.5}$ (t/y)	VOC (t/y)
5.3	5.1	0.4	0.4

Notes:

CO = carbon monoxide
t/y = tonne(s) per year

Dust from construction material handling and earth grading may contain potential contaminants of concern that could affect human health. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic (Tervita 2014). NORM may be present in dust and could be released in the air when moving vehicles and other equipment over the proposed Project expansion footprint. Tervita conducts air monitoring for NORM activity levels bi-annually to determine if dust being carried in the air has NORM activity levels above regulatory restrictions. The results of air monitoring at the existing landfill, indicate no loose NORM contaminants or evidence of NORM-contaminated dust leaving the property and worker exposure is anticipated to fall within the allowable regulatory guideline limits (see the SLHHRA in Appendix 11).

Due to the waste types present at the landfill (that is, waste materials from the oil and gas industry), minimal landfill gas is generated; however, this material can produce odours and vapours from volatile petroleum hydrocarbons (VPH) present in the waste (CCS 2002; Tervita 2014).

4.2.2.1 Contaminants of Potential Concern

Jacobs investigated the nature of emissions of hydrocarbon-related VOC vapours from landfill wastes at the existing landfill (CH2M 2016a). The intent of the study was to measure the chemical composition of landfill gas emissions at the existing landfill cells. Bitumen or low-density polyurethane caps are in place on closed landfill cells, which limit the release of landfill gases. Therefore, the VOC sampling was conducted on Cell 7, which was active and not capped at the time of sampling. This report is provided in Appendix 2.

The sampling activities were conducted in two phases: the first phase was a survey to identify “worst-case” sampling locations, while the second phase involved sampling using Summa canisters. The preliminary survey was conducted over a grid using a hand-held landfill gas analyser, measuring CH_4, carbon dioxide (CO_2), hydrogen sulphide (H_2S), and CO to potentially identify “hotspots” where emissions may be greatest. No detectable concentrations of CH_4, CO_2, H_2S, or CO were detected during this survey. As a result, the locations for the second phase of sampling were based on the terrain of the landfill cell. Two sampling points at higher elevations were selected for the Summa canister sampling. The results were compared to ambient air guidelines from Alberta and Ontario, as BC MECCS does not have ambient air criteria applicable to the VOCs analysed. Concentrations of VOCs were less than the selected ambient air criteria, except benzene. The concentration of benzene in one sample was equal to the Alberta 1-hour ambient air criterion. The report concludes that considering dispersion and dilution, VOC emissions from the landfill are unlikely to be greater than ambient air criteria at an offsite location.

As part of the existing operations, air emissions are also generated by heavy machinery and one diesel generator which supplies power to the existing landfill (CCS 2002; Tervita 2014). CACs that may be emitted during current operations include NO_x, sulphur oxide gases, and airborne PM, along with minor amounts of VOCs, as discussed previously. Minor quantities of GHGs are also expected to be emitted during all phases of the proposed Project expansion.

4.2.2.2 Ambient Air Quality in the Region

Ambient air quality monitoring data were obtained from the Province of BC Northeast Air Zone dataset to define existing air quality in the RAA. Specifically, data from the Fort St. John – Key Learning Center, Monitor Station ID# E299830 for the year 2016 were downloaded from BC MECCS (BC MECCS 2016a). The station is located at latitude 56.244722, and longitude -120.856111, approximately 46 km southeast of the proposed Project expansion. This station was chosen because it is the nearest station to the proposed Project expansion that measures a comprehensive list of CACs and in relatively close proximity to the proposed Project expansion footprint. Table 4.2-3 summarizes the air quality data.

Table 4.2-3. Summary of Ambient Air Quality in the Project Region – 2016 Data

NO_2	SO_2	O_3	$PM_{2.5}$	PM_{10}	Comments
43.5 ppb[a]	4.9 ppb[b]	57.4 ppb[c]	15.4 µg/m^3 [d]	66.9 µg/m^3 [e]	See footnotes
5.7 ppb	0.32 ppb	NA	5.6 µg/m^3	NA	Average of 24-hour averages (annual)

[a] 98th percentile of maximum daily 1-hour concentrations.

[b] 99th percentile of maximum daily 1-hour concentrations.

[c] 99th percentile of maximum daily 8-hour concentrations.

[d] 98th percentile of daily average concentrations.

[e] Second highest daily average concentration, 7 days of the year 2016 exceeded 50 µg/m^3.

Notes:

µg/m^3 = micrograms per cubic metre
NA = no applicable air quality objective or standard
NO_2 = nitrogen dioxide
O3 = ozone
ppb = part(s) per billion

A summary of BC AAQOs is shown in Table 4.2-4 (BC MECCS 2016b).

Table 4.2-4. Summary of British Columbia Ambient Air Quality Objectives

Contaminant	Averaging Period	Air Quality Objective	
		µg/m^3	ppb
NO_2	1-hour	188	100
	Annual	60	32
O_3	1-hour	160	82
	8-hour	123	63
$PM_{2.5}$	24-hour	25	-
	Annual	8	-
PM_{10}	24-hour	50	-
SO_2	1-hr	183	70
	Annual	13	5
TSP	24-hour	120	-
	Annual	60	-

The ambient air quality in the region, as measured at the Key Learning Center monitoring station, is well below provincial criteria for all contaminants measured. This monitoring station is in central Fort St. John and is likely a conservative estimate of actual air quality concentrations at the proposed Project expansion footprint, which is more remote with fewer nearby emission sources.

4.2.3 Traditional Knowledge Shared

In their comments on the VCs used, BRFN shared that odour from the existing landfill has a profound affect on the experience of the land for community members and leads to avoidance and alienation from lands. To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, DRFN has not provided any traditional knowledge related to air quality.

4.2.4 Air Quality Effects Assessment

4.2.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The proposed Project expansion is anticipated to interact with the Air Quality VC during the following construction, operations, and closure/reclamation activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Air quality and dust dispersion and deposition of contaminants
- Cell capping

Dust from construction material (rock and/or gravel) handling and earth grading may contain contaminants, which could be transported away from the proposed Project expansion. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic (Tervita 2014). Operational restrictions will take place if visible dust clouds are noted by onsite operators. These restrictions could include curtailment or cessation of work under high wind conditions, minimizing drop distances, covering or watering of open stockpiles, rehabilitating completed sections of the landfill as soon as practical, and adhering to posted speed limits onsite. Typically, fugitive dust particles are larger particles that will redeposit to the ground within a few hundred meters of the fugitive dust source. Therefore, total PM concentrations will approach background levels within a localized area. In addition, there is a significant distance to any potentially affected receptors, meaning that there is little potential for offsite dust nuisance. Emissions from construction equipment are expected to be localized and temporary in nature. In addition, Project-related traffic on roads to and from the site may contribute to dust levels. During times when roads are dry and traffic could mobilize dust, mitigation measures such as watering of roads will be implemented in order to minimize dust impacts.

Table 4.2-5 summarizes the details of typical equipment to be used during cell construction. All equipment will adhere to low-emission Tier 4 engine specifications.

Table 4.2-5. Description of Cell Construction Equipment

Equipment Type	Number	Engine Model	Engine Size	Comments
CAT D6T dozers	2	C9.3 ACERT	161-kW net	U.S. EPA Tier 4
CAT 330F L excavators	2	C7.1 ACERT	175-kW net	U.S. EPA Tier 4
CAT 735 C trucks	6	C15 ACERT	329-kW net	U.S. EPA Tier 4
CAT 815K compactors	2	C7.1 ACERT	185-kW net	U.S. EPA Tier 4

Note:

kW = kilowatt(s)

Due to the waste types present at the existing landfill (that is, waste materials from the oil and gas industry), minimal landfill gas is expected to be generated during operations of the proposed Project expansion; however, this material can produce odours and vapours from VPH present in the waste (CCS 2002; Tervita 2014). As discussed above, a preliminary study of landfill emissions was done in 2016 to quantify the nature and concentration of emissions of VOC vapours from the existing landfill (CH2M 2016a). The results show that minor amounts of VOCs are emitted from the existing landfill cells under typical operating conditions. Similar wastes will be accepted at the proposed Project expansion, and VOC emissions are expected to be similar in nature and quantity. Progressive capping of the waste with LLDPE to minimize the open landfill area will reduce odour emissions. Additional mitigation measures outlined in the Dust and Odour Control Plan will be implemented to reduce odour effects of the Project.

The effects of the proposed Project expansion on air quality are assessed qualitatively as emission estimation and modelling of fugitive emissions from sources associated with landfills are very uncertain. Ambient air monitoring will be implemented for postconstruction as warranted to verify or confirm compliance for possible effects to air quality. An Air Quality Monitoring Plan is included as part of the proposed Project expansion's Operations Plan that will be submitted to BC EAO for approval.

Table 4.2-6 summarizes the potential effects related to proposed Project expansion activities, along with mitigation measures, and any potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. Given the nature of equipment and activities associated with the proposed Project expansion with regards to air emissions, avoidance and restoration are not directly applicable; therefore, mitigation measures have focused on minimization. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on air quality.

Moderate effectiveness is expected for measures to reduce idling of equipment and for equipment to use low-sulphur diesel because these measures can practicably be applied to only certain types of equipment (for example, idling is necessary for some equipment to function properly under extreme cold weather). Other mitigation measures described in Table 4.2-6 have high effectiveness as observed at the existing landfill.

Table 4.2-6. Air Quality – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation	Increase in air emissions including dust	RAA	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events.	Minimization	Immediate	High	Increase in air emissions during all phases of the Project
			• Contractor will ensure equipment is well-maintained	Minimization	Immediate	High	
			• Reduce idling of equipment, where possible.	Minimization	Immediate	Moderate	
			• Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized.	Minimization	Immediate	High	
			• Equipment to use low sulphur diesel, as appropriate.	Minimization	Immediate	Moderate	
			• Progressive capping of the waste with LLDPE to minimize the open landfill area	Minimization	Immediate	High	
			• Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan.	Minimization	Immediate	High	
Construction, Operations, Closure/Reclamation	Project contribution to GHG emission levels	International	• The Contractor will ensure equipment is well-maintained.	Minimization	Immediate	High	Increase in GHG emissions during all phases of the Project
			• Reduce idling of equipment, where possible.	Minimization	Immediate	Moderate	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

4.2.4.2 Characterization and Significance of Potential Residual Effects

Residual adverse effects on the Air Quality VC identified in Table 4.2-6 include an increase in air and GHG emissions during construction, operations and closure/reclamation.

Table 4.2-7 provides a summary of the significance evaluation of the residual adverse effects associated with the Air Quality VC during proposed Project expansion activities and considers the probability for significance in the evaluation as outlined in Section 3.

Table 4.2-7. Residual Effects Significance Evaluation for Air Quality Valued Component

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Increase in air emissions during all phases of the Project	RAA	Short-term	Frequent/ Regular	Reversible	Negligible to medium	High	High	Not significant
b) Increase in GHG emissions during all phases of the Project	RAA	Extended-term	Continuous	Irreversible	Low	High	High	Not significant

4.2.4.3 Increased Air Emissions

Construction activities will involve the operation of fossil fuel-based vehicles, heavy equipment (for example, excavators, trucks and dozers) and auxiliary equipment (for example, power generators) which will emit CACs. CACs associated with the use of gasoline and diesel-based vehicles and equipment consist of NO_x, CO, $PM_{2.5}$ with a trace amount of VOCs and SO_2. Construction activities such as topsoil movement, grading and transportation on unpaved roads are expected to result in dust emissions.

Based on the professional experience of the assessment team, emissions of CO and NO_x are expected to result in short-term elevated concentrations relative to background but are likely to be well within long-term (for example, 8-hour and annual) air quality objectives since most of the construction activities will occur during the day allowing more time for dispersion during the night. Brief episodes of high ambient concentrations of PM will likely occur in close vicinity to proposed Project expansion construction activities during these occasional activities, which are common to typical construction projects. All construction activities are considered intermittent and isolated events (that is, activities will cease once proposed Project expansion construction is finished). The increase in CAC emissions during construction is expected to raise existing background CAC concentrations, but not to reach BC AAQO or Canadian Ambient Air Quality Standard limits; the increases are expected to be reversible since emissions will cease once construction activities are completed. During the operational phase, equipment number and nature will be similar to what is currently being used; therefore, the increase in air contaminant concentrations compared to baseline conditions may be detectible but within normal variability of existing landfill operations.

The mitigation in Table 4.2-6 and the Air Quality Monitoring Plan and Dust and Odour Control Plan will reduce the severity of Project-related air emissions, which are short-term in duration and of medium magnitude during construction, since long-term average concentrations will stay below AAQO, and negligible magnitude during operation and closure/reclamation. Consequently, an increase in Project-related air emissions during all Project phases is considered not significant (Table 4.2-7, point [a]).

4.2.4.4 Increased Greenhouse Gas Emissions

GHG emissions are expected to be released as a result of proposed Project expansion activities. These emissions are expected to be primarily from combustion sources such as construction equipment tailpipe emissions and generator use. Emissions from the Tervita TRD Facility are expected to continue in similar quantity as they currently are, and there will not be a notable increase in the emissions as presented in Table 4.2-2. All construction equipment will adhere to low-emission Tier 4 engine specifications. Due to the nature of the waste accepted at the landfill, generation of CH_4 is not expected to be substantial, although some biodegradation of hydrocarbon materials will contribute to CO_2 emissions. The proposed Project expansion's contribution to GHG emissions will be minor compared to provincial or national emissions totals and the residual effect is considered not significant (Table 4.2-7, point [b]).

4.2.4.5 Cumulative Effects Assessment

The proposed Project expansion will act cumulatively with existing activities and reasonably foreseeable developments in the Air Quality RAA to increase air emissions during construction and operations. Existing sources of increased air emissions in the Air Quality RAA include oil and gas development (including ongoing pipeline and facility maintenance activities), agricultural activities, utility activities (for example, maintenance on transmission lines), transportation activities and forestry activities involving equipment use (that is, timber harvesting). Smoke from burning may also be generated during clearing and land management activities associated with agricultural, forestry, and oil and gas developments. The construction of the proposed Project expansion, and to a lesser extent, the operations, will increase air emissions and interact with construction and operations of certain reasonably foreseeable developments.

Reasonably foreseeable proposed air emission sources in the Air Quality RAA include the construction of five oil and gas developments (see Table 3.9-2 and Figure 3.9-2). Although the construction schedule of these reasonably foreseeable oil and gas facilities is unknown, it was assumed that these developments would be constructed prior to construction of the proposed Project expansion, as they are relatively minor in scale (Section 8.2.3). No other reasonably foreseeable developments were identified within the Air Quality RAA, however, existing developments and activities identified in Section 3.9.1.2 are expected to continue into the future.

Given the short duration of construction activities and limited sources of proposed Project expansion-related emissions during operation, it was assumed that the proposed Project expansion would contribute less to increased air emissions compared to the total emissions from the existing and reasonably foreseeable developments in the Air Quality RAA. Nevertheless, during construction, the total cumulative effect may approach medium magnitude levels as a result of brief, localized increases in air emissions associated with proposed Project expansion construction activities.

The total cumulative effect of increased air emissions in the Air Quality RAA during operations is considered to be of low magnitude since the emissions arising from existing activities, the proposed Project expansion and reasonably foreseeable developments are expected to low. During operation, air emissions may be detectable, but are within applicable environmental and regulatory standards and will occur at substantial distances from any potential receptors.

The mitigation in Table 4.2-6 and the Air Quality Monitoring Plan and Dust and Odour Control Plan will reduce the severity of Project-related air emissions. It is expected that operators of existing and reasonably foreseeable developments will also implement mitigation developed in accordance with industry standards for air emissions. With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on air emissions are of short-term duration, low magnitude and are considered to be reversible. Consequently, the proposed Project expansion's contribution to cumulative effects on air emissions will be not significant.

4.2.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. The implementation of the Air Quality Monitoring Plan and the Dust and Odour Control Plan will reduce the severity of Project-related air emissions. These plans will include a mitigation strategy to mitigate air quality effects and dust deposition.

4.3 Acoustic Environment

Table 4.3-1 shows the subcomponents and KIs for the Acoustic Environment VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.3-1. Acoustic Environment Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Wildlife • Land and resource use	• Noise levels • Level of annoyance	• Project activities may generate noise, potentially impacting wildlife, and use of the surrounding environment

4.3.1 Assessment Boundaries

The following assessment boundaries have been defined for the Acoustic Environment VC.

4.3.1.1 Spatial Boundaries

The spatial boundaries for the Acoustic Environment VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as the following:

- LAA – A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.
- RAA – A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

As disruption of the acoustic environment may potentially affect wildlife and land users, the Acoustic Environment LAA and RAA are the same as those of the Wildlife and Wildlife Habitat VC and Land and Resource Use VC.

4.3.1.2 Temporal Boundaries

The temporal boundaries identified for the Acoustic Environment VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.3.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Acoustic Environment VC.

4.3.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Acoustic Environment VC.

4.3.2 Existing Conditions

The following methods of data collection were used to describe the existing conditions for the Acoustic Environment VC:

- Desktop review of provincial and regional information sources
- A review of the nature and number of equipment to be used during construction
- A description of noise sources and estimated noise levels at offsite sensitive receptors in the Acoustic Environment RAA

Data from these sources provide an appropriate baseline for assessing the effects of the Project on the acoustic environment. Tervita has a good understanding of the nature and the number of equipment required for activities relating to the proposed Project, and the potential receptors. The noise levels associated from this equipment were obtained from recognized databases and overall noise impacts at sensitive receptors were determined using conservative assumptions.

Health Canada does not regulate noise levels, but does provide recommendations for the assessment of noise impacts (Health Canada 2010, 2017), including:

- Identification and mapping of noise-sensitive receptors such as residences, schools, nursing homes and First Nations communities, relative to a project location
- Estimation of baseline sound levels for a project be estimated at both day and night
- Identification of all potential Project noise during all Project phases
- Comparison of baseline noise levels with predicted noise levels at sensitive receptor locations
- Evaluation of severity of predicted changes and prediction of health impacts
- Implementation of mitigation measures, noise management and complaint resolution planning

The BC OGC *British Columbia Noise Control Best Practices Guideline* (BC OGC 2018a) was developed to outline requirements for noise control for activities under BC OGC jurisdiction and has also been applied to assess noise levels that may disturb local residents. The Guideline compares predicted noise levels to permissible sound levels (PSLs) for day and night. BC noise guidelines for temporary activities (that is, activities lasting less than 60 days) state that noise impacts should be less than 55 decibels (dBA).The guideline set PSLs of 40 decibels absolute energy level equivalent (dBA Leq) during night-time hours (the period between 22:00 and 07:00) and 50 dBA Leq during day-time hours (the period between 07:00 and 22:00) at 1.5 km from any dwellings or landfill fenceline, whichever is the lesser distance (BC OGC 2018a). The average ambient sound level in rural areas is approximately 35 dBA Leq at night and daytime ambient sound levels are commonly 10 dBA Leq higher than nighttime levels (BC OGC 2018a). Although the guideline was established for noise control associated with operations of oil and gas wells/facilities, its recommended best practices are commonly adopted for management of noise for construction and operations of various project types in BC.

The major source of noise contributing to existing sound levels in the Acoustic Environment RAA are road and train traffic. Beatton River Road (also referred to as the Buick Creek Road) is present to the west of

the Project footprint with railway lines beyond. Frequent daily rail traffic is present; however, the noise from the road and rail traffic is considered “variable and intermittent” (Tervita 2014). Average car traffic along the Beatton River Road during the summer is estimated to be 735 vehicles per day (CCS 2002). Natural sounds, such as wind rustling through vegetation and birds, are also expected to contribute to ambient noise levels when vehicle traffic is absent.

At the existing landfill, noise is primarily generated from the waste-handling machinery and trucks hauling the waste (CCS 2002). The noise from normal daytime landfill operations includes truck traffic, heavy equipment, back-up beepers, speaker systems and radios (Tervita 2014). Noise sources associated with the proposed Project expansion will be similar to noise sources at the existing landfill.

The nearest human resident receptor is a seasonal occupant of a residence located at a distance of 2.5-km northeast from the existing landfill (Tervita 2014). The existing landfill is also surrounded by forest, which helps to dampen noise generated from operations (CCS 2002). Project-related noise levels at the nearest resident receptor or at 1.5 km from the property fence-line are expected to be within the BC noise guidelines. There have been no sensory effects or noise annoyance complaints due to operations of the existing landfill identified for wildlife, use of land, and use of resources in the Acoustic Environment RAA.

4.3.3 Traditional Knowledge Shared

In their comments on the VCs chosen for the proposed Project expansion, BRFN reported that an increase in noise could have a devastating effect on wildlife and in turn on BRFN interests since wildlife is sensitive to noise and other vibrations. To account for this, BRFN requested that the spatial boundaries be adjusted and that a percent annoyance parameter be added to the assessment of the proposed Project expansion. Noise was considered in the effects pathways as potential effects to wildlife and land users. The spatial boundaries for noise effects assessment (that is, Acoustic Environment LAA and RAA) are the same as those of the Wildlife and Wildlife Habitat VC and Land and Resource Use VC.

To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, DRFN has not provided any traditional knowledge related to the acoustic environment.

4.3.4 Acoustic Environment Effects Assessment

4.3.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The proposed Project expansion is anticipated to interact with the Acoustic Environment VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Cell capping
- Postclosure maintenance and monitoring

Construction Phase

During construction of the proposed Project expansion, it is expected that the following equipment (or similar) will be used:

- Two CAT D6T dozers
- Two CAT 330F excavators
- Six 30-ton CAT 735C rock trucks
- Two CAT 815K compactors

It is unlikely that all equipment will be used simultaneously, and construction is only anticipated during the daylight hours. According to the U.S. Department of Transportation, Federal Highway Administration, *Construction Noise Handbook* (2017), the previously noted equipment have measured and averaged sound pressure level measurements at 15 m as follows: compactor (83 dBA), dozer (82 dBA), dump truck (76 dBA), and excavator (81 dBA).

To screen the potential for adverse noise impacts during the construction stage, noise levels have been estimated from the equipment list provided above and compared to PSLs.

If it is conservatively assumed that the dozers, excavators, compactors, and rock trucks will be onsite, with two of all these categories of equipment working in the same general area simultaneously (the remaining rock trucks will likely be travelling to and from other areas at the construction site), then the predicted total sound level at 15 m would be 90 dBA. This noise level will attenuate to less than 55 dBA (the BC OGC PSL for daytime operations with less than 60 days or operations [Class B] adjustment) at a distance of less than 1 km. This estimate conservatively assumes only distance attenuation and no other attenuation due to foliage, terrain, solid barriers, etc. Therefore, based on the noise screening, these temporary construction noise levels will not substantially affect offsite sensitive receptors in the area.

Construction noise levels were estimated based on simultaneous operation of several pieces of equipment expected to be used during cell preparation. This equipment is only expected to be used during daytime hours. The noise levels are conservatively expected to attenuate to less than 55 dBA within 1 km of the Project footprint and will not affect sensitive receptors to levels greater than BC noise guidelines. The noise effects of construction are expected to be temporary, localized, and reversible.

Operations Phase

The operations phase of the proposed Project expansion will require the use of similar equipment in the same quantities as what is currently being used at the existing landfill. During operations of the proposed Project expansion, it is expected that the following equipment (or similar) will be used:

- Two John Deere 850k dozers
- One John Deere 210 GLC excavator

According to the U.S. Department of Transportation, Federal Highway Administration, *Construction Noise Handbook* (2017), the previously noted equipment have measured and averaged sound pressure level measurements at 15 m as follows: dozer (82 dBA) and excavator (81 dBA). This equipment is only expected to be used during daytime hours. The noise levels produced by this equipment are conservatively expected to attenuate to less than 55 dBA within 1 km of the Project footprint and will not affect sensitive receptors to levels greater than BC noise guidelines.

Noise levels during the operations phase are predicted to be the same as existing conditions since the proposed Project expansion will use similar equipment in the same quantities as what is currently being used. The existing cells at the landfill will no longer be used once the proposed Project expansion is in operation and minimal noise is expected from periodic maintenance vehicles and equipment. Therefore, it is not expected that there will be a noticeable increase in noise at off-property receptors associated with the use of equipment and vehicles during the operations phase of the proposed Project expansion.

Closure/Reclamation Phase

The closure/reclamation phase of the proposed Project expansion will occur during daytime hours and will require the use of a smaller number of similar equipment that will be used for construction. Similar to predicting noise effects of construction and operations, the increase in noise levels during closure/reclamation activities are conservatively expected to attenuate to less than 55 dBA within 1 km of the Project footprint and will not affect sensitive receptors to levels greater than BC noise guidelines. The noise effects of closure/reclamation phase are expected to be temporary, localized, and reversible.

Postclosure Phase

Postclosure activities are expected to be intermittent and involve the use of vehicles for monitoring and inspection site visits. Therefore, it is not expected that there will be a noticeable increase in noise at off-property receptors associated with the use of vehicles during the postclosure phase of the proposed Project expansion.

Table 4.3-2 summarizes the potential effects, mitigation measures, and potential residual effects of proposed Project expansion noise emissions on the Acoustic Environment VC. Vibration has not been included as a potential effect as vibration due to equipment used during construction and operations is not expected to cause any noticeable vibrations.

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. Given the nature of equipment and activities associated with the proposed Project expansion with regards to noise emissions, avoidance and restoration are not directly applicable; therefore, mitigation measures have focused on minimization. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on the Acoustic Environment VC. Mitigation measures described in Table 4.3-2 have been implemented at the existing landfill and are considered to have high effectiveness.

Table 4.3-2. Acoustic Environment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Increase in noise levels	LAA and RAA	• Construction work will be done in daylight hours and operational work will be done between the hours of 7 a.m. and 7 p.m.	Minimization	Immediate	High	Increased noise emissions during all phases of the Project
			• Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	Minimization	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

4.3.4.2 Characterization and Significance of Potential Residual Effects

Residual adverse effects on the Acoustic Environment VC identified in Table 4.3-2 include increased noise emissions during construction, operations and closure/reclamation.

Table 4.3-3 provides a summary of the significance evaluation of the residual effects associated with the Acoustic Environment VC during proposed Project expansion activities and considers the probability for significance in the evaluation as outlined in Section 3.

Table 4.3-3. Residual Effects Significance Evaluation for Acoustic Environment Valued Component

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Increased noise emissions during all phases of the Project	LAA and RAA	Short-term	Frequent/ Regular	Reversible	Low	High	High	Not significant

4.3.4.3 Increased Noise

The most influential assessment criteria for the acoustic environment are magnitude, duration and reversibility, although many of the criteria ratings are inherently related. The determination of significance on the acoustic environment is strongly influenced by the context for the residual effect, which is reflected in the criteria ratings for magnitude.

Increases in sound levels arising from proposed Project expansion construction are expected. There may be some elevated and localized noise emissions occurring above background levels due to heavy equipment use associated with the construction phase; however, the emissions are short-term, localized, low in magnitude, and reversible. During the operations phase, equipment number and nature will be similar to what is currently being used and; therefore, increase in overall noise emissions will be negligible compared to baseline conditions.

It is not anticipated that there will be a significant increase in noise levels within 1 km of the proposed Project expansion or at the nearest sensitive receptors approximately 2.5 km away.

The residual effect of increased noise emissions on the Acoustic Environment VC is considered to be not significant (Table 4.3-3, point [a]).

4.3.4.4 Cumulative Effects Assessment

Ambient noise in the Acoustic Environment RAA is primarily caused by existing activities (that is, local and industrial vehicle traffic, existing facilities and industrial maintenance activities). Although forestry activities may occur in the Acoustic Environment RAA, no activities related to forestry are anticipated to occur during construction of the proposed Project expansion. Some other activities, such as maintenance and operations activities, that may contribute noise emissions, are of a very short-term nature and occur as isolated events. There are no other reasonably foreseeable developments identified within the Acoustic Environment RAA (see Tables 3.9-1 and 3.9-2 and Figure 3.9-2); however, existing developments and activities identified in Section 3.9.1.2 are expected to continue into the future.

While the nuisance noise in the Acoustic Environment RAA will increase during proposed Project expansion activities, the increase is anticipated to be greater during construction than during operations,

closure/reclamation, and postclosure activities given the use of heavy construction equipment and the longer duration of construction compared to other activities.

The total cumulative effect on the Acoustic Environment VC resulting from the proposed Project expansion in combination with existing and reasonably foreseeable developments within the Acoustic Environment RAA is considered to be of low magnitude due to the remote location and lack of permanent receptors and given that the proposed Project expansion will be within the PSLs outlined by the BC OGC.

The mitigation in Table 4.3-2 will reduce the severity of proposed Project expansion contributions to cumulative noise emissions. It is expected that operators of reasonably foreseeable developments will also implement mitigation developed in accordance with industry standards for noise emissions. No mitigation beyond the Project-specific mitigation already proposed is deemed to be warranted.

The Project-specific contributions of effects on a cumulative increase in nuisance noise within the Acoustic Environment RAA are considered reversible, and short to long-term in duration since the cumulative increase in nuisance noise will be alleviated upon completion of construction, maintenance or operation activities (that is, the lifetime of the proposed Project expansion). Considering the remote location and lack of permanent receptors, adherence within the PSLs outlined by the BC OGC, and mitigation in Table 4.3-2, the Project-specific contribution of effects to a cumulative increase in nuisance noise is low in magnitude.

With implementation of the proposed mitigation measures, the proposed Project expansion's contribution to potential cumulative effects on the acoustic environment are of short-term duration, low magnitude and are considered to be reversible. The proposed Project expansion's contribution to cumulative effects on the Acoustic Environment VC will be not significant.

4.3.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. No specific follow-up strategies have been identified for the Acoustic Environment VC. Construction work will be done in daylight hours and operational work will be done between the hours of 7 a.m. and 7 p.m. Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise. If noise concerns are raised during Project activities, Tervita will evaluate all reasonable measures to address the specific concerns identified.

4.4 Surface Water

Table 4.4-1 shows the subcomponents and KIs for the Surface Water VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.4-1. Surface Water Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Water quality • Water quantity	• Water quality indicators (for example, sediment, concentrations of metals and hydrocarbons, perceived taste and smell) • Water volume and movement	• BC EAO Guidelines and original EAC Application. • There is potential for contamination of surface water by the proposed Project expansion due to stormwater runoff during construction, operations, and closure. Runoff may come in contact with waste (including NORM material) or spills. Runoff that has come into contact with waste will be handled as leachate. Surface water quality will be assessed using provincial and federal guidelines, such as the Canadian WQG and the BC WQG. • Seasonal surface drainage from the south portion of the existing site (that is, snow melt and rainfall) is presently controlled by ditches and berms and is directed towards the stormwater retention pond on the west side of the site.

Table 4.4-1. Surface Water Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Water quality • Water quantity (cont'd)	See above	• Surface water quantity is not expected to be a concern as no changes to surface water quantity have been observed at the existing landfill. Stormwater management and monitoring systems are already in place at the existing facility, and will be adjusted accordingly to account for stormwater retention associated with the proposed Project expansion. Surface water must regularly be removed from the system to maintain operating levels, as per Section 26(6) of the HWR. As per Section 26(1)(b)(i) of the HWR, the surface water collection system will be inspected weekly and/or immediately after a major storm or a catastrophic event. Surface water monitoring includes: inspections of the surface water controls and analytical and volume disposed/discharged/sent for alternate reuse.

4.4.1 Assessment Boundaries

The following assessment boundaries have been defined for the Surface Water VC.

4.4.1.1 Spatial Boundaries

The spatial boundaries for the Surface Water VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as the following:

- LAA: A 500-m radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities: The LAA is considered to be the extent in which direct potential effects could occur (that is, the geographic area in which direct interaction of the proposed Project expansion with surface water may occur in the unlikely event of discharge from the proposed Project expansion site to the environment). No guidance is available for BC to determine the potential area of effects to surface water from a landfill; however, the 500 m distance includes the area with the greatest potential for effect from the landfill and is based on Ontario Ministry of the Environment, Conservation and Parks (MECP) Guideline D-4, which states that the most significant contaminant discharges are normally within 500 m of the perimeter of a fill area (Ontario MECP 2016).
- RAA: The proposed Project expansion is located on a watershed divide between the Blueberry River and Monnery Creek, and therefore includes portions of both of these watersheds. The RAA is limited to a portion of these watersheds only, to allow for a reasonable assessment of cumulative effects. In determining an appropriate scale for the RAA and the cumulative effects assessment, two primary factors were considered:
  - If the spatial extent was too large, effects of the Project appear relatively small (Hegmann et al. 1999; Antoniuk 2000, 2002).
  - If the spatial scale was too small, it may exclude potentially significant development (Hegmann et al. 1999; Finley and Revel 2002).

  To find an appropriate balance, the RAA for this Project includes the watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the proposed Project expansion site.

4.4.1.2 Temporal Boundaries

The temporal boundaries identified for the Surface Water VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.4.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Surface Water VC.

4.4.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. The potential adverse effects of the landfill construction, operations, closure/reclamation, and postclosure on surface water are generally well-understood and have predictable effects. Tervita operates an existing landfill adjacent to the proposed expansion and as such has baseline data gathered from construction and operation experience. Information on existing conditions was based on a desktop review, site investigations, and field data collection, including results of surface water sampling activities for the existing landfill. Much of the baseline characterisation presented in this section was based on the available data for the existing landfill and an understanding of Tervita's surface water management system. This understanding, in conjunction with the results of the desktop review and available field data, meant that there was a complete technical understanding for conducting the assessment.

4.4.2 Existing Conditions

The following methods of data collection, as outlined in the AAIR, have been used to inform the description of existing conditions for the Surface Water VC:

- Desktop review of provincial and regional information sources
- Information from site investigations, ongoing surface water discharge analytical data at the existing facility and data collection efforts
- Comparison of the surface water quality data to the BC WQG

In addition, information from the Hydrogeologic Siting Suitability Investigation (Clifton 2002, Appendix 5) conducted for the existing landfill was also reviewed for context related to the Surface Water VC.

Data from these sources provide an appropriate baseline for assessing the effects of the proposed Project expansion on surface water. Surface water within the property (which includes the proposed Project expansion and the existing landfill) is controlled by a water management system consisting of a network of onsite ditches, runon and runoff systems, and a surface water (stormwater) pond. Surface water generally flows from the southeast side of the property to the northwest side of the property, and a ditch constructed around the perimeter will direct runoff towards the stormwater pond on the northwest side of the existing landfill; therefore, the existing conditions related to surface water at the proposed Project expansion are based on analytical results of sampling events for the stormwater pond conducted

by Nichols Environmental (Canada) Ltd. in spring and summer, yearly, from 2014 to 2019 at the existing landfill.

Tervita's current approved Surface Water Monitoring Plan for the existing landfill does not require analysis for comparison to the BC WQG and Tervita's surface water consultant uses the BC CSR when interpreting the monitoring results; therefore, for consistency, the Application also uses the BC CSR when discussing existing conditions for the Surface Water VC.The following subsections summarize available information on existing conditions of surface water within the spatial boundaries defined for the Surface Water VC in Section 4.4.1.1.

4.4.2.1 Environmental Context

The proposed Project expansion is situated at an elevation of approximately 755 m above sea level (asl). Several permanent creeks and lakes were identified within a 10-km radius of the existing landfill during a hydrogeological study (Clifton 2002) completed prior to the construction of the existing landfill in 2003. Surface topography near the proposed Project expansion footprint slopes at 1 to 2 percent to the northwest towards an ephemeral stream located approximately 100 m north of the existing landfill's stormwater retention pond. Upset Creek, St. John Creek, an unnamed creek, and two unnamed lakes or sloughs are also listed as being present within 5 km of the existing landfill (Clifton 2002). The nearest major surface water body is the Blueberry River, located approximately 7 km to the north, at an elevation approximately 100 m lower than the elevation of the existing landfill and proposed Project expansion (CH2M 2017; Matrix 2017). Most recent and available surface water quality data (temperature, hydrogen [ion] concentration [pH], conductivity, dissolved oxygen, and turbidity) at the Blueberry River and its tributaries were measured in August 2017 by Stantec (Stantec 2017) for the Westcoast's Spruce Ridge Program which is an expansion of Westcoast's existing natural gas transmission system in the PRRD. The Spruce Ridge Program is located approximately 40 km northwest and within the Community Services, Community Infrastructure, and Economy RAAs of the proposed Project expansion. Water temperatures measured at the Blueberry River and its tributaries for the Spruce Ridge Program ranged from 10 degrees Celsius (°C) to 13.4°C. Values of pH ranged from 6.0 to 8.0. Conductivity measurements ranged from 101.2 to 340.9 microSiemens per centimetre. Dissolved oxygen levels ranged from 0.7 to 8.6 milligrams per litre (mg/L). Water temperature was within optimum levels for fish species present (BC MOE 2006) at the watercourses with water present at the time of sampling. Dissolved oxygen concentrations were below the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (greater than 5 mg/L; CCME 2007) and the *British Columbia Approved Water Quality Guidelines* (greater than 5.0 mg/L; BC MOE 2006) at one of the tributaries. Turbidity measurements ranged from 2.6 to 101 Nephelometric Turbidity Unit.

4.4.2.2 Stormwater Management

Stormwater management and monitoring systems are already in place at the existing facility and will be adjusted accordingly to account for stormwater retention associated with the proposed Project expansion. Surface water generally flows from the southeast side of the property to the northwest side of the property. Seasonal surface drainage from the south portion of the existing landfill (that is, snow melt and rainfall) is presently controlled by ditches and berms and is directed towards the stormwater retention pond on the northwest side of the existing landfill. The total volumes of surface water runoff from the existing facility were 17,440 m^3 in 2018, 15,680 m^3 in 2017, and 18,189 m^3 in 2016. Surface water must regularly be removed from the system to maintain operating levels, as per Section 26(6) of the HWR. As per Section 26(1)(b)(i) of the HWR, the surface water collection system will be inspected weekly and/or immediately after a major storm or a catastrophic event. Surface water monitoring includes: inspections of the surface water controls and analytical and volume disposed/discharged/sent for alternate reuse.

Prior to release, water is tested as required against Schedule 1.2 of the HWR. Once analytical data is received, the results are reviewed and compared against water quality parameters, water volume and date of discharge are recorded, then water is discharged/released in the following ways:

- Discharge to the environment: Tervita will conduct testing of water quality parameters prior to release. If the surface water meets the standard for discharges, the water will be released to land. Surface water is pumped out to Tervita land directly north and northwest of the surface water pond. If the

surface water fails discharge criteria, treatment may be considered depending on the economics and feasibility.

- Deepwell disposal: If the surface water fails discharge to the environment criteria, Tervita will send the water to an approved disposal facility. Tervita's Oilfield Waste Management Facilities also process waste and have quality assurance/quality control (QA/QC) programs in place to ensure fluids meet criteria prior to injection.
- Site use for construction and dust control: Surface water may be used at the Project site for construction and/or dust suppression.
- Reuse for hydraulic fracturing in the oil and gas industry: If the surface water meets the criteria, the surface water may be reused as makeup water for oilfield fracturing operations and/or other industrial uses where the surface water can be used to offset freshwater. Tervita will work with the user(s) of the surface water to ensure the proper regulatory requirements are in place before withdrawal(s) occur.

Precipitation falling on the active landfill cell is contained within the lined area and, either will be dealt with as leachate (see Section 4.4.1.3) or discharged to surface if it meets relevant criteria for water quality. Water quality in the stormwater pond is measured multiple times a year for metals, nutrients, water quality, petroleum hydrocarbons, polychlorinated biphenyls, organic halides, and oil and grease. In 2018, there was one exceedance for chlorine during one sampling event. All other analyzed parameters were less than the CSR and HWR for all water use pathways including drinking water, irrigation, livestock and freshwater aquatic life (Nichols Environmental [Canada] Ltd., 2019; Appendix 3). Details of stormwater sampling results from 2018 and comparison to BC CSR and HWR water quality standards are provided in Tables 1 to 4 of the Nichols Environmental (Canada) Ltd. Report in Appendix 3.

During the *EMA* permit application for the proposed Project expansion, the Stormwater Management Plan currently in place for the existing facility will be amended for annual sampling of surface stormwater (prior to discharge to the environment) to include analysis of the same analytical parameters as the soil and groundwater samples, and compared to the relevant surface water guidelines.

4.4.2.3 Leachate Management

Leachate management and monitoring systems are already in place at the existing landfill and will be adjusted accordingly to account for leachate generation associated with the proposed Project expansion. The *Special Waste Regulation* stipulates that a secure landfill must have, as a minimum, a dual liner with a leak detection system between the two liners. Each of the two liners can be either soil or synthetic in construction. The proposed design incorporates a primary (top) composite liner consisting of both a 1.5-mm thick synthetic high-density polyethylene liner and 0.6-m thick compacted clay liner (CCL) as the secondary liner. The existing landfill is equipped with a leachate collection and a leak detection system (CCS 2002). The proposed Project expansion will connect to the existing system. The collected leachate is pumped into leachate vault, which is subsequently pumped out and disposed of in an offsite licenced disposal well (Golder 2008). Leachate at the existing landfill is monitored as part of the groundwater monitoring program.

Leachate generation has been conservatively estimated based on BC MECCS Normals (1961-1990) for Fort St. John, and assume all precipitation falling on the active landfill area will become leachate (that is, neglecting any reduction through evapotranspiration). This estimates an average maximum flow rate of 0.23 litres per second. A review of the leak detection sample data suggests that the current landfill leachate collection and containment system is operating effectively (Matrix 2019; Appendix 4).

Leachate collected in the leachate drainage network will be managed in the following ways:

- Discharge to the environment: If the leachate meets the standard for discharges to the environment and there are no other contaminants of concern, the leachate will be released to land. If the leachate fails discharge criteria, treatment or a deepwell disposal method will be considered depending on the economics and feasibility.

- Deepwell disposal: Leachate will be tested for Class Ib disposal criteria stated in Section 3.5.2.2 of the *Procedure for Authorizing Deepwell Disposal of Wastes* and select contaminants of concern from Schedule 4, Table 1 of the HWR. Tervita's Oilfield Waste Management Facilities also process waste and ensure QA/QC programs are established to ensure fluids meet criteria prior to injection.
- Reuse for hydraulic fracturing in the oil and gas industry: If the leachate meets the standard for discharges to the environment, the leachate may be reused as makeup water for oilfield fracturing operations and/or other industrial uses where the leachate can be used to offset the use of regional fresh water. Tervita will work with the end user of the leachate to ensure the proper regulatory requirements are in place before withdrawals occur.
- Recirculation: Leachate generated from the landfill may be recirculated back into the waste fill or may be utilized for dust control.

4.4.3 Traditional Knowledge Shared

DRFN shared knowledge about the connectivity between waterways identified in the LAA for the proposed Project expansion and noted the importance of ensuring the water contamination did not occur. BRFN shared that the perceived safety value and quality of water, including taste and smell, is important to aboriginal values and requested that assessment of these qualities of water be conducted.

4.4.4 Surface Water Effects Assessment

4.4.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the proposed Project expansion on the Surface Water VC is based on the results of surface water monitoring at the existing site, results of previous studies, and desktop review performed for the proposed Project expansion.

The proposed Project expansion is anticipated to interact with the Surface Water VC during the following construction, operations, and closure/reclamation, and postclosure activities:

- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Leachate management
- Stormwater management
- Cell capping
- Postclosure maintenance and monitoring

Activities associated with construction, operations, closure/reclamation, and postclosure of the proposed Project expansion have the following potential effects on surface water:

- Increased sediment in stormwater runoff
- Contamination of surface water due to accidental release of chemicals, oil, or other fuels from stormwater or leachate

Table 4.4-2 identifies the potential effect of increased sediment in stormwater runoff due to the proposed Project expansion on the Surface Water VC, as well as mitigation measures and potential residual effects. Accidental release or spills of contaminants during proposed Project expansion activities that may cause contamination of surface water are assessed in Accidents and Malfunctions Section (Section 9).

Mitigation measures for the potential effect of increase sediment in stormwater runoff have been identified in a manner consistent with Section 3.5 of this Application. These mitigation measures focus on minimization, except for restoration measures that would be implemented if erosion occurs. As the majority of these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse

effects on the Surface Water VC. The seeding measure, as well as those mitigation measures involving inspections, require a time lag before they function effectively in preventing erosion.

Mitigation measures for potential adverse effects on surface water are generally described as having high effectiveness with BMPs and technologies that are widely used in various industries, and that are considered to be effective at reducing erosion. These mitigation measures are also observed to be highly effective at the existing landfill.

In addition to the summary of mitigation provided below, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 4.4-2. Surface Water – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Increased sediment in stormwater runoff	Project footprint and LAA	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Minimization	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures
			• Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion.	Minimization	Construction	High	
			• Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event.	Minimization	During all Project phases	High	
			• Erosion occurring on surface water control works will be repaired and mitigated as soon as possible.	Restoration	Immediate	High	
			• Mitigation measures to prevent surface water erosion may include swales, hay bales, rock rip-rap, and/or coconut matting.	Restoration	Immediate	High	
			• The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion.	Minimization	During all Project phases	High	
			• The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible.	Restoration	During all Project phases	High	
			• A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3.	Minimization	Immediate	High	
			• All surface water runs to a pond on the northwest portion of the existing landfill. Sediments will settle in the pond, and the water will be released as required. On-site erosion control will be utilized if extreme conditions warrant.	Minimization	Immediate	High	
			• Throughout the operation period, prior to final capping, waste is placed a minimum of 1.0 m below the top of berm (top of liner) elevation. Interior grading is maintained such that surface water runoff from the waste is contained within the cell(s).	Minimization	Immediate	High	
			• Implement additional measures provided in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan.	Minimization	During all Project phases	High	
			• Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Minimization	During all Project phases	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

4.4.4.2 Characterization and Significance of Potential Residual Effects

No potential residual effects have been identified for the Surface Water VC. Based on Tervita's experience constructing and operating the existing landfill, the potential adverse effects of the proposed Project expansion on Surface Water VC are generally well-understood. Evidence at the existing landfill (refer to Appendix 3) indicates that Tervita's mitigation measures and construction practices are effective in preventing or reducing potential residual effects on Surface Water VC. The landfill design along with the implementation of mitigation measures are expected to sufficiently avoid and/or prevent residual adverse effects to surface water quality. With the implementation of appropriate mitigation and remedial measures, there are no potential residual effects predicted for the Surface Water VC.

Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

4.4.4.3 Cumulative Effects Assessment

No residual effects have been identified for the Surface Water VC, therefore, a cumulative effects assessment is not required.

4.4.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Surface Water VC, and no specific follow-up strategies have been identified. Monitoring of surface water quality postconstruction will be integrated with current operations and incorporated with other routine operational monitoring activities that will be expanded for the proposed Project expansion. Operation monitoring activities include but are not limited to the implementation of mitigation measures as summarized in the Erosion and Sediment Control Plan (Section 13.1), the Emergency Preparedness and Response Plan (Section 13.4), the Leachate Management Plan (Section 13.12), the Stormwater Management Plan (Section 13.13), and the Landfill Leak Detection Monitoring Plan (Section 13.14), and Tervita will adhere to additional construction or postconstruction monitoring (PCM), follow-up and reporting requirements required under Certificate Conditions.

4.5 Groundwater

Table 4.5-1 shows the subcomponents and KIs for the Groundwater VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.5-1. Groundwater Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Water quality • Water quantity	• Water quality indicators such as concentrations of inorganic ions (such as calcium, magnesium, sodium, potassium, chloride, sulphate, fluoride), dissolved metals (such as aluminum, antimony, arsenic, barium, boron, iron, lead), perceived taste and smell and other contaminants (such as petroleum hydrocarbons, VPHs, PAHs) • Water volume and movement	• BC EAO Guidelines, BC Ministry of Water, Land and Air Protection's sampling methodology (BC WLAP 2013), and original EAC Application. • Construction and operations may introduce groundwater contamination and changes in groundwater quantity during pumping of a high water table. • Potential impacts to groundwater at the proposed Project expansion site and the surrounding area is contamination from landfill materials. Groundwater contamination may affect downstream surface water, aquatic habitat, or drinking water through migration of leachate through the soil to groundwater or aquifers during operation and post closure. • At the existing landfill site, Tervita maintains a Groundwater Monitoring Program and is in compliance with BC MECCS permit requirements for long-term groundwater monitoring. Tervita's hydrogeologist reviews groundwater monitoring information to review potential impacts to the environment.

Table 4.5-1. Groundwater Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale

Note:
PAH = polycyclic aromatic hydrocarbon

4.5.1 Assessment Boundaries

The following assessment boundaries have been defined for the Groundwater VC.

4.5.1.1 Spatial Boundaries

The spatial boundaries for the Groundwater VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as the following:

- LAA – A 500-m radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities: The LAA is considered to be the extent in which direct potential effects could occur (that is, the geographic area in which direct interaction of the proposed Project expansion with groundwater may occur in the unlikely event of discharge from the proposed Project expansion site to the environment). No guidance is available for BC to determine the potential area of effects to groundwater from a landfill; however, the 500 m distance includes the area with the greatest potential for effect from the landfill and is based on Ontario MECP Guideline D-4, which states that the most significant contaminant discharges are normally within 500 m of the perimeter of a fill area (Ontario MECP 2016).
- RAA – The proposed Project expansion site is located on a watershed divide between the Blueberry River and Monnery Creek, and therefore includes portions of both of these watersheds. The RAA is limited to a portion of these watersheds only, to allow for a reasonable assessment of cumulative effects. In determining an appropriate scale for the RAA and the cumulative effects assessment, two primary factors were considered:
  - If the spatial extent was too large, effects of the Project appear relatively small (Hegmann et al. 1999; Antoniuk 2000, 2002).
  - If the spatial scale was too small, it may exclude potentially significant development (Hegmann et al. 1999; Finley and Revel 2002).

  To find an appropriate balance, the RAA for this Project includes the watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the proposed Project expansion site.

4.5.1.2 Temporal Boundaries

The temporal boundaries identified for the Groundwater VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).

- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.5.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Groundwater VC.

4.5.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Groundwater VC. Information on existing conditions was based on a desktop review, site investigations, and field data collection, including results of groundwater monitoring activities for the existing landfill. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on groundwater are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review and available field data, meant that there was a complete technical understanding for conducting the assessment.

4.5.2 Existing Conditions

The following methods of data collection, as outlined in the AAIR, have been used to inform the description of exiting conditions for the Groundwater VC:

- Desktop review of provincial and regional information sources
- Information from site investigations and data collection efforts, including:
  - Annual groundwater monitoring program (Matrix 2019, Appendix 4)
  - Hydrogeologic Siting Suitability Investigation (Clifton 2002, Appendix 5)

Data from these sources provide an appropriate baseline for assessing the effects of the proposed Project on groundwater. The groundwater monitoring network of 14 active wells includes a quarterly groundwater monitoring and sampling program, which would identify potential effects of seasonality. The groundwater monitoring well locations were chosen based on groundwater flow directions and the potential for impact to groundwater quality associated with onsite facilities. Pre-2012 data from monitoring well BH-103, located upgradient near the southeast corner of the proposed Project expansion area, were used to determine background conditions for the property. Leachate and leak detection system samples have been collected in conjunction with the groundwater monitoring sampling events (Matrix 2019, Appendix 4). An evaluation of the effectiveness of the leachate collection and containment system typically involves comparing the results of the leachate samples to that of the groundwater samples to determine if groundwater has been impacted by leachate.

The following subsections summarize available information on existing conditions of groundwater within the spatial boundaries defined for the Groundwater VC in Section 4.5.1.1.

4.5.2.1 Environmental Context

The proposed Project expansion is underlain by flat-lying sedimentary rock of the Upper Cretaceous Dunvegan Formation (BC Geological Survey 2018; Church and Ryder 2010). The Dunvegan Formation is composed of light grey to yellow-grey sandstone interbedded with laminated siltstone and dark grey shale (Prior et al., 2013). The local surficial geology is composed of a thin clay unit that overlies a thick clay till unit (Matrix 2019). The primary soil parent material is glacial till and fine-textured Gray Luvisols are the dominant soil group with till and stony, silty clay being predominant (Church and Ryder 2010). A thin, patchy cover of lacustrine material may also be present (referenced in Metrix 2019). The overlying clay typically has a thickness between 1.5 and 3 m. The underlying clay till unit may extend to the maximum depth drilled of 20.7 mbgs (Matrix 2019, Appendix 4). Locally, shallow groundwater flow is likely directed to the northwest toward the Blueberry River under a hydraulic gradient of 0.03 mm (shallow) and 0.04 mm (deep) (Clifton 2002, Appendix 5); however, regional groundwater may flow south toward the Peace River. Groundwater monitoring results indicate the presence of a shallow groundwater depth ranging from

1.3 m to 8.5 m below surface at the property (Matrix 2019). Field response tests at the site indicate an estimated hydraulic conductivity of the clay till unit to range from 3 x 10^{-7} to 8 x 10^{-7} m/s (Clifton 2002, Appendix 5). Based on the results of the Hydrogeologic Siting Suitability Investigation (Clifton 2002, Appendix 5), near surface soils have low hydraulic conductivity and no aquifers identified as a groundwater resource are located below or within several kilometers of the existing landfill and proposed Project expansion (Clifton 2002; Appendix 5).

The property is considered suitable for the proposed Project expansion based on the following results of the Hydrogeologic Siting Suitability Investigation (Clifton 2002, Appendix 5):

- The site meets all siting requirements in the BC HWR with an engineered design of a liner and leachate collection system to mitigate potential seepage issues
- No major drainage courses are present in the vicinity of the site; there is an ephemeral stream 100 m northwest of the storm retention pond of the existing landfill
- The near surface soils (0 m to 20 m below surface) have a low hydraulic conductivity
- No appreciable groundwater resource has been identified below the site (within 20 m of surface) or within several kilometres of the site

As part of a hydrogeological study conducted for the property (Clifton 2002, Appendix 5), groundwater was sampled and analyzed for general chemistry, metals, hydrocarbons, phenols, and PAHs. The groundwater was characterized as a “sulphate type water with no dominant cation”. Total dissolved solids concentrations ranged between 1,160 mg/L to 7,060 mg/L and is considered “brackish”. Hydrocarbons, phenols, and PAHs were absent (nondetect) in the samples collected, while metals analytes were generally detected. Clifton (2002) indicates that the concentrations measured in groundwater are indicative of natural background conditions, and that the groundwater would not be suitable for potable use because of high sulphate, sulphide, and total dissolved solids concentrations (Appendix 5).

Matrix (2019) conducted a water well search through the BC Water Resources Atlas. Four water wells were identified within 5 km of the proposed Project expansion. One well is located 0.3 km south-southeast of the existing landfill and is used for nondomestic purposes and owned by Tervita. Two wells are located 2.5 km to the east, owned by Leucrotta Exploration Inc., and used for monitoring. The fourth well is a domestic well owned by the BC Railway Company, and is located 4 km to the northwest.

4.5.2.2 Groundwater Monitoring

The existing groundwater monitoring well network was evaluated for its continued suitability for identifying impact on groundwater quality for the proposed Project expansion. Regular groundwater monitoring has been conducted at the existing landfill before and after site commissioning. The current groundwater monitoring well network consists of 14 active monitoring wells located in the landfill area, including a background monitoring well, which is located hydraulically upgradient of the landfill and onsite facilities. Refer to Appendix 4 for locations and detailed descriptions of these monitoring wells. All monitoring wells were designed to evaluate the characteristics of shallow and, in some areas, deep groundwater in the unconsolidated surficial deposits. Well data identify two stratigraphic units at the landfill site: Unit A comprises a thin layer of clay and overlays Unit B, which comprises primarily clay till.

The groundwater monitoring network has been divided based on the potential for impact to groundwater quality associated with onsite facilities and groundwater flow directions, and to establish background groundwater conditions hydraulically upgradient of the landfill area. Well data collected over the operational phase of the existing landfill indicates groundwater levels have remained relatively consistent throughout the monitoring periods, though there have been marginal increases and decreases recorded. For example, the hydrogeological study completed in 2002 encountered a shallow water table ranging from 1.8 to 3.8 mbgs, which is generally consistent with annual groundwater monitoring reports completed during operations (for example, EBA 2009, 2010; Matrix 2015; NLR/AE 2012, 2013).

The horizontal groundwater velocity beneath the landfill is estimated to be less than 0.3 to 0.4 m per year and is consistent with historical calculations. Well data also indicate shallow groundwater flow direction is

to the northwest (Clifton 2002; Matrix 2017). In 2018, shallow groundwater beneath the site was interpreted to flow toward the northwest with an estimated horizontal groundwater velocity of less than 1 m per year. Groundwater beneath the landfill generally shows recharge conditions (Matrix 2019). In 2018, there was one exceedance for fluoride during one sampling event. All other analyzed parameters were less than CSR standards for all nonbackground monitoring wells (Matrix 2019).

4.5.2.3 Leachate Management

To prevent impacts to groundwater from operations, the existing landfill is lined and equipped with a leachate collection and leak detection system. The proposed Project expansion landfill cells will be lined and connected to the existing leachate collection and leak detection systems. Testing of the leachate collection and leak detection systems is conducted concurrently with the groundwater monitoring program. Leachate samples from both systems are compared to the BC CSR, which has the most conservative water standards that are protective of freshwater aquatic life, livestock, irrigation watering, and drinking water use (Matrix 2019), and Protocol 21 for Contaminated Sites: Water Use Determination (Matrix 2019).

An evaluation of the effectiveness of the leachate collection and containment system typically involves comparing the results of the leachate samples to that of the groundwater samples to determine if groundwater has been impacted by leachate.

Per the existing landfill's BC MECCS permit, a groundwater monitoring program is conducted, and a summary report of the groundwater monitoring program is prepared annually (EBA 2009, 2010; Golder 2007, 2008; Matrix 2004, 2015, 2017, 2019; NLR/AE 2012, 2013). The annual reports assess whether groundwater shows evidence of impacts from the landfill or if the groundwater quality is indicative of natural conditions. The reports also confirm that the leachate collection and leak detection systems are functioning as designed.

In 2018, results of monitoring and sampling program for groundwater and leachate collection and leak detection system of the existing landfill suggest that the current landfill leachate collection and containment system is operating effectively (Matrix 2019).

The proposed Project expansion will be incorporated into the existing groundwater monitoring program which provides an annual summary report and will be accommodated in accordance with any revised permit requirements. Additional background information on leachate management is provided under the Surface Water VC (Section 4.4.1.3).

4.5.3 Traditional Knowledge Shared

DRFN shared knowledge about the connectivity between waterways identified in the LAA for the proposed Project expansion and noted the importance of ensuring the water contamination did not occur. BRFN shared that the perceived safety value and quality of water, including taste and smell, is important to aboriginal values and requested that assessment of these qualities of water be conducted.

4.5.4 Groundwater Effects Assessment

4.5.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the proposed Project expansion on the Groundwater VC is based on the results of groundwater monitoring at the existing site, results of previous studies, and desktop review performed for the proposed Project expansion.

The proposed Project expansion is anticipated to interact with the Groundwater VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Excavation, construction of cells
- Leachate management, stormwater management, and ongoing monitoring

- Cell capping
- Postclosure maintenance and monitoring

Activities associated with construction, operations, closure/reclamation, and postclosure of the proposed Project expansion have the following potential effects on groundwater:

- Alteration of groundwater hydrogeology

- Contamination of groundwater due to accidental release of leachate

Table 4.5-2 identifies the potential effect of alteration of groundwater hydrogeology due to the proposed Project expansion on the Groundwater VC, as well as mitigation measures and potential residual effects. Accidental release of leachate during proposed Project expansion activities that may cause contamination of groundwater are assessed in the Accidents and Malfunctions Section (Section 9).

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in reducing or avoiding potential adverse effects on Groundwater VC (by using a phase approach in construction of landfill cells and by not using groundwater from the monitoring wells, respectively). These mitigation measures have been implemented at the existing landfill and are considered to have high effectiveness.

In addition to the summary of mitigation provided below, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 4.5-2. Groundwater – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure/Reclamation	Alteration of groundwater hydrogeology	Project footprint and LAA	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Minimization	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures
			• Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	Avoidance	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

4.5.4.2 Characterization and Significance of Potential Residual Effects

No potential residual effects have been identified for the Groundwater VC. Based on Tervita's experience constructing and operating the existing landfill, the potential adverse effects of the proposed Project expansion on the Groundwater VC are generally well-understood. Evidence at the existing landfill (refer to Appendix 4) indicates that Tervita's mitigation measures and construction practices are effective in preventing or reducing potential residual effects on the Groundwater VC. The existing landfill has mitigation measures in place that will be applied to the proposed Project expansion and the landfill design to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). With the implementation of appropriate mitigation and remedial measures, there are no potential residual effects predicted for the Groundwater VC.

Given that there are no identified residual effects, a characterization and evaluation of significance of residual effects is not warranted.

4.5.4.3 Cumulative Effects Assessment

No residual effects have been identified for the Groundwater VC, therefore, a cumulative effects assessment is not required.

4.5.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Groundwater VC, and no specific follow-up strategies have been identified. Monitoring of groundwater quality postconstruction will be integrated with current operations and incorporated with other routine operational monitoring activities that will be expanded for the proposed Project expansion. Operation monitoring activities include but are not limited to the implementation of mitigation measures provided in the Groundwater Monitoring Plan, the Leachate Management Plan, the Landfill Leak Detection Monitoring Plan, and the Emergency Preparedness and Response Plan. Tervita will adhere to additional construction or PCM, follow-up and reporting requirements required under Certificate Conditions.

4.6 Terrestrial Vegetation

Table 4.6-1 shows the subcomponents and KIs for the Terrestrial Vegetation VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.6-1. Terrestrial Vegetation Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Plant species of concern, including rare plant species and plant species used for traditional purposes • Vegetation communities of concern • Invasive plant species	• Loss of plant species of concern, including rare plant species and plant species used for traditional purposes • Loss of vegetation communities of concern • Vegetation uptake of contaminants from air quality and dust dispersion and deposition • Introduction or spread of Noxious weeds	• BC EAO Guidelines and original EAC Application. • Construction and operations are expected to have a minimal effect on terrestrial vegetation within the Project footprint as well as the surrounding areas. The proposed Project expansion site is previously disturbed from agricultural activity. • There is low natural vegetation diversity at the proposed Project expansion site and there is low potential for loss of plant species or ecological communities of conservation concern during construction activities. • Introduction or spread of Noxious weeds may occur during construction, operation, or closure activities. To minimize the spread of Noxious weeds, equipment is inspected and washed prior to mobilization and demobilization.

4.6.1 Assessment Boundaries

The following assessment boundaries have been defined for the Terrestrial Vegetation VC.

4.6.1.1 Spatial Boundaries

The spatial boundaries for the Terrestrial Vegetation VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as:

- LAA: A 100-m radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  Key considerations used to establish the spatial boundaries of the Terrestrial Vegetation LAA for the proposed Project expansion include the distance that edge effects to plant species and communities are expected to extend from a disturbed area. The spatial extent of changes in terrestrial vegetation composition may be affected by a number of factors. In one study, increased light was shown to allow the invasion of shade-intolerant vegetation up to 30 m (Ranney et al. 1981). Some tree species exhibit increased growth and regeneration within 30 to 60 m of clear-cut edges; however, depending on the species, tree mortality can also increase (Bannerman 1998). Within an old-growth Douglas-fir forest, air temperature and humidity were generally found to be influenced to a distance of 120 to 180 m in areas adjacent to a clear-cut edge, while soil temperature and moisture were influenced from 60 to 120 m from the edge (Chen et al. 1990). Forman et al. (2003) found that the greatest changes to microclimate and dust levels occurred within the first 30 to 50 m from road edges, while the greatest changes in hydrological function, salinity and nitrogen levels could extend 100 m from the disturbed area. Based on the above concepts, a 100-m-wide LAA, from the outside boundary of the landfill footprint was established to assess Project-related effects to terrestrial vegetation resources.

- RAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  Key considerations used to establish the spatial boundaries of the Terrestrial Vegetation RAA for the proposed Project expansion included the following:

  – The separation distance typically used to distinguish one rare plant population from another

  – The dispersal of non-native, invasive species to or from the footprint

  – Provision of baseline data and mapping sufficient to support accurate assessment of wildlife habitat resources within the respective LAA of that biophysical component

  – The footprint of the proposed Project expansion within a regional landscape context

  An Element Occurrence (EO) is the area of land or water in which a rare species or rare ecological community of conservation interest is or was present (BC MOE 2011, NatureServe 2002). EOs generally refer to a local population or metapopulation (NatureServe 2002). Although there are many factors which may be taken into account in determining individual EOs, the default minimum separation distance for plant species EOs is 1 km (NatureServe 2002, 2004). Although dispersal distances depend on a number of factors, many weed species produce large numbers of seeds that are wind dispersed (Forman et al. 2003). Forman et al. (2003) found that the spread of non-native, invasive species could extend up to 1 km from the disturbed area. A 1-km-wide Terrestrial Vegetation RAA corresponds with the Wildlife and Wildlife Habitat LAA for the proposed Project expansion, which will facilitate accurate mapping, modeling and assessment of wildlife habitat at a scale where it is most likely to be affected by proposed Project expansion construction and operations. The 1-km-wide Terrestrial Vegetation RAA will allow for a meaningful assessment of potential effects to plant species and vegetation communities of concern, as well as for the potential introduction or spread of Noxious weeds within a regional landscape context.

4.6.1.2 Temporal Boundaries

The temporal boundaries identified for the Terrestrial Vegetation VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.6.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Terrestrial Vegetation VC.

4.6.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Terrestrial Vegetation VC. Information on existing conditions was based on a desktop review and field surveys. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on vegetation are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review, meant that there was a complete technical understanding for conducting the assessment.

4.6.2 Existing Conditions

The following methods of data collection have been used to inform the description of existing conditions for the Terrestrial Vegetation VC:

- Desktop review of provincial and regional information sources
- Information from site investigations and data collection efforts (Appendix 6)
- Noxious weed information received from PRRD
- Soil sampling program for the PDMA (see Section 4.1.2.3 and Appendix 1 for the results of the soil sampling program)

Data from these sources provide an appropriate baseline for assessing the effects of the Project on terrestrial vegetation. Field surveys in June 2015 and June 2017 identified the vegetation present on the proposed Project footprint. No Noxious weeds were identified. While the primary effects on terrestrial vegetation will be confined to the proposed Project footprint, the pathways to potential vegetation uptake of contaminants from air quality and dust dispersion and deposition off the proposed Project footprint were considered in the soils, air quality, surface water, and groundwater sections. The proposed Project expansion is located within the Halfway Plateau Ecosection of the Central Alberta Upland Ecoregion of Canada (Ecological Stratification Working Group 1995) and is located in the BWBS BGC Zone of BC, within the moist, warm subzone (BWBSmw) (DeLong et al. 1991).

The proposed Project expansion will be constructed on land that is owned by Tervita and is located within the existing fenced boundaries of the operating landfill. There is low natural vegetation diversity within the Project footprint, as vegetation has been disturbed by past agricultural activities.

A vegetation field survey was conducted for the proposed Project expansion on June 24, 2015 (see the Vegetation Survey Report in Appendix 6). The majority of the Project footprint is located within a hayfield, with a young aspen-rose-creamy peavine forest at the eastern edge. The hayfield is dominated by common timothy grass (*Phleum pratense*) and clover (white clover [*Trifolium repens*] and alsike clover [*Trifolium hybridum*]). The young aspen-rose-creamy peavine forest at the eastern edge of the Project footprint is characterized as a zonal ecosystem in the BWBSmw (101$4B) in a pole/sapling structural stage. The forests to the south of the Project footprint (greater than 100 m from the Project footprint boundary) are also dominated by young aspen-rose-creamy peavine forests (BWBSmw/101$5B) with remnant patches of white spruce-trailing raspberry-step moss forests (BWBSmw/1015M) ranging between 60 and 80 years old.

A moist, shrubby area was observed at the eastern side of the Project footprint, composed of willows (*Salix* spp.), alder (*Alnus incana*), and bluejoint reedgrass (*Calamagrostis canadensis*). Wet swales were evident; however, they were dry during the time of the field survey.

The Project footprint was visited again in June 2017 for wildlife surveys and the same vegetation communities and composition were observed at that time (that is, no plant species/vegetation communities of conservation concern or Noxious weeds); however, patches of forest harvesting (logging) and wildfires had occurred since 2015 in the northeast portions of the LAA and RAA.

4.6.2.1 Plant Species and Vegetation Communities of Concern

There is low potential for plant species and/or vegetation communities of concern to occur within the Project footprint, since the land has been previously disturbed for agricultural activities. Plants used for traditional purposes are assessed in Section 6.1. No occurrences of plant species or vegetation communities of concern were observed in the Project footprint or the LAA during the field surveys conducted for the proposed Project expansion. Therefore, plant species and vegetation communities of concern are not considered further in the assessment.

4.6.2.2 Invasive Plant Species

No occurrences of Noxious weeds or invasive plants were observed in the Project footprint or LAA during the field surveys conducted for the proposed Project expansion. The hayfield is mainly composed of agronomic species, with a mix of non-native and native plants.

4.6.3 Traditional Knowledge Shared

DRFN reported that they actively pick and harvest berries, medicinal plants, and other plants and fungi throughout their traditional territory. Culturally important species include lily pads, spruce gum, devils club, Labrador tea and yarrow. BRFN requested that spatial distribution of vegetation losses, and landscape changes be included as KIs of changes in terrestrial vegetation,

4.6.4 Terrestrial Vegetation Effects Assessment

4.6.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification of the potential effects of the proposed Project expansion on the Terrestrial Vegetation VC is based on the results of the desktop assessment for the proposed Project expansion, as well as information from field surveys.

The proposed Project expansion is anticipated to interact with the Terrestrial Vegetation VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Cell capping
- Postclosure maintenance and monitoring

Table 4.6-2 identifies the potential effects of the proposed Project expansion on the Terrestrial Vegetation VC, as well as mitigation measures and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. Given the nature of activities associated with the proposed Project expansion with regards to potential adverse effects to terrestrial vegetation, avoidance and restoration are not directly applicable; therefore, mitigation measures have focused on minimization. As the majority of these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on the Terrestrial Vegetation VC. Seeding and weed control measures, as well as those mitigation measures involving inspections, require a time lag before they function effectively in reducing potential adverse effects on the Terrestrial Vegetation VC.

Moderate effectiveness is expected for measures to reduce idling of equipment and for equipment to use low-sulphur diesel because these measures can practicably be applied to only certain types of equipment (for example, idling is necessary for some equipment to function properly under extreme cold weather). Using a cover crop to assist in weed and erosion control, where warranted, is expected to have a moderate effectiveness as establishment of cover crop would depend on site conditions. Other mitigation measures described in Table 4.6-2 have high effectiveness as observed at the existing landfill.

In addition to the summary of mitigation provided herein, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 4.6-2. Terrestrial Vegetation – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Introduction or spread of Noxious weeds	Project footprint	• Areas of Noxious weeds/invasive plants (as designated on Schedule A of the *Weed Control Regulation*) will be noted during weekly inspections, especially during times of high vegetation growth (May-August).	Minimization	During all Project phases	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• To supplement the list of Noxious and invasive plants, the PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants.	Minimization	During all Project phases	High	
			• If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs.	Minimization	Immediate	High	
			• To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). Prior to mobilization and demobilization, construction equipment will be cleaned. Any equipment leaving site will utilize the following tools to remove soil prior to exiting: – Track shovels – Brooms – Air Compressor (if available).	Minimization	Immediate	High	
			• When seed is being used for re-vegetation at site, best efforts will be made to source local seed in consultation with local First Nations to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot.	Minimization	Immediate	High	
Construction, Operations, Closure/Reclamation, and Postclosure	Vegetation uptake of contaminants from air quality and dust dispersion and deposition	Air Quality RAA	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events.	Minimization	Immediate	High	Loss or alteration of native vegetation
			• Contractor will confirm that equipment is well-maintained	Minimization	Immediate	High	
			• Reduce idling of equipment, where possible.	Minimization	Immediate	Moderate	
			• Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized.	Minimization	Immediate	High	
			• Equipment to use low sulphur diesel, as appropriate.	Minimization	Immediate	Moderate	
			• Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	Minimization	Immediate	High	
	Loss or alteration of native vegetation	Project footprint	• Tervita will seek to reduce disturbance to native vegetation to the extent possible.	Minimization	Immediate	High	Loss or alteration of native vegetation
			• Use a cover crop to assist in weed and erosion control where warranted.	Minimization	During all Project phases	Moderate	
			• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Minimization	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

Note:
IAPP = Invasive Alien Plant Program

4.6.4.2 Characterization and Significance of Potential Residual Effects

Construction, operations, closure, and postclosure activities have the potential to contribute to the introduction or spread of Noxious weeds. No occurrences of Noxious weeds or invasive plants were observed in the Project footprint or LAA during the field surveys conducted for the proposed Project expansion. As identified in Table 4.6-2, if areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. In addition, to prevent the spread of Noxious weeds, Tervita vehicles and equipment will be cleaned as best as possible (before entering/exiting the landfill). Prior to mobilization and demobilization, construction equipment will be cleaned. Any equipment leaving the site will utilize various tools to remove soil prior to existing. Since no occurrences of Noxious weeds or invasive plants were observed during the field surveys with the implementation of the mitigation measures identified in Table 4.6-2, no residual effects on the introduction and spread of Noxious weeds are anticipated; therefore, a characterization of significance of residual effects is not warranted.

Residual adverse effects on the Terrestrial Vegetation VC identified in Table 4.6-2 include loss or alteration of native vegetation.

Table 4.6-3 provides a summary of the significance evaluation of the residual effect associated with the Terrestrial Vegetation VC during proposed Project expansion activities and considers the probability for significance in the evaluation as outlined in Section 3.

Table 4.6-3. Residual Effects Significance Evaluation for the Terrestrial Vegetation Valued Component

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Loss or alteration of native vegetation	Project footprint	Short to extended-term	Infrequent to Continuous	Reversible	Low	High	High	Not significant

A minor loss or alteration of native vegetation on the eastern edge of the Project footprint will result from construction and operations of the proposed Project expansion. Approximately 2.2 ha of a young aspen forest habitat located along the eastern edge of the Project footprint may be directly disturbed by proposed Project expansion construction and operations. In addition, there is potential for construction, operations, and closure activities to lead to vegetation uptake of contaminants from air quality and dust dispersion and deposition. Since pathways to contamination are considered in the soils, air quality, surface water, and groundwater sections, it would be duplicative to also assess this pathway in the vegetation section. As discussed in Section 4.2, the mitigation measures outlined in the Air Quality Monitoring and Dust and Odour Control Plan are expected to reduce the severity of Project-related air emissions such that it is predicted that there will be insignificant additional loading of dust and contaminants in the Air Quality RAA. With the implementation of mitigation measures, vegetation uptake of contaminants from air quality and dust dispersion and deposition is expected to be negligible. Construction and operations are expected to have a minimal effect on terrestrial vegetation within the Project footprint as well as the surrounding areas. Areas prone to erosion will be seeded with an appropriate native seed mix or cover crop.

The residual effect of construction and operations of the proposed Project expansion on the loss or alteration of native vegetation is reduced by limiting the area of disturbance (by expanding an existing operating landfill, overlapping existing disturbances, and using existing access). With implementation of the mitigation to reduce effects on soil, air quality, low-lying wet habitats and wildlife (Sections 4.1, 4.2, 4.4, and 4.8), the residual effect of construction and operations of the proposed Project expansion on the loss or alteration of native vegetation is predicted to be low magnitude. Effects on native vegetation associated during construction or specific operations activities are short-term in duration and infrequent.

Effects on native vegetation resulting from ongoing operations are extended term duration and continuous frequency. Consequently, with a high level of confidence, the proposed Project expansion's residual effect of loss or alteration of native vegetation is not significant (Table 4.6-3, point [a]).

4.6.4.3 Cumulative Effects Assessment

The predicted adverse residual effect of loss or alteration of native vegetation was considered in the cumulative effects assessment for the Terrestrial Vegetation VC. However, it should be noted that the potential for cumulative effects is limited as there are no reasonably foreseeable projects identified within the Terrestrial Vegetation RAA (see Tables 3.9-1 and 3.9-2 and Figure 3.9-2). Cumulative effects on the Terrestrial Vegetation VC would be caused mainly by ongoing operational activities at the existing landfill and nearby forestry operations.

4.6.4.4 Loss or Alteration of Native Vegetation

The proposed Project expansion will act in combination with the existing landfill and nearby forestry operations to result in the cumulative loss or alteration of native vegetation within the Terrestrial Vegetation RAA.

Existing activities and developments in the Terrestrial Vegetation RAA that have contributed to cumulative changes in native vegetation composition include forestry cutblocks, existing rights-of-way and associated facilities (for energy transmission, and oil and gas), and roads for industrial use. The proposed Project expansion will contribute to cumulative alteration of natural vegetation by disturbing approximately 2.2 ha during operation when cells are constructed along the east margins of the Project footprint. In the Terrestrial Vegetation RAA, forestry activities are the currently accepted and desired land use for these regions, by the TSA, where the current AAC is 2,115,000 m^3 (see Section 6.1.2 for details). A site visit in 2017 confirmed recent logging and wildfire activity had occurred in the northeast portion of the Terrestrial Vegetation LAA. It is assumed that forestry activities and associated traffic will occur concurrently with the proposed Project expansion within the Terrestrial Vegetation RAA to result in the potential loss or alteration of native vegetation.

Tervita will implement mitigation in Table 4.6-2 to reduce the proposed Project expansion's contribution to cumulative loss or alteration of native vegetation. It is expected that other industries such as forestry in the Terrestrial Vegetation RAA will implement industry standard mitigation to reduce or avoid loss or alteration of native vegetation.

The predicted cumulative effect on native vegetation resulting from existing activities in combination with the proposed Project expansion and reasonably foreseeable developments is low magnitude and not significant, and is likely to persist with or without the proposed Project expansion. With a high degree of confidence, the proposed Project expansion's contribution to the cumulative effect is negligible in magnitude at the regional scale. No mitigation beyond the Project-specific mitigation already recommended in Table 4.6-2 is warranted.

4.6.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. The implementation of the Noxious Weeds Plan and the Vegetation Management Plan will reduce the potential loss or alteration of native vegetation.

4.7 Fish and Fish Habitat

Table 4.7-1 shows the subcomponents and KIs for the Fish and Fish Habitat VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.7-1. Fish and Fish Habitat Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Fish species of management interest and their habitat, including fish species of concern to Aboriginal groups	• Change in habitat (including possible effects to the food chain, such as effects to invertebrates through contamination or loss of habitat that have an effect on fish species of management interest and fish species of concern to Aboriginal groups)	• Fish species of management interest and their habitat was identified as a subcomponent to include species of fish that contribute to commercial, recreational or Aboriginal fisheries as defined in the *Fisheries Act*, as well as fish species of conservation concern that are listed by the COSEWIC or under the *SARA* as Endangered, Threatened, or Special Concern, or Red or Blue-listed provincially.
• Fish species of management interest and their habitat, including fish species of concern to Aboriginal groups (cont'd)	• Change in mortality risk	• There is potential for contamination of surface water by the proposed Project expansion due to stormwater runoff during construction, operations and closure. Contaminated surface water has the potential to impact fish, if contaminated water reaches watercourses or drainages that support fish. • There is an ephemeral drainage near the Project site, however, no fish have been documented in this drainage and the nearest documented fish presence is approximately 6 km downstream of the Project site.

Notes:

COSEWIC = Committee on the Status of Endangered Wildlife in Canada
SARA = *Species at Risk Act*

4.7.1 Assessment Boundaries

The following assessment boundaries have been defined for the Fish and Fish Habitat VC.

4.7.1.1 Spatial Boundaries

The spatial boundaries for the Fish and Fish Habitat VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as:

- LAA: A 500-m radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  Fish habitat is not expected to be physically affected by the proposed Project expansion, since there are no watercourses or drainages located where they will be physically affected by the proposed Project expansion construction and operations.

  Fish and fish habitat could be affected if contaminated water leaves the proposed Project expansion site. The Fish and Fish Habitat LAA is, therefore, based on the Surface Water LAA, which includes the area within 500 m of the proposed Project expansion site. The Fish and Fish Habitat LAA includes those portions of drainages or watercourses that lie within the Surface Water LAA. The Fish and Fish Habitat LAA does not extend downstream of the area encompassed by the Surface Water LAA, since all drainages in the vicinity of the proposed Project expansion site are first order drainages and likely to be dry or contain little water most of the year. In addition, monitoring of surface and groundwater movement at and around the proposed Project expansion site will allow early detection of potentially contaminated water leaving the site and allow its retention and treatment within boundary of the LAA.

- RAA: The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the proposed Project expansion site.

  The Fish and Fish Habitat RAA is the same as the Surface Water RAA as potential cumulative effects to fish and fish habitat will occur by the same mechanisms, and in the same potential area as cumulative effects to surface water.

4.7.1.2 Temporal Boundaries

The temporal boundaries identified for the Fish and Fish Habitat VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.7.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Fish and Fish Habitat VC.

4.7.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Fish and Fish Habitat VC. Information on existing conditions was based on a desktop review and field surveys. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on vegetation are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review, meant that there was a complete technical understanding for conducting the assessment.

4.7.2 Existing Conditions

The following methods of data collection have been used to inform the description of existing conditions for the Fish and Fish Habitat VC:

- Desktop review of provincial and regional information sources.
- Information from site investigations, ongoing surface water discharge analytical data at the existing facility and data collection efforts.
- Drainage patterns within the Fish and Fish Habitat RAA are primarily dendritic. The proposed Project expansion is located in the Blueberry River Watershed, a sub-basin of the Beatton River system. The Blueberry River and its tributaries originate on the plateau uplands within the Halfway Plateau ecosection of northeastern BC. Aquatic habitats are typically characterized by low to moderate gradient riffle/pool structures and gravel/cobble substrates with a high proportion of fines (DES 2002).

Data from these sources provide an appropriate baseline for assessing the effects of the Project on fish and fish habitat. As identified in the Hydrogeologic Siting Suitability Investigation (CCS 2002), drainage patterns within the Fish and Fish Habitat RAA are primarily dendritic. There is no direct discharge of surface water to water bodies, and no known channel connections exist between the proposed Project expansion and nearby fish-bearing water bodies (CCS 2002).

The proposed Project expansion is located in the Blueberry River Watershed, a sub-basin of the Beatton River system. The Blueberry River and its tributaries originate on the plateau uplands within the Halfway Plateau ecosection of northeastern BC. Aquatic habitats are typically characterized by low to moderate gradient riffle/pool structures and gravel/cobble substrates with a high proportion of fines (DES 2002).

The Blueberry River and its tributaries support a variety of nonsportfish species including lake chub, longnose dace, white sucker, longnose sucker, redside shiner, slimy sculpin, spoonhead sculpin, troutperch, and flathead chub. Low seasonal flow rates, high summer temperatures, and high turbidity limit suitability for sportfish species. Only northern pike and Arctic grayling have been previously recorded in the watershed (DES 2002; GBC 2019a). Northern pike appear to exist at very low densities in the Blueberry River mainstem and the lower reach of larger tributaries. Arctic grayling distribution is restricted to isolated upper reach habitats, where reduced suspended sediment levels provide improved spawning and seasonal rearing potential (DES 2002).

The proposed Project expansion is located within the catchment area of a tributary to an unnamed tributary to the Blueberry River. This unnamed tributary is the nearest potentially fish-bearing watercourse, and is located approximately 1.5 km downstream of an ephemeral tributary at the northwest boundary of the proposed Project expansion site. In October 1994, Diversified Environmental Services conducted fish salvage sampling in the unnamed tributary and in its unnamed parent tributary nearby. White sucker, longnose sucker, lake chub, redside shiner and a single sub-adult norther pike were captured. Low to moderate seasonal rearing habitat is present for these species, however, over-wintering potential is severely limited by negligible winter flow (DES 2002; BC MECCS 2018b).

4.7.3 Traditional Knowledge Shared

DRFN reported that they fish for rainbow trout, speckled trout, grayling, whitefish, pickerel, salmon and jackfish in watercourses within their traditional territory.

BRFN requested that they be given an opportunity to provide traditional knowledge with respect to species presence, abundance and distribution. However, to date, BRFN has not provided traditional knowledge specific to fish and fish habitat.

4.7.4 Fish and Fish Habitat Effects Assessment

4.7.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

As per the Fisheries Habitat Assessment done during the original EAC application, the ephemeral tributary at the northwest corner of the existing landfill is nonfish-bearing, offering only seasonal connectivity to the unnamed tributary located approximately 1.5 km downstream (DES 2002). Consequently, there is no direct discharge of surface water to water bodies, and no known channel connections exist between the proposed Project expansion and nearby fish-bearing water bodies (CCS 2002).

As previously discussed under the Surface Water VC in Section 4.4., no deleterious effects to the environment from stormwater discharge or leachate contamination have been documented to date, and the proposed Project expansion will be incorporated into Tervita's existing annual surface water monitoring sampling and monitoring program. In consideration of the fish and fish habitat characteristics discussed, scope of proposed Project expansion operation and design, results of the previous habitat assessment (DES 2002) as well as results of the assessment on surface water in Section 4.4, the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.

4.7.4.2 Cumulative Effects Assessment

No residual effects have been identified for the Fish and Fish Habitat VC; therefore, a cumulative effects assessment is not required.

4.7.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Fish and Fish Habitat VC; therefore, a follow-up strategy is not required.

4.8 Wildlife and Wildlife Habitat

Table 4.8-1 shows the subcomponents and KIs for the Wildlife and Wildlife Habitat VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 4.8-1. Wildlife and Wildlife Habitat Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Moose • Other ungulates • Black bear • Furbearers (including species of importance to Aboriginal groups such as porcupine and beaver) • Mature and old-forest birds • Early seral forest birds • Western toad	• Change in habitat (including usage of mineral licks and changes to diet) • Change in movement and distribution • Change in mortality risk	• BC EAO Guidelines and original EAC Application. • Construction and operations may affect mammal, bird and amphibian wildlife species, including species at risk, through changes in habitat (for example, the removal or alteration of habitat), movement (for example, sensory disturbance that produces a barrier or filter to movement, or wildlife attraction to the Project Area), mortality risk (for example, vehicle collisions or increased human-wildlife conflict), and their interactions. Potential impacts may occur during construction, operation, or closure activities. The landfill will be fenced to help prevent wildlife interaction with operations. • The changes in habitat resulting from the proposed Project expansion may affect usage of nearby mineral licks. • The proposed Project expansion site will occur adjacent to the existing landfill footprint on land that was previously used for agriculture, therefore, potential for direct alteration of wildlife habitat is limited. Indirect habitat alteration may arise from noise, artificial light, dust, or surface water moving beyond the Project footprint. • With the increase in traffic volumes during construction phases, the potential risk of road kills for a number of species – particularly ungulates, small mammals and birds – is increased. However, Tervita has strict controls in place on speed limits to reduce the potential risk of road kills.

4.8.1 Assessment Boundaries

The following assessment boundaries have been defined for the Wildlife and Wildlife Habitat VC.

4.8.1.1 Spatial Boundaries

The spatial boundaries for the Wildlife and Wildlife Habitat VC are shown on Figures 3.2-1 and 3.2-2 and include the Project footprint as well as:

- LAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  Key considerations used to establish the spatial boundaries of the Wildlife and Wildlife Habitat LAA for the proposed Project expansion include the effects pathways, and available information on wildlife sensitivity to disturbance (for example, zones of influence, setback distances).
- RAA: A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  Key considerations used to establish the spatial boundaries of the Wildlife and Wildlife Habitat RAA for the proposed Project expansion included the following:

  – Biologically relevant spatial scale at which management of wildlife species occurs.

  – Home range and dispersal distance of wildlife species.

– The species likely to occur within the proposed Project expansion area with the largest home ranges and territories are black bear, moose and elk. The home ranges of each of these species vary between individuals and seasons; however, the Wildlife and Wildlife Habitat RAA encompasses the average movements for each of these species (moose: Doerr 1983; Gillingham and Parker 2008; elk: Gillingham and Parker 2008; black bear: Blood 2001), and therefore, is likely to allow for a meaningful assessment of potential effects to wildlife species and wildlife habitat within a regional landscape context.

4.8.1.2 Temporal Boundaries

The temporal boundaries identified for the Wildlife and Wildlife Habitat VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

4.8.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Wildlife and Wildlife Habitat VC.

4.8.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Wildlife and Wildlife Habitat VC. Information on existing conditions was based on a desktop review and field surveys. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on vegetation are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review, meant that there was a complete technical understanding for conducting the assessment.

4.8.2 Existing Conditions

The following methods of data collection have been used to inform the description of existing conditions for the Wildlife and Wildlife Habitat VC:

- Desktop review of provincial and regional information sources
- Site investigations and data collection efforts (Appendices 7, 8, 9, and 10)
- Soil sampling program for the PDMA
- Traditional Knowledge information

Data from these sources provide an appropriate baseline for assessing the effects of the Project on wildlife and wildlife habitat. Field surveys were conducted using standard protocols during summer, late winter, early winter and spring, providing data on the presence of wildlife in different seasons. The results of the desktop review combined with the field surveys have gathered enough data to provide a thorough understanding of the existing conditions to inform the assessment.

The proposed Project expansion is located in the BWBS BGC Zone (Meidinger and Pojar 1991) within the PRRD. The proposed Project expansion will be constructed on land that is owned by Tervita and is located within the existing fenced boundaries of the operating landfill. There is low natural vegetation diversity within the Project footprint, as vegetation has been disturbed by past agricultural activities. Land uses in the area include agriculture and oil and gas activity.

The proposed Project expansion is not located within any provincially identified wildlife areas (for example, UWR or WHA) (GBC 2019b; BC MFLNRORD 2018c). The proposed Project expansion is not located within any Parks and Protected Areas (GBC 2019b), Important Bird Areas (Bird Studies Canada and Nature Canada 2004-2010), Migratory Bird Sanctuaries (ECCC, 2017), National Wildlife Areas (ECCC 2018), Western Hemisphere Shorebird Reserves (WHSRN 2018), or Ramsar wetlands (Bureau of the Convention on Wetlands 2016).

The following wildlife surveys were completed for the proposed Project expansion:

- An Early Summer Wildlife Survey on June 24, 2015 (Appendix 7)
- An Early-mid Winter Snow Tracking Survey on January 24 and 25, 2017 (Appendix 8)
- A Late-winter Snow Tracking Survey on March 13 and 14, 2017 (Appendix 9)
- A Spring Breeding Bird and Amphibian Survey on June 9, 13, and 30, 2017 (Appendix 10)

4.8.2.1 Winter Track Surveys

Winter track surveys were used to collect information on the presence, distribution, relative abundance, and habitat associations of mammals and upland bird species in the Project footprint and adjacent areas. A total of 13 wildlife species (that is, deer, elk, moose, coyote, lynx, black bear, marten/fisher, weasel/ermine, snowshoe hare, red squirrel, mouse/vole, grouse *sp.* and raptor/owl *sp*.) or their sign were observed during the early-mid and late-winter wildlife surveys. No species of conservation concern were conclusively observed during the surveys (that is, marten/fisher tracks were observed, but it is not possible to confirm which species). Notably, fewer tracks were observed overall during the late-winter survey than during the early to mid-winter survey in January 2017. Mammal tracks that were observed during the surveys included moose, deer, coyote, lynx, marten/fisher, weasel/ermine, snowshoe hare, red squirrel, and mouse/vole. The most abundant tracks observed were snowshoe hare. Photos of selected tracks are provided in Appendix A of the winter reports (Appendices 8 and 9).

4.8.2.2 Spring/Summer Surveys

The wildlife surveys conducted in June 2015 (Appendix 7) and 2017 (Appendix 10) were completed in the proposed Project expansion footprint and adjacent areas to document wildlife and wildlife sign (for example, scat, browse, tracks, cavity nests, stick nests, etc.). In addition, areas of potential interest beyond the Project footprint were investigated (for example, game trails, riparian areas). The areas surveyed were reviewed for their potential to support species with special conservation status, as well as to provide comment on the proposed Project expansion footprint from a wildlife and wildlife habitat perspective.

Breeding bird point count surveys were conducted during both surveys to collect information on the presence of breeding bird species and information on habitat use. A total of 36 and 23 bird species were observed during the June 2015 and 2017 surveys, respectively. Most commonly observed bird species were black-and-white warblers (observed primarily in forested areas), Wilson's warblers and white-throated sparrows (observed in both forest and shrubby habitats), and savannah sparrows (observed primarily in the hayfield). A Canada warbler, listed as Threatened under Schedule 1 of *SARA* and by COSEWIC, was heard during the 2015 survey; and one raptor was visually observed, a northern harrier foraging over a hayfield. One nightjar species, the common nighthawk, was observed taking off from the ground in the hayfield when flushed by the northern harrier. A red-tailed hawk was also observed during the 2017 survey.

Four mammal species or their sign were observed during wildlife fieldwork in 2015 (Appendix 7). Moose, elk, and deer scat were observed in several locations, primarily in the shrubby margin between the forest

and the hayfield. One set of elk tracks were observed. Several red squirrel middens were observed in the forested area of the Project footprint.

Amphibian surveys were targeted at low-lying wet areas adjacent to the expansion area to expand the survey coverage beyond the areas checked in 2015. Juvenile western toads were observed in 2015 at the east edge of the Project footprint (Appendix 7). One of the goals of these spring surveys was to identify potential breeding habitat near the proposed Project expansion, including the possible habitat in a small shrubby low-lying area at the east edge of the Project footprint. A total of 22 amphibian surveys were conducted in June 2017 (Appendix 10). Amphibian surveys were conducted at eleven low-lying wet areas during the course of the June surveys, one location inside the Project footprint and nine outside the Project footprint. Two amphibian species were observed during the June 2017 site visits, including numerous wood frog tadpoles, juveniles and adults; and only one western toad juvenile observation. Wood frog tadpoles and adults were observed in all but low-lying locations during the site visits. The western toad was observed at the east edge of the Project footprint in the same low-lying ditch where the other toad was observed in 2015. No western toad breeding habitat was observed during the site visits in June 2015 or 2017.

4.8.2.3 Wildlife Species of Conservation Concern

No species of conservation concern were conclusively observed during the winter tracking surveys (that is, marten/fisher tracks were observed, but it is not possible to confirm which species).

Three species of conservation concern were observed during the wildlife field survey on June 24, 2015:

- Canada warbler (Blue-listed in BC, Threatened under Schedule 1 of *SARA* and by COSEWIC)
- Common nighthawk (Threatened under Schedule 1 of *SARA* and designated as Special Concern by COSEWIC)
- Western toad (Blue-listed in BC, Special Concern under Schedule 1 of *SARA* and by COSEWIC)

During the 2017 wildlife survey, one auditory, incidental observation of an olive-sided flycatcher (Blue-listed in BC, Threatened under Schedule 1 of *SARA* and designated as Special Concern by COSEWIC) was recorded on June 30 in the southeast corner approximately 100 m from the Project footprint.

4.8.3 Traditional Knowledge Shared

DRFN reported that hunting is an important activity throughout their traditional territory. Culturally important species include moose, caribou, elk, deer, sheep, goats, black and grizzly bear, furbearers, porcupine and grouse. In particular, caribou and moose are important species to DRFN. DRFN have observed declines in numbers of caribou and moose within their traditional territory and have also observed changes in the quality of the meat due to pollution, disease and an increase in parasites. DRFN reported that community members require access to healthy ecosystems that support the wildlife used for hunting and trapping.

DRFN recommended that Tervita assist in the reforestation of forested lands within the Local Effects Area to provide habitat for wildlife species and, also, requested that DRFN be included in the decisions about the vegetation that is planted during restoration to ensure that it benefits local wildlife. For example, specific species of berries, lichen and other plants are known to be grazed by caribou in different seasons. DRFN also recommended protection of areas of high habitat quality and best practices to avoid animal disturbance. In addition, DRFN provided mitigation measures for caribou including a rest period of 10 years for development in one third of the caribou range, a ban of industrial activity in caribou calving habitat, fencing of man-made licks and industrial sites like landfill sites, and establishing a monitoring program.

DRFN reported that based on the wildlife studies conducted that birds and amphibian species appear to be the most likely at highest direct risk of disturbance from the proposed Project expansion. DRFN

supports the recommendations of the study to conduct an amphibian salvage of frogs or toads within the Project footprint prior to construction and to conduct nest sweeps of the shrubby low-lying area in the southeastern corner before construction starts if vegetation clearing starts within the breeding bird window.

BRFN understands that the area is important for birds including the eared grebe. BRFN is concerned that additional lighting at dawn and dusk which are critical periods for migratory birds, may have effects on bird navigation and way-finding.

BRFN shared that the area is used by ungulates including moose, deer and elk. BRFN are concerned that animals browsing shrubs and using lick sites or getting water from areas immediately downstream and downgradient from the proposed Project expansion may become contaminated if the site is expanded. To capture wildlife activity in the area, BRFN recommended a minimum of four wildlife cameras to determine how moose and other ungulates are using these areas. These cameras were added by Tervita in September 2016.

BRFN expressed concerns that the wildlife and wildlife habitat VC is not disaggregated enough to identify those species of importance to BRFN such as moose. BRFN expressed concern that traditional knowledge has not been used to understand behaviours and movement patterns of wildlife of importance to BRFN, although BRFN did not share traditional knowledge related to this.

4.8.4 Wildlife and Wildlife Habitat Effects Assessment

4.8.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification of the potential effects of the proposed Project expansion on the Wildlife and Wildlife Habitat VC is based on the results of the desktop assessment for the proposed Project expansion, as well as information from field surveys.

The proposed Project expansion is anticipated to interact with the Wildlife and Wildlife Habitat VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Leachate management, stormwater management, and ongoing monitoring
- Cell capping
- Postclosure maintenance and monitoring
- Air quality and dust dispersion, deposition and vegetation uptake of contaminants

Table 4.6-2 identifies the potential effects of the proposed Project expansion on the Wildlife and Wildlife Habitat VC, as well as mitigation measures and potential residual effects. The potential effects include changes in wildlife habitat from direct and indirect effect pathways, changes in wildlife movement, and changes in wildlife mortality risk. Potential effects associated with water and air quality, including dust dispersion, deposition, and vegetation uptake of contaminants is considered in the assessment of indirect effects on wildlife habitat. Potential effects associated with wildlife health from contaminant exposure are further evaluated in Section 8 and the SLHHRA for the Project (refer to Section 4.2.4 in Appendix 11), which found the risk from soil, groundwater, and surface water pathways to be low or unlikely.

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. Mitigation measures to avoid potential adverse effects on the Wildlife and Wildlife Habitat VC include measures for avoiding interactions with wildlife. For example: Tervita will schedule construction activities outside of the migratory bird nesting period; an active landfill area will be fenced; all food and wastes will be stored and secured appropriately; feeding or harassment of livestock or wildlife will be prohibited; no firearms or pets are allowed on the Project site; and measures in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan to prevent sediment, contaminants, waste materials, or leachate from being released to surface or subsurface water outside of

the Project footprint will be applied. Other proposed mitigation measures, as described in Table 4.8-2, focus on minimizing potential adverse effects on the Wildlife and Wildlife Habitat VC, such as minimization of noise through proper maintenance of equipment onsite, and dust suppression.

As the majority of these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on the Wildlife and Wildlife Habitat VC. Using a cover crop to assist in weed and erosion control, where warranted, is expected to have a time lag and a moderate effectiveness as establishment of cover crop would require time and depend on site conditions. Other mitigation measures described in Table 4.8-2 are consistent with BMPs for reducing adverse effects to wildlife and wildlife habitat and are generally described as having high effectiveness.

In addition to the summary of mitigation provided below, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 4.8-2. Wildlife and Wildlife Habitat – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Loss or alteration of wildlife habitat	LAA	• Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive pre-construction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period.	Minimization	Immediate	High	Loss or alteration of wildlife habitat
			• Use a cover crop to assist in weed and erosion control, where warranted.	Minimization	During all Project phases	Moderate	
			• If previously unidentified wildlife species with special conservation status or their site-specific habitat (for example, dens and nests) are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented in consultation with a Wildlife Resource Specialist and the appropriate government authority, if applicable.	Minimization	Immediate	High	
			• Existing mitigation measures, such as dust suppression at the landfill, will be implemented for the proposed Project expansion, including the following: – Current mitigation measures will continue, such as occasional watering of roadways and curtailment of activity during high wind events. – Contractor will confirm that equipment is well-maintained. – Reduce idling of equipment, where possible. – Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. – Equipment to use low-sulphur diesel, as appropriate. – Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	Minimization	Immediate	High	
			• Implement measures in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan to prevent sediment, contaminants, waste materials, or leachate from being released to surface or subsurface water outside of the Project footprint.	Avoidance	Immediate	High	
	Changes to wildlife movement	LAA	• The active landfill area will be surrounded by a fence, as required by Section 8(a)(i) of the HWR, limiting wildlife interactions	Avoidance	Immediate	High	Changes to wildlife movement
			• All food and wastes will be stored and secured in vehicles or appropriate facilities.	Avoidance	Immediate	High	
			• Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis from 7 a.m. to 7 p.m.	Minimization	Immediate	High	

Table 4.8-2. Wildlife and Wildlife Habitat – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Increased wildlife mortality risk	LAA to RAA	• The feeding or harassment of livestock or wildlife will be prohibited. Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	Avoidance	Immediate	High	Increased wildlife mortality risk
			• Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive pre-construction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period	Avoidance and minimization	Construction	High	
			• If amphibians are found, Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities.	Minimization	Construction	High	
			• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site.	Minimization	Immediate	High	
			• All collisions (including wildlife) along the Project access road or within the Project site must be immediately reported to the Facility Manager. The root causes of the collision will be recorded and reasonably corrective measures will be put in place to try and prevent future collisions.	Restoration	Immediate	High	
			• Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks, or other releases from Project facilities and equipment.	Minimization	Immediate	High	
			• Any wildlife mortalities or injuries at the Project site will be documented.	Restoration	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

4.8.4.2 Characterization and Significance of Potential Residual Effects

Residual adverse effects on the Wildlife and Wildlife Habitat VC identified in Table 4.8-2 include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk during construction and operations.

Table 4.8-3 provides a summary of the significance evaluation of the residual effects associated with the Wildlife and Wildlife Habitat VC during proposed Project expansion activities and considers the probability for significance in the evaluation as outlined in Section 3.

Table 4.8-3. Residual Effects Significance Evaluation for Wildlife and Wildlife Habitat Valued Component

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Loss or alteration of wildlife habitat	LAA	Short to extended-term	Infrequent to Continuous	Reversible	Low	High	High	Not significant
b) Changes to wildlife movement	LAA	Short to extended-term	Infrequent to Continuous	Reversible	Low	High	High	Not significant
c) Increased wildlife mortality risk	RAA	Short to extended-term	Singe/ Rare	Reversible	Low	Low	Moderate	Not significant

4.8.4.3 Loss or Alteration of Wildlife Habitat

A minor loss or alteration of wildlife habitat will result from construction and operations of the proposed Project expansion. The Project footprint is predominantly located on previously disturbed land, mostly hayfield. Approximately 2.2 ha of a young aspen forest habitat located along the eastern edge of the Project footprint may be directly disturbed by proposed Project expansion construction and operations. Within the forested area, there is also a small, shrubby low-lying wet area located in the southeast corner of the Project footprint. Surrounding forest habitat is dominated by young aspen forest and remnant patches of mature spruce dominated forest. If vegetation clearing occurs in the breeding bird window of May 1 to July 31 (BC MFLNRORD 2014), Tervita will engage a qualified environmental professional(s) to conduct nonintrusive nest surveys prior to construction. The highest likelihood of amphibians occurring in the Project footprint is in the southeast quadrant where a small, shrubby low-lying wet area is present. Prior to any construction in this area, Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint, if activities will occur during the amphibian breeding period.

Indirect habitat alteration occurs when habitat is available; however, the quality or effectiveness of the habitat is changed such that wildlife avoid the habitat or reduce their use of it. Habitat effectiveness may be affected by noise, light and activity associated with proposed Project expansion construction and operations (for example, traffic and machinery use). Sensory effects on wildlife can potentially include habitat loss or reduced habitat effectiveness through avoidance, increased energy expenditure, changes in normal behaviours (for example, feeding) and impaired communication between individuals. Bayne et al. (2005) determined that the abundance of passerines is up to 1.5 times greater near noiseless energy facilities than areas in the vicinity of noise-producing facilities. However, different species and even individuals of a given species are expected to respond differently to sensory disturbances. Various factors affect an animal's response to sensory disturbances, such as noise level and frequency distribution, duration, number of events, rate of onset, level of existing ambient noise, time of year or day, animal activity and location, animal age, life stage and gender. Completing site preparation activities outside

sensitive nesting, breeding and rearing periods for wildlife, will reduce potential effects associated with sensory disturbance and reduced habitat effectiveness. Where construction activities will occur during the summer, pre-construction surveys will be conducted in areas of suitable habitat for active nests of migratory birds and other important wildlife habitat features (such as, amphibian breeding sites), and appropriate buffers will be implemented to avoid disturbance of active habitat features.

Reduced habitat effectiveness can occur as a result of fragmentation, creation of edges, or sensory disturbance (for example, noise, artificial light, proximity to facilities and infrastructure, human activity, and traffic). Habitat fragmentation can cause habitat to become unsuitable for species with large territories or home ranges (that is, patch sizes become too small), alter predator-prey dynamics (Gehring and Swihart 2003) and allow for increased invasive or parasitic species abundance (for example, cowbird parasitism of songbird nests near forest edges). By constructing the landfill directly adjacent to the existing, operating landfill on an area of existing disturbance, the proposed Project expansion's potential effects on habitat fragmentation and isolation of habitat patches will be avoided.

Indirect alteration of habitat may also result from changes in vegetation communities. For example, vegetation uptake of contaminants from air quality and dust dispersion and deposition (refer to Section 4.6.4) can affect the quality of wildlife forage or cover habitat. Change in water quality is another effect pathway that could cause indirect effects on habitat quality outside of the Project footprint. Amphibians are particularly sensitive to changes in water quality or increased siltation that may result from construction adjacent to low-lying wet areas. The highest likelihood of amphibians occurring in the Project footprint is in the southeast quadrant where a small, shrubby low-lying wet area is present. As previously described, an amphibian salvage permit will be obtained to salvage any potential frogs or toads from the Project footprint prior to construction. In addition, implementing the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan to prevent sediment, contaminants, waste materials, or leachate from being released to surface or subsurface water outside the Project footprint is expected to avoid or reduce potential effects from changes in water quality on wildlife habitat during construction and operations. While there is lighting at the existing facility, there is no anticipated change in indirect effects on wildlife habitat from artificial lighting, as the proposed expansion does not require additional lighting.

The residual effect of construction and operations of the proposed Project expansion on wildlife habitat is reduced by limiting the area of disturbance (by expanding an existing operating landfill, overlapping existing disturbances, and using existing access). With implementation of the mitigation to reduce effects on water quality, vegetation, and low-lying wet habitats (Sections 4.4, 4.6, and 4.8), the residual effect of construction and operations of the proposed Project expansion on wildlife habitat is predicted to be low magnitude. Effects on wildlife habitat associated with temporary reduction in habitat effectiveness during construction activities are short-term in duration and infrequent. Effects on habitat resulting from ongoing operations are extended term duration and continuous frequency. Consequently, with a high level of confidence, the proposed Project expansion's residual effect of wildlife habitat loss or alteration is not significant (Table 4.8-3, point [a]).

4.8.4.4 Changes to Wildlife Movement

By constructing the proposed Project expansion on predominantly disturbed land within Tervita's existing, operational landfill, changes to wildlife movement from increased access or fragmentation will be avoided. Habitat effectiveness can be reduced when factors such as sensory disturbance reduce the use of habitat that would otherwise occur in the absence of such factors. Species such as the Connecticut warbler, Canada warbler, LeConte's sparrow and Nelson's sharp tailed sparrow, which may find suitable nesting and foraging habitat in the vicinity of the proposed Project expansion site, may experience reduced habitat effectiveness through the construction and operations phases of the landfill. However, construction for the active landfill cells will be localized within Tervita's existing operational site and is scheduled to occur during the summer and fall period. Therefore, sensory disturbance to breeding birds in the proposed Project expansion vicinity is expected to be negligible. The only increase in sensory disturbance will be localized (that is, restricted to the activity of the active cell) and occur from landfill operations, however, the predicted increase in sensory disturbance is expected to be negligible when compared to existing operations.

With the Application of the recommended mitigation such as fencing and preventing attraction of wildlife to the construction site, limiting noise from the Project and avoiding increased lighting at the site, the predicted residual effect of proposed Project expansion construction on wildlife movement patterns will be low magnitude. Effects on wildlife movement associated with construction activities are short-term in duration and infrequent. Effects on wildlife movement resulting from ongoing operations are extended term duration and continuous frequency. There is a good understanding of cause-effect relationships and sufficient information pertinent to the proposed Project expansion area to conclude with a high degree of confidence that the predicted residual effect of wildlife movement is not significant (Table 4.8-3, point [b]).

4.8.4.5 Increased Wildlife Mortality Risk

The level of mortality risk that will occur due to proposed Project expansion construction activities will depend on the species guild. Clearing can create risk of mortality for wildlife that nest or den in trees and understory vegetation. Vegetation clearing and soil handling activities may affect mammals and amphibians that inhabit woody debris, litter and soil. With the slight increase in traffic volume attributed to the proposed Project expansion, the potential risk of road kills for a number of species, particularly ungulates, small mammals and birds, is increased.

Wildlife mortality risk caused by the proposed Project expansion will be mitigated in part by scheduling (for example, initiating clearing and constructing outside the migratory bird nesting period to prevent mortality of nesting birds and young). For any construction activities that will be completed during seasons when wildlife may be breeding or rearing in habitats within or adjacent to the Project footprint, mitigation includes conducting pre-construction surveys for evidence of occupied habitat, such as migratory bird nesting sites, and implementing an amphibian salvage in the event amphibians are observed on the Project footprint. Risk of wildlife mortality will be further mitigated by using multi-passenger vehicles to transport crews, limiting and enforcing vehicle speed limits, relocating wildlife observed on the Project footprint, properly managing waste storage and disposal, and fencing the operational area to avoid access by wildlife. Furthermore, Tervita will enforce a no firearms/no hunting policy for all Project personnel and contractors on the proposed Project expansion site.

The potential increase in wildlife mortality risk as a result of construction activities is low magnitude and of low probability. There is a good understanding of cause-effect relationships and sufficient information pertinent to the proposed Project expansion area to conclude with a high degree of confidence that the predicted residual effect of increased wildlife mortality risk is not significant (Table 4.8-3, point [c]).

4.8.4.6 Cumulative Effects Assessment

The predicted adverse residual effects of the proposed Project expansion on Wildlife and Wildlife Habitat that will potentially interact with existing and reasonably foreseeable developments and activities to have cumulative effects within the Wildlife and Wildlife Habitat RAA include:

- Changes to wildlife habitat
- Changes to wildlife movement

Since increased wildlife mortality risk was assessed as having a low probability of occurrence (see Table 4.8-3, point[c]), it is not considered likely to interact spatially or temporally with the proposed Project expansion to have a cumulative effect.

4.8.4.7 Cumulative Loss or Alteration of Wildlife Habitat

It is expected that the proposed Project expansion and existing and reasonably foreseeable developments described in Section 3.9 have the potential to act cumulatively to result in the loss or alteration of wildlife habitat within the Wildlife and Wildlife Habitat RAA.

Existing activities that have resulted in the loss or alteration of wildlife habitat in the Wildlife and Wildlife Habitat RAA include agriculture, forestry, oil and gas, energy transmission, and infrastructure such as roads and railways. These activities typically alter wildlife habitat by creating openings, early seral forests

and fragmenting habitat patches. The proposed Project expansion will contribute to cumulative alteration of natural vegetation by disturbing approximately 2.2 ha during operation when cells are constructed along the east margins of the Project footprint. There are no other reasonably foreseeable developments identified within the Wildlife and Wildlife Habitat RAA (see Tables 3.9-1 and 3.9-2 and Figure 3.9-2); however, existing developments and activities identified in Section 3.9.1.2 are expected to continue into the future. It is assumed that agriculture and forestry activities, existing and proposed oil and gas projects (such as, construction of wells and pipelines as well as ongoing operations and maintenance activities), and associated traffic will occur concurrently with the proposed Project expansion within the Wildlife and Wildlife Habitat RAA to result in the potential loss or alteration of wildlife habitat.

Tervita will implement mitigation in Table 4.8-2 to reduce the proposed Project expansion's contribution to cumulative loss or alteration of wildlife habitat. It is expected that other industries such as oil and gas operators in the Wildlife and Wildlife Habitat RAA will implement industry standard mitigation (such as, the *Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area* [BC MFLNRORD 2014]) to reduce or avoid loss or alteration of wildlife habitat.

The predicted cumulative effect on wildlife habitat resulting from existing activities in combination with the proposed Project expansion and reasonably foreseeable developments is low magnitude and not significant, and is likely to persist with or without the proposed Project expansion. With a high degree of confidence, the proposed Project expansion's contribution to the cumulative effect is negligible in magnitude at the regional scale. No mitigation beyond the Project-specific mitigation already recommended in Table 4.8-2 is warranted.

4.8.4.8 Cumulative Changes in Wildlife Movement

Displacement and sensory disturbance of wildlife resulting from proposed Project expansion construction and operations activities may act cumulatively with existing sources of auditory and visual disturbances, including agriculture, forestry, oil and gas, energy transmission, and infrastructure such as roads and railways in the Wildlife and Wildlife Habitat RAA, to cause wildlife to alter their movement patterns (that is, avoidance). There are no other reasonably foreseeable developments identified within the Wildlife and Wildlife Habitat RAA (see Tables 3.9-1 and 3.9-2 and Figure 3.9-2); however, existing developments and activities identified in Section 3.9.1.2 are expected to continue into the future. It is assumed that agriculture and forestry activities, existing and proposed oil and gas projects (such as, construction of wells and pipelines as well as ongoing operations and maintenance activities), and associated traffic will occur concurrently with the proposed Project expansion within the Wildlife and Wildlife Habitat RAA resulting in a cumulative interaction causing changes in wildlife movement.

The magnitude of the cumulative effect on wildlife movement patterns is considered low to moderate in the Wildlife and Wildlife Habitat RAA, where roads, a railway, cutblocks in various stages of regeneration, oil and gas exploration (seismic lines), agriculture, transmission lines, and pipeline rights-of-way are expected to influence movement patterns throughout the RAA. The proposed Project expansion is predicted to have a minor incremental contribution of the cumulative effects on wildlife movement patterns in the Wildlife and Wildlife Habitat RAA, given the proposed Project expansion is situated at Tervita's existing, operating landfill, the use of existing access, and mitigation provided in Table 4.8-2. Cumulative effects on wildlife movement from existing and reasonably foreseeable developments are expected to be managed through the implementation of best practices and mitigation (such as, the *Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area* [BC MFLNRORD 2014]).

The predicted cumulative effect causing changes in wildlife movement in the Wildlife and Wildlife Habitat RAA is low to medium magnitude and is not significant, and is likely to persist with or without the proposed Project expansion. With a high degree of confidence, the proposed Project expansion's contribution to the cumulative effect is negligible to low magnitude at the regional scale. No mitigation beyond the Project-specific mitigation already recommended in Table 4.8-2 is warranted.

4.8.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. The implementation of the Traffic Management Plan, Wildlife Management Plan, and the Night Time Light Management Plan will reduce the potential effect to wildlife.

5. Economic Effects Assessment

This section of the Application presents the assessment of the potential effects of the proposed Project expansion on the Economy VC during the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion.

The following subsection explains the selection process for the Economy VC, the associated subcomponents, and the KIs. The assessment boundaries for the Economy VC are described and existing conditions are summarized. The potential effects of the proposed Project expansion on the Economy VC has been identified, as measured with reference to the KIs. Proposed measures to mitigate or enhance the potential effects on the VC are also identified. Any residual effects on the VC have been characterized using the criteria set out in Section 3 of the AAIR and a determination of significance has been made. Any cumulative adverse effects likely to result from the residual adverse effects of the proposed Project expansion interacting with the residual adverse effects of past, present, and reasonably foreseeable developments have also been assessed.

5.1 Economy

Table 5.1-1 shows the subcomponents and KIs for the Economy VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 5.1-1. Economy Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Resource-based economy • Barter economy • Employment	• Economic activity levels in the LAA and RAA • Employment levels	• The Project is expected to benefit the economy in some ways, which will be discussed in the Application. • The proposed Project expansion has the potential to affect resource economic activities (for example, hunting, trapping). The landfill helps support the oil and gas industry by providing an economic and secure disposal option. First Nations and resource users in the area are being actively consulted to determine potential effects. • The closure of the landfill in the future has the potential to adversely affect employment levels. • Each subcomponent will consider effects to First Nations communities and the public.

5.1.1 Assessment Boundaries

The following assessment boundaries have been defined for the Economy VC.

5.1.1.1 Spatial Boundaries

The spatial boundaries for the Economy VC are shown on Figures 3.2-3 and 3.2-4 and include the Project footprint as well as:

- LAA – Includes municipalities and communities, including First Nations communities, where it can be reasonably expected that direct economic activities will be undertaken. These communities include BRFN, DRFN, the Community of Buick, and the City of Fort St. John.

  The spatial boundaries of the Economy LAA include communities where it was considered that economic and employment activities directly related to the proposed Project expansion will occur.

- RAA – The area within Electoral Area B of the PRRD.

  The spatial boundaries of the Economy RAA include the area where direct and indirect economic influences could overlap with the proposed Project expansion and cause cumulative effects on the KI.

5.1.1.2 Temporal Boundaries

The temporal boundaries identified for the Economy VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

5.1.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an Environmental Assessment. No administrative boundaries have been identified for the Economy VC.

5.1.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Economy VC. Information on existing conditions was based on a desktop review and Tervita's experience constructing and operating the existing landfill. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on the economy are generally well-understood and have predictable effects. This understanding, in conjunction with the results of the desktop review and available data, meant that there was a complete technical understanding for conducting the assessment.

5.1.2 Existing Conditions

The following methods of data collection have been used to inform the description of existing conditions for the Economy VC:

- Desktop review of economic activity in the LAA and RAA using provincial, regional, and municipal information sources

Data from these sources provide an appropriate baseline for assessing the effects of the Project on the economy. A desktop review of the economic activity in the LAA and RAA using provincial, regional, and municipal information sources provides appropriate data to inform the assessment of the effects of the proposed Project on the economy as it provides a snapshot of existing conditions. The economic benefits of the proposed Project are also well-understood.

5.1.2.1 Economic Context

Key industrial sectors in the Economy RAA primarily consist of oil and gas production, agricultural production and forestry. The proposed Project expansion is expected to contribute to the economic well-being of families and communities in the Economy RAA, and the type of proposed Project expansion activities described in Section 1.2 are compatible with employment and procurement activities and the local economies in the Economy RAA. The proposed Project expansion is expected to result in a positive interaction on the Economy VC.

The proposed Project expansion will, over more than 25 years of life, contribute millions of dollars in construction-related expenditures, labour income and employment, and taxes to the municipal, regional,

provincial, and federal governments. Construction expenditures are estimated to total approximately $43.5 million for all proposed cells. The operations phase expenditures are estimated to total approximately $3 million per year, and include regular maintenance and material expenditures, labour, and contracting. Costs associated with initial decommissioning and abandonment are estimated at approximately $7 to 8 million, and include activities such as soil and groundwater monitoring, leachate and stormwater testing, demolishing the office site, weigh scales, clay liners and berms, grading and contouring, erosion and dust control, topsoil replacement, seeding, and inspections. Annual costs associated with decommissioning and abandonment are estimated at $140,000, and include activities such as annual inspections and maintenance, soil and groundwater monitoring, laboratory testing of leachate and stormwater, dust control, mowing, and vegetation control. Reclamation requirements and associated costs will be determined during the decommissioning phase.

Currently, Silverberry pays a royalty of $0.90 per tonne of waste accepted per the *Waste Discharge Regulation*, which amounted to $269,199.73 in royalties in 2018. This revenue is expected to be similar for the proposed Project expansion if rates remain the same. The operations of the proposed Project expansion will also generate revenue in the form of property taxes. The construction of the proposed Project expansion will generate a demand for goods, services, and workers, which will contribute to the local and regional economy. There will be direct and indirect business income, and direct and indirect employment income. There will also be increased tax revenues during construction and operations as a result of sales tax and fuel tax, for example.

The proposed Project expansion will generate employment and contracting opportunities for Aboriginal and non-Aboriginal community members and businesses. The construction phase will require a workforce of approximately 20 personnel for 4 to 5 months to construct each cell, which is the equivalent to a total of 36 person-years for construction of all 6 proposed cells. The proposed Project expansion construction will provide most employment opportunities for local businesses and community members. Types of job requirements for landfill cell construction include an environmental and regulatory advisor, a landfill project manager, third-party landfill engineering firms, a construction crew, a liner crew, and an inspector. Although Tervita will make best efforts to hire locally, all major construction is sent out to bid and awarded to companies with appropriate experience versus cost. Companies are, however, typically Western Canadian. Tervita currently employs seven full-time personnel (175 person-years for the operations phase) residing in Fort St. John for operations and no additional full-time employment is expected to be generated for the proposed Project expansion.

5.1.2.2 Peace River Regional District

In 2016, the population of PRRD Electoral Area B was 5,628, an increase of 1.2 percent from 2011. In 2015, the number of total income recipients aged 15 years and over in private households was an estimated 3,505, with a median individual income of $36,036 and a median household income of $93,397. Approximately 70 percent of the total population in the PRRD Electoral Area B aged 15 years and over by labour force status, participated in the labour force and approximately 10.3 percent of the participating labour force was unemployed. In comparison, BC's employment provincial unemployment rate was 6.7 percent during the same year. Most common occupations by labour force are trades, transport and equipment operators and related occupations; management occupations; business, finance and administration occupations; followed by natural resources, agriculture and related production occupations. Most common industries by labour force are agriculture, forestry, fishing and hunting; mining, quarrying, and oil and gas extraction; followed by construction, retail trade and transportation and warehousing (Statistics Canada 2018).

Major employers in the PRRD include the school districts, Northern Health Authority, BC Hydro, energy, mining and forestry companies (PRRD 2018). While the PRRD has experienced strong economic growth, the residents recognize the importance of a balanced community, economy and environment. By expanding the existing landfill, Tervita will be able to continue providing a service to oil and gas operators in the region for the disposal of nonrecyclable wastes in a safe, environmentally responsible manner. In this way, and by constructing and operating the new landfill cells at Tervita's existing landfill site; the proposed Project expansion supports the economic goal established in the *North Peace Fringe Area Official Community Plan* of achieving a working balance that protects the well being, health and safety of

area residents, while ensuring a sustainable level of resource development (PRRD 2017). Refer to Section 1.2.5 for details of the proposed Project expansion's expected economic benefits.

5.1.2.3 City of Fort St. John

In 2016, the population of the City of Fort St. John was 20,155, an increase of 8.3 percent from 2011. In 2015, the number of total income recipients aged 15 years and over in private households was an estimated 15,055, with a median individual income of $48,851 and a median household income of $102,903. Approximately 79 percent of the total population in the City of Fort St. John aged 15 years and over by labour force status, participated in the labour force and approximately 10.8 percent of the participating labour force was unemployed. Most common occupations by labour force are sales and service occupations; trades, transport and equipment operators and related occupations; occupations in education, law and social, community and government services; business, finance and administration occupations; followed by natural and applied sciences and related occupations. Most common industries by labour force are construction; mining, quarrying, and oil and gas extraction; retail trade; accommodation and food services; health care and social assistance; followed by professional, scientific and technical services (Statistics Canada 2018).

Known as the "Energy Capital of BC", the City of Fort St. John is a major centre for the oil and gas industry in the region. Showing steady growth, Fort St. John is planning for further growth, working with industry to create a community that supports new energy projects and other resource projects (City of Fort St. John 2018a, 2018b). Guiding principles identified in the Official Community Plan include supporting a prosperous economy with a diverse cross-section of employment sectors, included oil and gas, while proactively ensuring development is delivered in a manner that has the least possible impact on areas of high natural value within and around the city (City of Fort St. John 2018b). By expanding the existing operating landfill on Tervita's existing, previously disturbed lands, Tervita will be able to continue providing a service to oil and gas operators in the region for the disposal of nonrecyclable wastes in a safe, environmentally responsible manner that aligns with guiding principles identified in the Official Community Plan. Refer to Section 1.2.5 for details of the proposed Project expansion's expected economic benefits.

5.1.3 Traditional Knowledge Shared

To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, no traditional knowledge has been shared by BRFN or DRFN in relation to economic effects.

5.1.4 Economic Effects Assessment

5.1.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the proposed Project expansion on the Economy VC is based on the results of results of previous studies and experience from the existing landfill, consultation and engagement, and professional judgement.

The proposed Project expansion is anticipated to interact with the Economy VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Leachate management, stormwater management, and ongoing monitoring
- Cell capping
- Postclosure maintenance and monitoring

Table 5.1-2 identifies the potential effects of the proposed Project expansion on the Economy VC, as well as mitigation measures and potential residual effects. Mitigation measures have been identified in a

manner consistent with Section 3.5 of this Application. The proposed Project expansion is anticipated to provide economic benefits. Mitigation measures described in Table 5.1-2 are enhancement measures that are considered to have high effectiveness in increasing local employment and local, provincial, and federal revenue. Except for the notification measure, which has an immediate effect, there will be a time lag for other enhancement measures described in Table 5.1-2 before their benefits are realized for local, provincial, and federal economy.

Table 5.1-2. Economy – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure/Reclamation	Increased contract procurement and employment opportunities	RAA	• Inform appropriate municipalities, Aboriginal groups and economic development agencies of the Project developments and workforce details, as warranted.	Enhancement	Immediate	High	Increased contract procurement and employment opportunities.
			• Engage with the local and regional business community to notify businesses of project contracting, subcontracting, and employment opportunities and requirements.	Enhancement	During all Project phases	High	
	Increased local, provincial and federal revenue	RAA	• Increase government revenue by promoting local labour income and expenditure.	Enhancement	During all Project phases	High	Increased revenue for local, regional, provincial and federal governments.

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC

5.1.4.2 Characterization and Significance of Potential Residual Effects

Residual effects on the economy identified in Table 5.1-2 include Increased contract procurement and employment opportunities, and increased revenue for local, regional, provincial and federal governments.

Table 5.1-3 provides a summary of the significance evaluation of the residual effects associated with the Economy VC during proposed Project expansion activities and considers the probability for significance in the evaluation as outlined in Section 3.

Table 5.1-3. Residual Effects Significance Evaluation for Economy VC

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Increased contract procurement and employment opportunities	RAA	Short to long-term	Continuous	Reversible	Low	High	High	Not significant
b) Increased revenue for local, regional, provincial and federal governments	RAA	Short to long-term	Continuous	Reversible	Low	High	High	Not significant

5.1.4.3 Contracting and Employment Opportunities

The proposed Project expansion will result in direct (employment directly related to proposed Project expansion construction and operations) and indirect (employment that supplies goods and services to the proposed Project expansion) employment opportunities, as well as direct and indirect income, and employment effects.

The capital cost of the proposed Project expansion is estimated at $43.5 million to be spent during the entire expansion. Approximately $9 million will be spent to expand the landfill every 3 to 4 years. The operations phase expenditures are estimated to total approximately $3 million per year, and include regular maintenance and material expenditures, labour, and contracting. Costs associated with initial decommissioning and abandonment are estimated at approximately $7 to 8 million. Annual costs associated with decommissioning and abandonment are estimated at $140,000.

Proposed Project expansion construction is expected to provide direct employment for approximately 20 workers during the 4 to 5 month construction period for each cell, which is the equivalent of total 36 person-years for construction of all 6 proposed cells. Types of job requirements for landfill cell construction include an environmental and regulatory advisor, a landfill project manager, third-party landfill engineering firms, a construction crew, a liner crew, and an inspector. Most skills required for the proposed Project expansion exist within the local Fort St. John area, Tervita intends to hire locally, where possible. Tervita currently employs seven full-time personnel (175 person-years for the operations phase) residing in Fort St. John for operations and no additional full-time employment is expected to be generated for the proposed Project expansion.

In addition to the direct economic benefits described above, purchases of supplies and services for Project development will generate indirect economic benefits. Construction purchases will include materials such as the geomembrane liner, gravel, leachate piping and sumps. Approximately 35 percent of the estimated $43.5 million construction costs will be allocated to cover these costs. It was assumed that the majority of construction purchases will be made locally. The geomembrane liner and filter fabric may, however, be purchased from outside the province. Furthermore, local businesses including lodging

accommodations, restaurants, and local service stations may also benefit economically during construction of the proposed Project expansion.

This positive predicted residual effect of increased contracting and employment opportunities is short to long-term in duration, reversible, and of low magnitude, and is, therefore, not significant (Table 5.1-3, point [a]).

5.1.4.4 Increased Revenue for Local, Regional, Provincial and Federal Governments

The construction of the proposed Project expansion will generate a demand for goods, services and workers, which will contribute to the local and regional economy. Currently, Silverberry pays a royalty of $0.90 per tonne of waste accepted per the *Waste Discharge Regulation*, which amounted to $269,199.73 in royalties in 2018. This revenue is expected to be similar for the proposed Project expansion if rates remain the same. There will be direct and indirect business income, and direct and indirect employment income. There will also be increased tax revenues during construction and operations as a result of sales tax and fuel tax, for example. The operations of the proposed Project expansion will also generate revenue in the form of property taxes.

This positive residual effect of increased revenue for local, regional, provincial, and federal governments is short to long-term in duration, reversible, and of low magnitude, and is, therefore, not significant (Table 5.1-3, point [b]).

5.1.4.5 Cumulative Effects Assessment

The cumulative effects assessment is to be completed for VCs where potential residual adverse effects are evaluated as likely to occur and will interact with other past, present, or reasonably foreseeable projects (BC EAO 2013, 2018). The predicted residual effects for the Economy VC are positive, and therefore, do not warrant a cumulative effects assessment.

5.1.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. No specific follow-up strategies have been identified for the Economy VC.

6. Social Effects Assessment

This section of the Application presents the assessment of the potential effects of the proposed Project expansion on the Land and Resource Use, Community Services and Community Infrastructure VCs during the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion.

The following subsection explains the selection process for the Land and Resource Use, Community Services and Community Infrastructure VCs, the associated subcomponents, and the KIs. The assessment boundaries for the Land and Resource Use, Community Services and Community Infrastructure VCs are described and existing conditions are summarized. The potential effects of the proposed Project expansion on the Land and Resource Use, Community Services and Community Infrastructure VCs have been identified, as measured with reference to the KIs. Proposed measures to mitigate or enhance the potential effects on the VCs are also identified. Any residual effects on the VCs have been characterized using the criteria set out in Section 3 of the AAIR and a determination of significance has been made. Any cumulative adverse effects likely to result from the residual adverse effects of the proposed Project expansion interacting with the residual adverse effects of past, present, and reasonably foreseeable developments have also been assessed.

6.1 Land and Resource Use

Table 6.1-1 shows the subcomponents and KIs for the Land and Resource Use VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 6.1-1. Land and Resource Use Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Agriculture • Oil and gas activity • Trapping • First Nation land and resource use including, but not limited to, hunting and trapping, as well as travel to First Nation land and resource use sites • Logging/forestry	• Area of grazing tenures and ALR affected • Oil and gas infrastructure and pipeline tenures affected • Viability of trapping tenures • Viability of identified First Nation land and resource use sites	• BC EAO Guidelines and original EAC Application. • The main land and resource use activities within a 5-km radius of the proposed Project expansion site include agriculture, oil and gas activities, trapping, and forestry. Project activities may disrupt land use activities on ALR, grazing tenures, trapping tenures, and pipeline tenures through potential physical disruption and potential access disruption during construction, operation, and closure. • First Nations land and resource use occurs within 5-km radius of the proposed Project expansion. • Cattle and forage production are the primary agricultural activities in the area.

6.1.1 Assessment Boundaries

The following assessment boundaries have been defined for the Land and Resource Use VC.

6.1.1.1 Spatial Boundaries

The spatial boundaries for the Land and Resource Use VC are shown on Figures 3.2-2 and 3.2-3 and include the Project footprint as well as:

- LAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

The Land and Resource Use LAA includes the areas where direct disturbance could occur to land and resource users (including, but not limited to, visual, physical and acoustic disturbance and changes to resources such as vegetation and wildlife).

- RAA: A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.

  The Land and Resource Use RAA includes the area where direct and indirect influences on land and resource use could overlap with the proposed Project expansion and cause cumulative effects on the KI.

6.1.1.2 Temporal Boundaries

The temporal boundaries identified for the proposed Land and Resource Use VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

6.1.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an environmental assessment. No administrative boundaries have been identified for the Land and Resource Use VC.

6.1.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Land and Resource Use VC.

6.1.2 Existing Conditions

The following methods of data collection have been used to inform the description of existing conditions for the Land and Resource Use VC:

- Desktop review of provincial and regional information sources
- Discussion with local land users, including First Nations
- Review of available First Nations Traditional Use Studies

Data from these sources provide an appropriate baseline for assessing the effects of the Project on land and resource use. Provincial and regional information sources provide a general overview of land use activities in the Land and Resource LAA and RAA and discussion with local land users supplements this understanding. At the time of the Application BRFN had not provided a traditional use study to inform the proposed Project; however through other Project communications BRFN identified the Land and Resource LAA and RAA as areas where traditional land use activities occur and that resources harvested in traditional land use activities such as wildlife also use the Land and Resource Use LAA and RAA.

6.1.2.1 Agriculture

The proposed Project expansion is located on land designated for "Agriculture/Settlement" in the Fort St. John LRMP (Fort St. John LRMP Working Group 1997), and on ALR lands regulated by the *Agricultural Land Commission Act*. ALR lands constitute 11 percent of the land in the PRRD. Within the PRRD, the primary field crops that dominate agriculture production include barley, alfalfa, wheat, oats, canola, forage seed and other tame hay and fodder crops (PRRD 2014). The land in the Project footprint was approved for nonfarm use by the ALC on June 3, 2019 (see Section 4.1.2.2 for additional details).

A Regional Agricultural Plan is currently being prepared by the PRRD. The plan is intended to provide guidance to the PRRD for encouraging and supporting agricultural activity in the region (PRRD 2014). The plan will also identify strategies to enhance agriculture production in the context of competition with other land uses including oil and gas infrastructure (PRRD 2014).

As described in Section 4.6.2, most vegetation within the Project footprint has been disturbed by previous agricultural activities. See Section 4.1.2.2 for additional details on agricultural productivity.

6.1.2.2 Forestry/Logging

Other than agriculture and oil and gas related activities, forestry (that is, timber harvesting) is the dominant land use activity in the Land and Resource Use RAA. The proposed Project expansion is located in the Fort St. John TSA, where the current AAC is 2,115,000 m^3, consisting of 1.2 million m^3 from coniferous-leading stands and 915,000 m^3 from deciduous-leading stands (Province of BC 2018d). Leading tree species in the TSA include white spruce, lodgepole pine, aspen and black spruce while minor amounts of birch, balsam poplar and larch are also present (BC MFLNRORD 2018b). A site visit in 2017 confirmed recent logging and wildfire activity had occurred in the northeast portion of the LAA (refer to Section 4.6.2 for more details).

6.1.2.3 Trapping

BC is divided into registered traplines. Traplines are provincial management areas in which registration is granted to one or more licensed trappers for the trapping of furbearing animals under the BC *Wildlife Act*. Traplines are designated by a regional manager of the recreational fisheries and wildlife programs. The *Wildlife Act* regulates who may set a trap for, hunt, kill, take or capture a furbearing animal within a trapline (BC MFLNRORD 2018c).

There are 71 registered traplines (or portions of) within the Fort St. John LRMP area and commercially harvested furbearers in the area include marten, lynx, beaver, coyote and fox (Fort St. John LRMP Working Group 1997). One of the management objectives of the Fort St. John LRMP is to maintain trapping opportunities through honoring existing tenures and managing furbearer habitats and populations. The proposed Project expansion footprint overlaps with one registered trapping area (TR0745T007), though the existing level of activity associated with the trapline was not available at the time of this assessment (BC MFLNRORD 2018b).

6.1.2.4 Oil and Gas

Energy is the largest economic sector in the Fort St. John LRMP area, followed by the public sector and agriculture, forestry, and mining. The Land and Resource Use LAA and RAA are located in the oil and gas development area of the Montney basin, which is the largest contributor to natural gas production volumes in the province. Gas production has increased by 24 percent in the last 5 years in northeast BC (BC OGC 2017) (see Section 3.9.1.2 for additional details). The proposed Project expansion will be constructed within Tervita's existing property boundaries on land that is zoned for "Oil and Gas Production" under the PRRD Zoning By-law No. 1000.

6.1.2.5 First Nation Land and Resource Use

First Nations have identified land and resource use activities including a travel route and hunting, trapping, fishing and plant gathering in the proposed Project expansion LAA and RAA.

Doig River First Nation

DRFN identified hunting and trapping activities within the LAA and RAA and noted that caribou and moose are culturally important species. They also identified fishing sites within the LAA and RAA and noted the importance of waterways for fishing, drinking water, and as travel routes throughout their traditional territory. DRFN identified plant gathering throughout the LAA and RAA and indicated that plant gathering was an important cultural activity for intergenerational transfer of knowledge. They also identified two travel routes and an archaeological site within the LAA.

DRFN did not identify any land and resource use sites within the Project footprint (Urban Systems 2017). DRFN expressed concerns about access to Traditional Land Use (TLU) areas and to a healthy ecosystem that supports hunting, trapping, fishing and peaceful enjoyment of the land (Urban Systems 2017).

Blueberry River First Nations

BRFN have identified patterns of economic activity, land use and occupation within their traditional territory including hunting, fishing, trapping, camping and gathering resources (Macdonald 2016; Traditions Consulting Services, Inc. 2013). The traditional territory of BRFN is defined as extending from approximately Tumbler Ridge in the south, to the Sikanni Chief River in the north, west to the Rocky Mountains, and east to the Alberta border (BRFN 2012). This area lies within the PRRD and is where BRFN members traditionally carried out activities central to their way of life. There are many historical trails in the region that were used for travel and hunting, many of which were documented in a 1915 map of the Peace River Block and later used by a BC Land Surveyor in 1930 (BRFN 2012).

Today, BRFN members hunt moose, elk, dear, bear, mountain sheep and caribou (Traditions Consulting Services, Inc. 2013). Members also harvest medicinal plants, berries and root vegetables, and up to 15 different species of fish have been known to be caught by members in the region (Traditions Consulting Services, Inc. 2013; BRFN 2012). BRFN has expressed concerns about cumulative effects in the region, impacting their access to lands and resources that sustain their traditional way of life (Macdonald 2016).

6.1.3 Land and Resource Use Effects Assessment

6.1.3.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification of the potential effects of the proposed Project expansion on the Land and Resource Use VC is based on the results of desktop review of provincial and regional information sources; discussions with local land users, including First Nations; and review of available First Nations Traditional Use Studies.

The proposed Project expansion is anticipated to interact with the Land and Resource Use VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Cell capping
- Postclosure maintenance and monitoring

Table 6.1-2 identifies the potential effects of the proposed Project expansion on the Land and Resource Use VC, as well as mitigation measures, and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. As the proposed Project expansion

area is currently fenced, interactions with agricultural or recreational users, or with First Nations in terms of land use, are avoided. Mitigation measures described in Table 6.1-2 are consistent with BMPs for reducing adverse effects to land and resource use and are generally described as having high effectiveness. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on land and resource use. Refer to Sections 4.4, 4.5, 4.6, and 4.8 for descriptions of other mitigation measures for land and resource use related to Surface Water, Groundwater, Terrestrial Vegetation, and Wildlife and Wildlife Habitat VCs, respectively.

In addition to the summary of mitigation provided herein, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 6.1-2. Land and Resource Use – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Potential disruption of resource use activities including agriculture, timber harvesting, industrial use and trapping activities	RAA	• The proposed Project expansion footprint is currently fenced and not being used by agricultural or recreational users.	Avoidance	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Provide forest tenure holders and trappers with information and protocols regarding the timeframe for construction.	Minimization	Immediate	High	
			• Consult with forest tenure holders and trappers and consider specific requests for mitigation.	Minimization	Immediate	High	
			• Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted.	Minimization	Immediate	High	
	Potential disruption of First Nation land and resource use including access to lands	LAA	• The proposed Project expansion footprint is currently fenced and not being used by First Nations.	Avoidance	Immediate	High	Potential residual effects are expected to be reduced to negligible levels through the implementation of mitigation measures.
			• Provide First Nations with information and protocols regarding the timeframe for construction.	Minimization	Immediate	High	
			• Consult with First Nations and consider specific requests for mitigation.	Minimization	Immediate	High	
			• Refer to Section 4.8 for mitigation measures relating to Wildlife and Wildlife Habitat.	Refer to Section 4.8			
			• Refer to Section 4.6 for mitigation measures relating to Terrestrial Vegetation.	Refer to Section 4.6			
			• Refer to Section 4.5 and Section 4.4 for mitigation measures relating to Groundwater and Surface Water.	Refer to Sections 4.4 and 4.5			
			• As no effects have been identified for fish and fish habitat (Section 4.7), no mitigation measures are required.	N/A	N/A	N/A	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

6.1.3.2 Characterization and Significance of Potential Residual Effects

Potential effects on the Land and Resource use VC will be reduced to negligible levels by constructing the proposed Project expansion on Tervita's existing fenced, operational landfill, by providing advanced notification of the construction schedule, and through consultation with land users and First Nations in the proposed Project expansion area. No additional land will be taken from First Nations or recreational users in the RAA (for example, trappers and/or forestry companies) and operational activities are not expected to affect First Nations land and resource use, trapping or forestry activities beyond any impacts that already exist as a result of the existing landfill.

The proposed Project expansion is compatible with the strategies identified in the Fort St. John LRMP and has been granted permission for nonfarm use by the ALC. The management strategy with respect to the agriculture/settlement zone within the Fort St. John LRMP (for which the proposed Project expansion is located) encourages multiple land and resource uses where appropriate and achievable (Fort St. John LRMP Working Group 1997). Final cover upon closure will meet agricultural standards as provided in the CSR, and Tervita will work with BC MECCS to consider future land uses upon closure.

With the implementation of appropriate mitigation measures, including mitigation measures for the VCs that support First Nation land and resource use, potential residual effects are predicted to be negligible for the Land and Resource Use VC and a characterization and evaluation of significance of residual effects is not warranted.

6.1.3.3 Cumulative Effects Assessment

No residual effects have been identified for the Land and Resource Use VC, therefore, a cumulative effects assessment is not required.

6.1.4 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Land and Resource Use VC, therefore, a follow-up strategy is not required.

6.2 Community Services

Table 6.2-1 shows the subcomponents and KIs for the Community Services VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 6.2-1. Community Services Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Community utilities and services	• Community and utility services capacity and demand • Accommodation capacity and demand • Health service impacts	• BC EAO Guidelines and original EAC Application. • Community utilities and services may be required by the proposed Project expansion workforce, and therefore may increase the demand on community services, utilities, and accommodation during transport of workers in construction, operation, and closure activities. The surrounding municipality is being consulted and any concerns will be addressed.

6.2.1 Assessment Boundaries

The following assessment boundaries have been defined for the Community Services VC.

6.2.1.1 Spatial Boundaries

The spatial boundaries for the Community Services VC are shown on Figure 3.2-3 and 3.2-4 and include the Project footprint as well as the following:

- LAA: The areas within the boundaries of the City of Fort St. John and the Community of Buick.

  The Community services LAA is defined by the boundaries of communities where direct effects on community services could occur, and where a community could offer goods or services.

- RAA: The area within Electoral Area B of the PRRD.

  The Community Services RAA is the regional district, to characterize and assess the cumulative effects of the proposed Project expansion on regional services.

6.2.1.2 Temporal Boundaries

The temporal boundaries identified for the Community Services include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

6.2.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an environmental assessment. No administrative boundaries have been identified for the Community Services VC.

6.2.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Community Services VC. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on community services are generally well understood and have predictable effects. This understanding, in conjunction with the results of the desktop review and available data, meant that there was a complete technical understanding for conducting the assessment.

6.2.2 Existing Conditions

Information on existing conditions of community services in the Electoral Area B (that is, Community Services RAA) was based on a desktop review of online information, primarily from Statistics Canada, the PRRD, and the City of Fort St. John and based on Tervita's experience constructing and operating the existing landfill. Data from these sources provide an appropriate baseline for assessing the effects of the Project on community services.

6.2.2.1 Community Service Context

The nearest communities with services to the proposed Project expansion are the City of Fort St. John (approximately 50 km southeast), the District Municipality of Taylor (approximately 60 km south), and the

Community of Wonowon (approximately 40 km northwest), which provide accommodation, restaurants, groceries, gas, and diesel. The Community of Buick, which consists of several houses, a community hall and a small store, is located approximately 16 km north.

In 2016, PRRD Electoral Area B had a population of 5,628, an increase of 1.4 percent from 2011 (Statistics Canada 2018). In 2016, the City of Fort St. John had a population of 20,155, an increase of 8.3 percent from 2011. In 2016, the District Municipality of Taylor had a population of 1,469, an increase of 7.0 percent from 2011 (Statistics Canada 2018).

6.2.2.2 Traditional Knowledge Shared

To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, BRFN and DRFN have not provided any traditional knowledge in relation to community services.

6.2.3 Community Services Effects Assessment

6.2.3.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the proposed Project expansion on the Community Services VC is based on the results of results of previous studies and experience from the existing landfill, consultation and engagement, and professional judgement.

The proposed Project expansion is anticipated to interact with the Community Services VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Postclosure maintenance and monitoring

Table 6.2-2 identifies the potential effects of the proposed Project expansion on the Community Services VC, as well as mitigation measures, and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. As the proposed Project expansion will rely on certain community utilities and services, avoidance and restoration are not directly applicable; therefore, mitigation measures have focused on minimization. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects of disruption of community life by temporary workers. Mitigation measures described in Table 6.2-2 have high effectiveness, as observed at the existing landfill. Refer to Sections 5.1 (Economy), 6.1 (Land and Resource Use), 6.3 (Community Infrastructure), and 8 (Human Health) for descriptions of other mitigation or enhancement measures related to the Community Services VC.

Table 6.2-2. Community Services – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, Closure/Reclamation, and Postclosure	Disruption of community life by temporary workers	RAA	• Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted.	Minimization	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps.	Minimization	Immediate	High	
			• Adhere to Tervita's Alcohol and Drug Policy.	Minimization	Immediate	High	
			• Adhere to Tervita's HSE Program.	Minimization	Immediate	High	
			• See mitigation to address potential effects related to Land and Resource Use in Section 6.1.	Refer to Section 6.1.			
			• See mitigation to address the potential effects on Community Infrastructure in Section 6.3.	Refer to Section 6.3			
			• See mitigation to address potential effects related to Human Health in Section 8.	Refer to Section 8			
			• See enhancement measures related to Economy in Section 5.1.	Refer to Section 5.1			

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

Note:

HSE = Health, Safety, and the Environment

6.2.3.2 Characterization and Significance of Potential Residual Effects

The City of Fort St. John contains numerous hotels and motels, gas stations, restaurants and other services that may be utilized by the temporary proposed Project expansion workforce consisting of 20 personnel. The City of Fort St. John also contains emergency, health and social services including the Fort St. John Hospital. It is anticipated that the capacity of local community services and facilities can handle the demands of the proposed Project expansion workforce without overburdening them or displacing local resident use. Due to the limited size of the proposed Project expansion workforce and sufficient availability of services in the City of Fort St. John, construction and operations of the proposed Project expansion is expected to have a negligible adverse impact on the Community Services VC and, consequently, with implementation of mitigation provided in Table 6.2-2, no residual effects were identified for the Community Services VC.

6.2.3.3 Cumulative Effects Assessment

No residual effects have been identified for the Community Services VC; therefore, a cumulative effects assessment is not required.

6.2.4 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Community Services VC, therefore, a follow-up strategy is not required.

6.3 Community Infrastructure

Table 6.3-1 shows the subcomponents and KIs for the Community Infrastructure VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 6.3-1. Community Infrastructure Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Traffic and transportation infrastructure	• Traffic volumes • Transportation infrastructure disturbance	• BC EAO Guidelines and original EAC Application. • Traffic volumes will be slightly increased during construction activities, and transportation infrastructure may be disturbed during construction, operation, and closure activities. During operation, vehicular traffic volumes will be the same as for the currently approved landfill. Vehicular traffic can track mud from the landfill onto public roads. The surrounding municipality is being consulted and any concerns will be addressed.

6.3.1 Assessment Boundaries

The following assessment boundaries have been defined for the Community Infrastructure VC.

6.3.1.1 Spatial Boundaries

The spatial boundaries for the Community Infrastructure VC are shown on Figure 3.2-3 and 3.2-4 and include the Project footprint as well as the following:

- LAA: The areas within the boundaries of the City of Fort St. John and the Community of Buick.

  The Community Infrastructure LAA is defined as the boundaries of communities where direct effects on community infrastructure could occur, and where a community could offer goods or services.

- RAA: The area within Electoral Area B of the PRRD.

  The Community Infrastructure RAA is the regional district, to characterize and assess the cumulative effects of the proposed Project expansion on regional infrastructure (for example, roads).

6.3.1.2 Temporal Boundaries

The temporal boundaries identified for the Community Infrastructure VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

6.3.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an environmental assessment. No administrative boundaries have been identified for the Community Infrastructure VC.

6.3.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Community Infrastructure VC. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on community infrastructure are generally well understood and have predictable effects. This understanding, in conjunction with the results of the desktop review and available data, meant that there was a complete technical understanding for conducting the assessment.

6.3.2 Existing Conditions

Information on existing conditions of community infrastructure in the Electoral Area B (that is, Community Infrastructure RAA) was based on a desktop review and Tervita's experience constructing and operating the existing landfill. Data from these sources provide an appropriate baseline for assessing the effects of the Project on community infrastructure.

6.3.2.1 Community Infrastructure Context

The nearest communities with services to the proposed Project expansion are the City of Fort St. John (approximately 50 km southeast), the District Municipality of Taylor (approximately 60 km south), the Community of Wonowon (approximately 40 km northwest), and the Community of Buick (approximately 16 km north).

Access to the proposed Project expansion is via local highways (for example, Highway 97) and Beatton River Road, which is paved. Average car traffic along the Beatton River Road (also referred to as the Buick Creek Road) during the summer is estimated to be 735 vehicles per day (CCS 2002). The Canadian National Railway crosses Beatton River Road approximately 500 m southwest of the landfill site turn-off. No new access is required to accommodate the expanded landfill.

6.3.3 Traditional Knowledge Shared

To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, no information has been shared in relation to community infrastructure by BRFN and/or DRFN.

6.3.4 Community Infrastructure Effects Assessment

6.3.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the proposed Project expansion on the Community Infrastructure VC is based on the results of results of previous studies and experience from the existing landfill, consultation and engagement, and professional judgement.

The proposed Project expansion is anticipated to interact with the Community Infrastructure VC during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Postclosure maintenance and monitoring

During cell construction, which will occur at the beginning for 4 to 5 months and periodically throughout operations (each time, 4 to 5 months), crew trucks will transport workers to and from site each day and there will be 15 to 20 truckloads of construction supplies. Onsite construction varies but generally requires 2 rock trucks, 2 bulldozers, 1 excavator and 1 compactor. All of these will be stored on site during the construction phase for each cell. Construction crews will car pool resulting in a peak of 10 personal trucks per day in and out of the proposed Project expansion site.

During operations, 20 to 30 end-dump trucks will transport waste to the proposed Project expansion site each day.

Table 6.3-2 identifies the potential effects of the proposed Project expansion on the Community Infrastructure VC, as well as mitigation measures, and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. Given the nature of activities associated with the proposed Project expansion with regards to potential adverse effects of increased traffic volumes and use of transportation infrastructure, avoidance and restoration are not directly applicable; therefore, mitigation measures have focused on minimization. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in reducing potential adverse effects on the Community Infrastructure VC. Mitigation measures described in Table 6.3-2 have high effectiveness, as observed at the existing landfill. Refer to Sections 6.1 (Land and Resource Use) and 8 (Human Health) for descriptions of other mitigation measures related to the Community Infrastructure VC.

Table 6.3-2. Community Infrastructure – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure or Reclamation	Increased traffic volumes as a result of transporting workers, supplies, equipment and incoming waste for disposal	RAA	• Restrict all construction and operations activities to the approved designated survey area. All Project-related traffic will adhere to safety and traffic regulations.	Minimization	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted.	Minimization	Immediate	High	
			• Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps.	Minimization	Immediate	High	
			• All incoming waste will be prebooked before arrival at the landfill site and will be received during daylight hours unless it's an emergency situation.	Minimization	Immediate	High	
			• Implement traffic management measures outlined in the Operations Plan.	Minimization	Immediate	High	
			• Adhere to Tervita's Alcohol and Drug Policy.	Minimization	Immediate	High	
			• Adhere to Tervita's HSE Program.	Minimization	Immediate	High	
			• See mitigation to address potential effects related to Land and Resource Use in Section 6.1.	Refer to Section 6.1.			
			• See mitigation to address potential effects related to Human Health in Section 8.	Refer to Section 8.			

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

6.3.4.2 Characterization and Significance of Potential Residual Effects

Although the proposed Project expansion may interact with current and ongoing transportation activities in the proposed Project expansion Community Infrastructure RAA, the expected increase of traffic from Project-related personnel, supplies and equipment during construction is expected to be negligible. Access routes to the existing landfill (Highway 97 and Beatton River Road) are well-established and maintained, and frequently utilized by local traffic and industrial traffic serving the agricultural and oil and gas industries in the RAA. During operation, the expanding landfill will experience regular traffic from operating personnel as well as waste transport trucks. However, the expanded landfill is not expected to result in any increase in traffic that the existing operating landfill already experiences during day to day operations.

It is anticipated that the capacity of community infrastructure can handle the incremental demands of Project-related traffic without overburdening it. Consequently, construction and operations of the proposed Project expansion is expected to have a negligible adverse impact on the Community Infrastructure VC and, with implementation of mitigation provided in Table 6.3-2, no residual effects were identified for the Community Infrastructure VC.

6.3.4.3 Cumulative Effects Assessment

No residual effects have been identified for the Community Infrastructure VC; therefore, a cumulative effects assessment is not required.

6.3.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Community Infrastructure VC, therefore, a follow-up strategy is not required.

7. Cultural and Heritage Effects Assessment

This section of the Application presents the assessment of the potential effects of the proposed Project expansion on the Cultural and Heritage VC during the construction, operations, closure/reclamation, and postclosure phases of the proposed Project expansion.

The following subsection explains the selection process for the Cultural and Heritage VC, the associated subcomponents, and the KIs. The assessment boundaries for the Cultural and Heritage VC are described and existing conditions are summarized. The potential effects of the proposed Project expansion on the Cultural and Heritage VC have been identified, as measured with reference to the KIs. Proposed measures to mitigate or enhance the potential effects on the VC are also identified. Any residual effects on the VC have been characterized using the criteria set out in Section 3 of the AAIR and a determination of significance has been made. Any cumulative adverse effects likely to result from the residual adverse effects of the proposed Project expansion interacting with the residual adverse effects of past, present, and reasonably foreseeable developments have also been assessed.

7.1 Culture and Heritage

Table 7.1-1 shows the subcomponents and KIs for the Land and Resource Use VC as approved by the BC EAO in the VC Rationale Document for the proposed Project expansion (CH2M 2016b).

Table 7.1-1. Culture and Heritage Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Archaeological sites • Historic sites	• Characteristics, conditions, and location of archaeological and heritage sites, if any	• BC EAO Guidelines and original EAC Application. • Regulatory requirement of the Archaeology Branch of the BC MFLNRORD under the *Heritage Conservation Act*. • The proposed Project expansion has a low probability of affecting archaeological sites and historic sites through direct disturbance. An Archaeological Impact Assessment has been completed and determined no archaeological resources have been found on the Project footprint to date. Therefore, there is low potential to encounter previously undiscovered heritage resources during construction.

7.1.1 Assessment Boundaries

The following assessment boundaries have been defined for the Culture and Heritage VC.

7.1.1.1 Spatial Boundaries

The spatial boundaries for the Culture and Heritage VC are shown on Figure 3.2-2 and include the Project footprint as well as the following:

- LAA: (same as Project footprint): The zone of influence in which heritage resources are most likely to be affected during construction and operations is the Project footprint. The potential for impacting archaeological, palaeontological or historical resources is limited to areas of potential clearing or ground disturbance (that is, the Project footprint). Consequently, the Heritage LAA is the same land area as the Project footprint.

- RAA: The area within all Borden Blocks crossed by the proposed Project expansion. A Borden Block measures 16 km by 16 km and is a terrestrial mapping system used to permanently name and register archaeological sites.

  The spatial boundaries of the Heritage RAA for the proposed Project expansion comprise an area extending beyond the Project footprint and are defined as the area within all Borden Blocks crossed by the proposed Project expansion (Borden 1952). A Borden Block measures 10 minutes of latitude by 10 minutes of longitude, and is the accepted standard division of land used by archaeologists across Canada to index individual archaeological sites. For the proposed Project expansion, the Borden Blocks intersected measure approximately 10 km east-west by 18 km north-south.

7.1.1.2 Temporal Boundaries

The temporal boundaries identified for the Culture and Heritage VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).

7.1.1.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an environmental assessment. No administrative boundaries have been identified for the Culture and Heritage VC.

7.1.1.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Culture and Heritage VC.

7.1.2 Existing Conditions

Information on existing conditions of heritage resources in the Heritage LAA and RAA was based on a desktop review to document previously recorded archaeological and historic sites and to identify areas of potential for heritage resources.

The following methods of data collection will be used to inform the description of existing conditions for the Cultural and Heritage Resources VC:

- An initial desktop review to identify previously recorded archaeological and historic sites in proximity to the proposed Project and to identify areas with potential for unrecorded heritage resources.

Data from a desktop review provides an appropriate baseline for assessing the effects of the Project on heritage resources. An Archaeological Impact Assessment, submitted as part of the EAC Application for the existing landfill, was completed under a *Heritage Conservation Act* Section 14 Inspection Permit and no archaeological resources were found on the Project footprint; therefore, there is a low potential of encountering previously undiscovered heritage resources during proposed Project expansion construction. Since heritage resources occupy specific spatial locations that do not change (for example, subsurface lithic scatters and historic homesteads), the proposed Project expansion can only interact with those heritage resource sites located within the Project footprint. There are no changes to the Project footprint as proposed in the original PAC Application and subsequently approved for development by the former Ministry of Sustainable Resource Management (Archaeological Planning and Assessment).

Heritage resources provide a window into past human experiences and the geological record, and by their very nature, are nonrenewable. Once disturbed, the resource may be altered or even lost. Consequently, the primary mitigation measure in protecting heritage resources is avoidance, and secondarily, site-specific mitigation developed in consultation with appropriate provincial regulatory authorities and approved by these authorities in fulfillment of permit obligations. In order to better understand heritage resources and the historical information associated with these materials, disturbing the resource through controlled, scientific excavation is an acceptable practice and, in many cases, the only method to collect in situ information to add to the archaeological record. Regardless of whether the excavation of the site is for academic or development purposes, the loss of heritage resource sites is offset by the recovery of knowledge about the site gained through meticulously identifying, cataloguing, and preserving artifacts and features in compliance with provincial guidelines.

The BC *Heritage Conservation Act* protects archaeological resources located on both public and private land throughout the province and is administered by the BC MFLNRORD Archaeology Branch. Sites and objects are protected under Section 13 of the *Heritage Conservation Act* by virtue of their antiquity (pre-1846) or under Section 9 as Provincial Heritage Sites, if designated as such by an order-in-council. The *Heritage Conservation Act* necessitates that a Permit issued by the Minister or designate must be in place prior to the altering of any protected archaeological sites.

An initial desktop review to document previously recorded archaeological and historic sites in proximity to the proposed Project expansion and to identify areas with potential for unrecorded heritage resources.

The proposed Project expansion is located in Borden Block HdRg. There are currently three sites listed within the Borden Block. The closest known archaeological site to the landfill site is HdRg-2, located approximately 7.2 km to the south-southeast, along St. John Creek. An Archaeological Impact Assessment, submitted as part of the PAC Application for the existing landfill, was completed under a *Heritage Conservation Act* Section 14 Inspection Permit and no archaeological resources were found on the Project footprint. Therefore, there is low potential to encounter previously undiscovered heritage resources during proposed Project expansion construction.

Since heritage resources occupy specific spatial locations that do not change (for example, subsurface lithic scatters and historic homesteads), the proposed Project expansion can only interact with those heritage resource sites located within the Project footprint. There are no changes to the Project footprint as proposed in the original PAC Application and subsequently approved for development by the former Ministry of Sustainable Resource Management (Archaeological Planning and Assessment); therefore, an Archaeological Impact Assessment will not be required for the proposed Project expansion.

7.1.3 Traditional Knowledge Shared

To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, BRFN and DRFN have not provided any traditional knowledge related to cultural and heritage resources.

7.1.4 Culture and Heritage Effects Assessment

7.1.4.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification of the potential effects of the proposed Project expansion on the Culture and Heritage VC is based on the results of desktop review of provincial and regional information sources; discussions with local land users, including First Nations; and results of the Archaeological Impact Assessment.

The proposed Project expansion is anticipated to interact with the Culture and Heritage VC during the following construction and operations activities:

- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure.

Table 7.1-2 identifies the potential effects of the proposed Project expansion on the Culture and Heritage VC, as well as mitigation measures, and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. The primary mitigation measure in protecting heritage resources is avoidance, and secondarily, site-specific mitigation developed in consultation with appropriate provincial regulatory authorities and approved by these authorities in fulfillment of permit obligations. As the proposed mitigation measures described in Table 7.1-2 would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in alleviate potential adverse effects on the Cultural and Heritage VC. These mitigation measures have high effectiveness as they align with regulatory requirements under the BC *Heritage Conservation Act*.

Table 7.1-2. Culture and Heritage – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction and Operations	Disturbance of previously unidentified cultural or heritage resources during construction or operations	LAA	• If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch – Immediately stop work within the site – Implement any other measures identified by the BC Archaeology Branch – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014)	Avoidance	Immediate	High	Potential residual effects are expected to be avoided through the implementation of mitigation measures.
			• Prohibit the collection of historical resources by Project personnel.	Avoidance	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

7.1.4.2 Characterization and Significance of Potential Residual Effects

The Archaeological Impact Assessment for the proposed Project expansion concluded that no archaeological resources were found on the Project footprint. In the unlikely event that any historical resources are discovered during construction, work will be stopped at the site and the BC Archaeology Branch will be notified immediately. Given that disturbances to heritage resources by the proposed Project expansion are effectively offset by knowledge gained through the mitigation approved by the provincial regulatory authorities, no residual effects on the Culture and Heritage VC have been predicted and, consequently, no further assessment of the Culture and Heritage VC is warranted.

7.1.4.3 Cumulative Effects Assessment

No residual effects have been identified for the Culture and Heritage VC; therefore, a cumulative effects assessment is not required.

7.1.5 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Culture and Heritage VC; therefore, a follow-up strategy is not required.

8. Health Effects Assessment

This section of the Application presents the assessment of the potential adverse effects of the proposed Project expansion on the Human Health VC during construction, operations and decommissioning or abandonment of the proposed Project expansion.

The following subsections explain the selection process of the Human Health VC and the associated KIs: noise, air quality, drinking water quality, leachate, soil quality, NORMs, or country foods quality. Spatial and temporal boundaries and the regulatory framework that apply to the assessment of the Human Health VC is discussed. The potential adverse effects of the proposed Project expansion on the Human Health VC have been identified and analyzed, as measured with reference to the KIs. Consideration of occupational health and safety requirements and existing measures to mitigate the potential adverse effects on the VCs are also identified. Any residual effects on the Human Health VC (after consideration of occupational health and safety requirements and mitigation measures currently in place) have been characterized using the criteria set out in Section 3.6 of the AAIR, and a determination of significance has been made.

The result of the assessment is a determination that any residual adverse effects of the proposed Project expansion on the Human Health VC is not significant.

8.1 Selection of Valued Components and Key Indicators

The BC EAO defines VCs as components of the natural and human environment that are considered by the proponent, the public, Aboriginal groups, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance (BC EAO 2013). KIs are metrics used to measure and report on the condition and trend of a VC, and are identified to further focus and facilitate the analysis of the effects of a proposed Project expansion on selected VCs.

To assess potential health concerns, Human Health was selected as a VC and is defined in the AAIR. Human Health was selected as a VC because the proposed Project expansion could result in changes to noise levels, air quality, drinking water quality, or soil quality. Changes to country foods quality may occur if there is a change to water or soil quality.

The selection of Human Health as a VC was based on: experience gained during previous projects with similar conditions and potential issues; feedback from regulatory authorities; input from Aboriginal groups and public stakeholders; relevant scientific studies; and professional judgment of the assessment team. Table 8.1-1 provides a summary of the KIs, rationale and measurable parameters used in the assessment of potential effects of the proposed Project expansion on the Human Health VC.

Table 8.1-1. Human Health Subcomponents, Key Indicators, and Rationale

Subcomponent(s)	KI(s)	Rationale
• Soil quality • Air quality • Water quality • Leachate quality • Visual quality • Noise • NORM • Quality of vegetation, fish, wildlife and water consumed as country foods, including consumption of First Nation-specific foods	• See indicators under the Air Quality (Section 4.2), Terrain and Soils (Section 4.1), Acoustic Environment (Section 4.3), Terrestrial Vegetation (Section 4.6), Fish and Fish Habitat (Section 4.7), Wildlife and Wildlife Habitat (Section 4.8), Surface Water (Section 4.4), and Groundwater (Section 4.5) VCs, as applicable. The overall study areas reflect the biophysical study areas of the atmospheric environment (acoustic environment and air quality) and water (surface water and groundwater), and includes measurable parameters such as: – Sound levels – Changes in air quality – Changes in water quality – Changes in soil quality – Changes in country foods quality • NORM levels • Traffic-related injuries • Radiological risk assessment • Community Health	• Human Health was selected as a VC to represent the interactions of the proposed Project expansion with the health of workers, land users, and First Nations. • Potential effects related to construction of the proposed Project expansion include: – Increased sound levels – Reduced air quality – Reduced drinking water quality – Contaminated soil quality – Quality of country foods • For these reasons, the KIs noise, respiratory health, drinking water quality and soil quality were chosen. Potential effects related to operations and maintenance of the proposed Project expansion include: – Increased sound levels at proposed Project expansion – Reduced air quality at proposed Project expansion – Dust generation by vehicular traffic

8.2 Assessment Boundaries

Assessment boundaries are used to set a frame of reference for the assessment. The following outlines the assessment boundaries used for the assessment of potential adverse effects of the proposed Project expansion on the Human Health VCs.

8.2.1 Spatial Boundaries

The spatial boundaries for the assessment were chosen in order to characterize local and regional effects of the proposed Project expansion on the Human Health VC. Proposed Project expansion activities have the potential to generate noise and may adversely affect air and water quality, which are indicators for the Human Health VC.

The spatial boundaries for Human Health include the Project footprint, the LAA and the RAA. The LAA boundaries includes the area in which all or most of the potential adverse health effects would be expected to occur. The LAA is the maximum extent of the area encompassed by the Acoustic Environment LAA, the Surface Water LAA, and the Groundwater LAA, and also the LAA of the Land and Resource Use VC (Figure 3.2-1) to account for potential adverse health effects from country foods.

A larger RAA can be used to provide additional context in the assessment of potential adverse effects, including cumulative effects. The RAA is the maximum extent of the area encompassed by the Acoustic Environment RAA, the Air Quality RAA, the Surface Water RAA, the Groundwater RAA, the Fish and Fish Habitat RAA, and the Wildlife and Wildlife Habitat RAA which also includes the RAA of the Land and Resource Use VC (Figure 3.2-2) to account for potential adverse health effects from country foods.

Mapped features and other spatial data used to inform the effects assessment were considered in the context of the largest LAA and RAA of those listed above, which are referred to as the Human Health LAA and RAA. Table 8.2-1 describes the spatial boundaries and rationale for the Human Health VCs.

Table 8.2-1. Health Study Area Boundaries

VC	Spatial Boundary	Rationale
Human Health	• Project footprint: the land area that will be directly disturbed by the proposed Project expansion construction and clean-up activities, including associated physical works and activities (for example, permanent right-of-way and temporary workspace for construction). • Health LAA encompasses the following: – Terrain and Soil LAA: Same as Project footprint. – Surface Water LAA: A 500-m radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities. – Groundwater LAA: A 500-m radius extending outwards form the proposed Project expansion footprint boundary, including associated physical works and activities. – Noise LAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities. – NORMs LAA: Maximum extent of the Terrain and Soil, Air, Surface Water and Groundwater LAA. – Country Foods LAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities. • Health RAA encompasses the following: – Terrain and Soil RAA: A 1-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities – Air Quality RAA: A 10-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities – Surface Water RAA: The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site. – Groundwater RAA: The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site. – Fish and Fish Habitat RAA: Same as the Surface Water RAA – Wildlife and Wildlife Habitat RAA: A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities. – Noise RAA: A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities. – NORMs RAA: Maximum extent of the Terrain and Soil, Air, Surface Water and Groundwater RAA. – Country Foods RAA: A 5-km radius extending outwards from the proposed Project expansion footprint boundary, including associated physical works and activities.	• The water quality subcomponent is encompassed by the assessment boundaries for the Surface Water and Groundwater VCs. • The Terrain and Soils LAA (that is, the Project footprint) is the only assessment boundary for the leachate quality subcomponent. • The LAA and RAA for the NORMs subcomponent is the maximum extent of the area encompassed by the Terrain and Soils, Air Quality, Surface Water, and Groundwater LAAs and RAAs. • The LAA and RAA for the country foods subcomponent is equivalent to the assessment boundaries for the Land and Resource Use VC.

Note:

[a] RAA/LAA = Health RAA/LAA

8.2.2 Temporal Boundaries

The temporal boundaries identified for the Human Health VC include the following:

- Construction phase (approximately 4 to 5 months for each cell from the initiation of the proposed Project expansion and periodically (for example, every 2 or 3 years) during the length of the proposed Project expansion as new cells are developed).
- Operations phase, accepting and disposing of hazardous waste and maintenance of the site. May include activities such as excavation, grading and compaction. As each cell reaches capacity, it will be closed with an impermeable cap (approximately 25 years – Years 1 to 25).
- Closure/reclamation phase. When the capacity of all cells is reached, the landfill will be capped with an impermeable cap and top soil and seeding will occur (approximately 1 year following operations – Year 26).
- Postclosure phase is when the entire landfill has been capped and reclaimed and monitoring will occur (approximately 25 years – Years 26 to 51).

8.2.3 Administrative Boundaries

Administrative boundaries refer to the effects of political, economic, or social boundaries on an environmental assessment. No administrative boundaries have been identified for the Human Health VC. However, the human health effects assessment is guided by the regulatory and policy setting described in Section 8.3.

8.2.4 Technical Boundaries

Technical boundaries refer to a proponent's ability to predict the effects of a project. No technical boundaries have been identified for the Human Health VC. The potential adverse effects of landfill construction, operations, closure/reclamation, and postclosure on human health are generally well understood and have predictable effects.

8.3 Regulatory and Policy Setting

The proposed Project expansion will be constructed and operated in compliance with all applicable federal and provincial legislation. This subsection provides a summary of the regulatory framework of legislation, regulations, policies and guidelines which pertain to each KI for the Human Health VC.

Public health in BC is the responsibility of the BC Ministry of Health in accordance with the *Public Health Act*. The *Act* addresses current and emerging health issues, health protection and health promotion, amongst other objectives. Also addressed in the *Act* are provisions designed to address the potential adverse health effects associated with exposure to environmental contaminants.

Health Canada assumes an advisory role with respect to federal and provincial environmental assessments. Health Canada has expertise in HHRA and in biophysical areas related to human health, including noise and air quality effects, drinking water quality, soil quality guidelines and contamination of country foods (Health Canada 2010).

8.3.1 Surface Water

The *Canada Water Act* provides for the management, conservation, development and use of the water resources of Canada in co-operation with provincial and territorial governments.

The BC *Water Act* is administered by BC MECCS and regulates the allocation and management of surface water in BC, in addition to establishing protection for groundwater and wells. The *Act* also regulates diversion and short-term use of watercourses. The *Water Regulation*, pursuant to the *Act* ensures that water quality and water user rights are not compromised by any instream activities.

The BC *Drinking Water Protection Act* and the *Drinking Water Protection Regulation* provide the regulatory framework for safe, reliable and accessible drinking water in BC. The *Act* and associated regulation are administered by the BC Ministry of Health. Health officers monitor drinking water systems for potential health and safety hazards (BC Ministry of Health 2013).

The BC CSR derived water standards in the former Schedule 6 (Generic Numerical Water Standards) and Schedule 10 (Generic Numerical Soil and Water Standards) tables for the following water uses: Drinking Water (DW), Irrigation Water (IW), Livestock Water (LW), and Aquatic Life (AW) (freshwater). These standards were used in the identification of COPCs in surface water and groundwater. The guidelines are used to screen against potential chemical health risks to people consuming local stream water or well water.

8.3.2 Soil Quality

The BC *EMA* regulates contaminated sites in the province. The CSR under the *Act* provides standards for contaminated sites, which may depend on the primary uses of the site. Soil quality guidelines from the CCME, BC MECCS, the CSR and U.S. EPA are used to screen potential health risks to people following direct contact or ingestion of soil contaminants. The BC CSR derived soil standards (agricultural land [AL] and industrial land [IL] use or Protocol 4 background) for soil were used in the identification of COPCs in soil.

8.3.3 Noise

Health Canada does not regulate noise levels, but does provide recommendations for the assessment of noise effects, including:

- Identification and mapping of noise-sensitive receptors such as residences, schools, nursing homes and First Nations communities, relative to a project location
- Estimation of baseline sound levels for a project be estimated at both day and night
- Identification of all potential project noise during all project phases
- Comparison of baseline noise levels with predicted noise levels at sensitive receptor locations
- Evaluation of severity of predicted changes and prediction of health effects
- Implementation of mitigation measures, noise management and complaint resolution planning (Health Canada 2010, 2017)

Further details on the regulatory framework for the acoustic assessment are provided in Section 4.3.3 Atmospheric Environment Effects Assessment.

8.3.4 Respiratory Health

The *Canadian Environmental Protection Act* requires that air pollutants are reported to the National Pollutant Release Inventory. Such air releases are used to help characterize air quality in Section 5, Atmospheric Environment Effects Assessment of the Application. Ambient air quality in BC is managed through provincial acts and regulations, with input from federal, regional and municipal governments. The *BC EMA* is the main provincial legislation for air quality and other environmental issues, and the *Waste Discharge Regulation* under the *Act* regulates the release and disposal of wastes to land, water and air in BC.

AAQOs are pollutant concentration thresholds that are set to protect human and environmental health across Canada. These limits provide regulatory benchmarks against which pollutant concentrations of CACs can be measured and assessed. The ambient air data were compared to ambient air guidelines from Alberta and Ontario, as BC MECCS does not have ambient air criteria applicable to the VOCs analyzed (BC MOE 2016).

Further details on the regulatory framework for the air quality assessment are provided in Section 4.2.3 Atmospheric Environment Effects Assessment.

8.3.5 Country Food Quality

Country foods are those that can be harvested through hunting, fishing or gathering activities, or grown in a noncommercial agricultural setting (Health Canada 2012). Harvesting activities may occur on or near contaminated sites or aquatic organisms may be consumed from water bodies affected by a contaminated site, therefore this exposure pathway for human health risk is considered for the assessment of the Country Foods Quality KI under the Human Health VC.

Health Canada provides expertise on the potential toxicological health effects of consuming contaminated country foods and is responsible for establishing the health standards for country foods. The quantity of country foods consumed and the predicted levels of contaminants in these foods vary, and expertise on contaminant pathways is limited (Health Canada 2010).

The US Environmental Protection Agency provides some guidance on the consumption of country foods, but there is little guidance overall with respect to sampling, analysis and consumption of country foods (Health Canada 2012). Health Canada provides guidance on when to consider a country foods study (that is, where there is a source of contamination, a mechanism for the contamination to move from the source into country foods and a subsequent route to the receptor via ingestion) (Health Canada 2012).

8.4 Existing Conditions and Context

This subsection provides information on existing environmental conditions in the Health RAA. Existing conditions for the Human Health VC refer to current surface water quality, groundwater quality, soil quality, quality of country foods, air quality, noise, and NORMs. The baseline information collected on environmental conditions is used to describe the potential effects of the proposed Project expansion on the Human Health VCs.

The information on environmental conditions in the following subsections was compiled from a variety of sources, including:

- The biophysical sections of the Application: Section 4.1 Terrain and Soils Effect Assessment; Section 4.2 Atmospheric Environment Effects Assessment; Section 4.3 Acoustic Environment Effects Assessment; Section 4.4 Surface Water Effects Assessment; and Section 4.5 Groundwater Effects Assessment
- A desktop SLHHRA (Appendix 11)
- Radiological risk assessment
- Description potential receptors, nearby water sources and historic usage of land
- Desktop review of publicly available information such as provincial and regional information sources, including the following Health Canada guidance documents:
  - Evaluating Human Health Impacts in Environmental Assessment: Noise
  - Evaluating Human Health Impacts in Environmental Assessment: Air Quality
  - Evaluating Human Health Impacts in Environmental Assessment: Water Quality
  - Evaluating Human Health Impacts in Environmental Assessment: Radiological Impacts
- Interviews with regional and municipal governments, health authorities and community organizations

Baseline information collected on environmental elements such as surface water, groundwater, soils, air quality, and the acoustic environment established the existing conditions for the potential pathways for effects on human health. Environmental media samples (soil, groundwater, surface water, and air sample) were collected and analyzed for parameters related to site activities and operations. These samples were considered applicable to characterize baseline conditions. Appropriate QA/QC measures were taken as part of sampling programs to confirm the quality of data collected from the Project site,

including field duplicates and trip blanks, where appropriate,. Samples were transported to qualified laboratories with rigorous laboratory QA/QC programs.

As with any environmental characterization activities, it is generally accepted that a number of uncertainties are inherent in collecting and analyzing environmental media. For example, heterogeneity of environmental media (such as soil), or sampling in space and time, can increase uncertainties. Sampling plans can reduce uncertainties by employing methods such as judgement sampling (identifying locations of previous releases or the location of known activities), or understanding the effect of exposure pathways on contaminant transport (selecting locations that are considered preferential pathways). Uncertainties in data are also addressed by employing multiple conservative assumptions that will overestimate actual risks (for example, reducing the effects of uncertainty by use of maximum observed concentrations or upper limits instead of a measure of central tendency, and/or assuming that environmental media is homogenously contaminated at maximum concentrations). In addition, potential receptors were selected based on current and historic use of the land. Health Canada guidance documents were reviewed and while some potential gaps may exist (for example, seasonal sampling), data considered in this risk assessment are considered sufficient to meet the objectives of the SLHHRA.

The proposed Project expansion is situated in the Boreal Plains Ecoprovince and the BWBS BGC Zone (CCS 2002). This zone is characterized by long and cold winters, with a warm and short growing season. Approximately 35 to 55 percent of precipitation falls as snow (BC MOF 1991). The topography ranges from 650 m asl to 850 m asl (Clifton 2002). The Blueberry River is located approximately 6.5 km to the north of the proposed Project expansion.

8.4.1 Human Health Risk Assessment Methodology

The SLHHRA evaluated the human health risk of exposure to potential stressors in the environment. Potential stressors considered in the SLHHRA included noise and environmental contaminants. Potential contaminants are chemicals released into air or water as a result of proposed Project expansion activities. The SLHHRA was carried out using guidance from regulatory authorities such as BC MECCS and Health Canada.

Potential risks to human health were evaluated using a conceptual model consisting of three components: a stressor; an exposure pathway; and a receptor. For a health risk to be plausible, all three components must be present, however, the health risk is also dependent on the magnitude and duration of the exposure to a stressor.

Further detail on the methodology and results of the SLHHRA is provided in Appendix 11.

8.4.2 Surface Water Quality

Surface water quality is included as a KI for the Human Health VC to identify any potential health effects resulting from reduced water quality.

Clifton (2002) identified several permanent creeks and lakes within a 10-km radius of the proposed Project expansion. The nearest surface water bodies include two unnamed creeks (tributaries to the Blueberry River), that are located approximately 1.4 km both to the west and north of the proposed Project expansion. Upset Creek, St. John Creek, an unnamed creek, and two unnamed lakes or sloughs are also listed as being present within 5 km of the proposed Project expansion (Clifton 2002). The nearest major surface water body is the Blueberry River, located approximately 7 km to the north, at an elevation approximately 100 m lower than the elevation of the proposed Project expansion. An ephemeral stream is located adjacent to the proposed Project expansion, to the north (CH2M 2017; Matrix 2017).

At the existing landfill, precipitation and runoff that does not contact waste drains offsite to the northwest following the topography. Precipitation that falls on the landfill is directed west using berms and ditches towards a stormwater retention pond (Tervita 2014). Surface water is sampled and analyzed prior to being pumped offsite to a forested area to the north of the existing landfill for re-infiltration (CH2M 2017).

There are no known channel connections between the proposed Project expansion and nearby fish-bearing water bodies (CCS 2002).

8.4.3 Groundwater Quality

Groundwater quality is included as a KI for the Human Health VC to identify any potential health effects resulting from reduced water quality.

A hydrogeological study (Clifton 2002) was completed prior to the construction of the existing landfill. This study encountered a shallow water table ranging from 1.8 to 3.8 mbgs. No aquifers identified as a groundwater resource are located below or within several km of the existing landfill. Groundwater flow was found to be to the northwest. The hydraulic conductivity of the clay till was found to be low, ranging from 3 by 10^{-7} cm per second (cm/s) to 8 by 10^{-7} cm/s. Horizontal groundwater migration rates were estimated in the range of centimetres per year (cm/y).

Recent investigations (Matrix 2017, 2019) have encountered the water table ranging from 0.65 to 9.54 mbgs, with flow to the northwest. Horizontal groundwater velocity was estimated at approximately 40 cm/y.

As part of the Clifton (2002) study, groundwater was sampled and analyzed for general chemistry, metals, hydrocarbons, phenols, and PAHs. The groundwater was characterized as a “sulphate type water with no dominant cation”. Total dissolved solids concentrations ranged between 1,160 mg/L to 7,060 mg/L and is considered “brackish”. Hydrocarbons, phenols, and PAHs were absent (nondetect) in the samples collected, while metals analytes were generally detected. Clifton (2002) indicates that the concentrations measured in groundwater are indicative of natural background conditions, and that the groundwater would not be suitable for potable use because of high sulphate, sulphide, and TDS concentrations.

Matrix (2017, 2019) conducted a water well search through the BC Water Resources Atlas. Within 5 km of the proposed Project expansion, three water wells were identified. Two wells are located 2.5 km to the east, owned by Leucrotta Exploration Inc., and used for monitoring; the third well is a domestic well owned by the BC Railway Company, and located 4 km to the northwest.

Potable water is trucked to the existing landfill, where it is stored in a cistern for general water use. A septic tank captures and stores wastewater until it is pumped out for offsite disposal (CCS 2002).

To prevent impacts to groundwater from the operations at the existing landfill, the cells are lined and equipped with a leachate collection and leak detection system (Tervita 2014). The proposed landfill expansion will be lined and connected to the existing leachate collection and leak detection systems.

Per the existing landfill’s BC MECCS permit, a groundwater monitoring program is conducted (Tervita 2014). A summary report of the groundwater monitoring program is prepared annually. The annual reports assess whether groundwater shows evidence of impacts from the landfill or if the groundwater quality is indicative of natural conditions. The reports also comment on whether the leachate collection and leak detection systems are functioning as designed.

8.4.4 Soil Quality

Soil quality is included as a KI for the Human Health VC to identify any potential health effects resulting from reduced soil quality.

The proposed Project expansion footprint is underlain by bedrock of middle Cenomanian age known as the Dunvegan Formation. The formation is characterized as grey sandstone, interbedded with grey to dark siltstone, shale, and carbonaceous shale (CCS 2002; Matrix 2017). This formation ranges from 50 to 250 m in thickness and is located at depths of approximately 6 to 18 mbgs in the vicinity of the existing landfill (Clifton 2002). Surficial deposits are characterized as glaciolacustrine deposits (clay) overlying clay till (CCS 2002; Clifton 2002; Matrix 2017). This information is consistent with Jacobs’ observations during

shallow soil sampling at the proposed Project expansion footprint (CH2M 2017), where topsoil underlain by clay and silty clay with trace fine sand and gravel was encountered.

The proposed Project expansion will extend the existing double-liner system already in place to the new landfill cells. The liner is in place to protect existing soil and groundwater from impacts from the landfill activities (Tervita 2014).

During construction and operations of the landfill, topsoil and subsoil is salvaged, stockpiled, and maintained with the purpose of using the salvaged soil as the final cover for the landfill cells (Tervita 2014). Measures taken to maintain these soils can include: “seeding, hydroseeding, erosion mitigation, cutting, weeding, or contouring to maintain efficient drainage” (Tervita 2014).

The types of waste that are currently accepted at the existing landfill include hydrocarbon-contaminated soils and sands, sulphur-contaminated soil, and salt-contaminated soils. These soils generate leachate. The existing landfill is equipped with a leachate collection and a leak detection system (CCS 2002). The proposed Project expansion will connect to the existing system. The collected leachate is pumped into leachate vault, which is subsequently pumped out and disposed of in an offsite licenced disposal well (Golder 2008). Leachate at the existing landfill is monitored as part of the groundwater monitoring program.

8.4.5 Country Foods Quality

Country foods are defined as foods which are trapped, fished, hunted, harvested or grown for subsistence or medicinal purposes, or obtained from recreational activities such as sport fishing or game hunting. Country foods do not include foods produced in commercial operations, such as large farms or greenhouses (Health Canada 2012).

Traditional foods and consumption rates can vary widely depending upon location. For example, the traditional diet of inland First Nations groups likely includes greater proportions of wild game, whereas coastal First Nations groups likely harvest and consume more marine fish and shellfish. Guidance from Health Canada on HHRAs for country foods states that between 6 percent and 40 percent of total dietary energy consumed by Aboriginal people is from country foods. A low of 6 percent occurs close to urban centres and communities, to a high of 40 percent in more remote areas (Health Canada 2012).

BRFN has indicated that they gather, hunt, fish, and trap in the vicinity of the proposed Project expansion. COPCs for country foods will be based on the COPCs identified in soil, groundwater, and surface water. Vegetation, fish, and wildlife may uptake COPCs in these media.

8.4.6 Air Quality

Ambient air quality is assessed by way of monitoring stations for various CACs, including the following:

- **NO_x**, which are the main component of industrial and vehicle emissions, and can transform into acidic nitrate particles in the presence of sunlight
- **SO_2**, which occurs naturally at low levels, but is primarily produced by industrial processes and fuel combustion
- **CO**, which is produced by vehicle emissions and interferes with the body’s ability to use oxygen
- **PM**, which are airborne particles characterized as coarse, with a diameter between 2.5 µm and 10 µm ($PM_{2.5-10}$) or fine, with a diameter of less than 2.5 µm ($PM_{2.5}$), are produced by industrial and natural processes, and are a major component of smog
- **VOCs,** which are carbon-containing compounds (for example, benzene and formaldehyde) that can react with sunlight and NO_x to form ground-level ozone (Health Canada 2010)

Increased levels of CACs are linked to a range of health effects, including reduction of lung function, pain and difficulty breathing, coughing and wheezing, especially in people already suffering from asthma or

bronchitis (Health Canada 2010), and effects on the cardiovascular system, such as cardiovascular disease, myocardial infarction, stroke, high blood pressure, and arrhythmias (Thurston et al. 2017). $PM_{2.5}$ can be inhaled deep into the lungs and damage the alveoli (Health Canada 2010). VOCs are not generally monitored in the ambient air; however, VOCs and other contaminants such as ammonia and NO_x can react to increase levels of ground-level ozone, which is linked to a broad array of human health effects such as decreased lung function (Health Canada 2013) and cardiovascular disease (Thurston et al. 2017).

Industrial emission sources (for example, well sites, flare stacks, and gas plants) are present in the region surrounding the proposed Project expansion, and with the exception of Tervita's adjacent TRD landfill, none are located within 1 km of the proposed Project expansion (CCS 2002; Tervita 2014).

Onsite, as part of the existing landfill operations, air emissions are generated by heavy machinery and one diesel generator, which supplies power to the existing landfill (CCS 2002; Tervita 2014).

Dust from construction material handling and earth grading, and traffic on the roads to and from the landfill, may generate dust. The dust from construction material handling and earth grading may contain potential contaminants of concern that could affect human health. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic (Tervita 2014). NORMs may be present in dust and could be released in the air when moving vehicles and other equipment over the proposed Project expansion area. Tervita conducts air monitoring for NORM activity levels bi-annually to determine if dust being carried in the air has NORM activity levels above regulatory restrictions.

Due to the waste types present at the landfill (that is, waste materials from the oil and gas industry), minimal landfill gas is generated; however, this material can produce odours and vapours from VPH present in the waste (CCS 2002; Tervita 2014).

The Respiratory Health KI was selected to identify and mitigate potential effects on the Human Health VC of reduced air quality due to the proposed Project expansion. proposed Project expansion emissions of air contaminants are equipment and vehicular emissions during construction and operations.

8.4.7 Noise

Noise was included as a KI under the Human Health VC in order to identify and mitigate potential effects from elevated noise levels associated with the proposed Project expansion on the Human Health VC. Noise is defined as any unwanted sound that has a sound level and duration sufficient to cause adverse effects on physical, mental or social well-being (Health Canada 2012). Noise-induced endpoints that are recognized as health effects include hearing loss, sleep disturbance, interference with speech comprehension, public complaints and change in percent of the population identified as "highly annoyed" (Health Canada 2010). Potential health effects of noise also include increased stress that may contribute to development of stress-related illnesses (Health Canada 2012).

The major source of noise contributing to existing sound levels around the proposed Project expansion area are road and train traffic. Buick Creek Road is present to the west of the site with railway lines beyond. Frequent daily rail traffic is present; however, the noise from the road and rail traffic is considered "variable and intermittent" (Tervita 2014). Average car traffic along Buick Creek Road during the summer is estimated to be 735 vehicles per day (CCS 2002). Natural sounds, such as wind rustling through vegetation and birds, are also expected to contribute to ambient noise levels when vehicle traffic is absent.

At the existing landfill, noise is generated from the waste-handling machinery and trucks hauling the waste (CCS 2002). The noise from normal daytime landfill operations includes "truck traffic, heavy equipment, backup beepers, speaker systems and radios" (Tervita 2014a). These noise sources are also associated with cell construction activities.

The nearest neighbour to the proposed Project expansion is seasonal and is located at a distance of 2.5 km from the proposed Project expansion footprint (Tervita 2014a). BRFN has indicated that they gather, hunt, and trap in the vicinity of the proposed Project expansion. The proposed Project expansion is also

surrounded by forest, which will dampen noise generated from operations (CCS 2002). The construction phase of the Project is expected to last approximately 4 to 5 months; therefore, the mitigation noise levels presented in Section 6.4.2 Table 6.2 of Health Canada's *Guidance for Evaluating Human Health Impacts in Environmental Assessments: Noise* are applicable and were used as a screening comparison to worst-case noise levels during construction. If it is conservatively assumed that two of each of the equipment types presented in Section 4.3.3.1 of the Environmental Assessment are being used simultaneously at the work site, the noise level at a distance of 2.5 km is expected to attenuate to 46 dBA. These construction activities are only expected to occur during daytime hours; therefore, the construction day-night sound level (Ldn) would be 44 dBA. If baseline Ldn is conservatively assumed to be 45 dBA for a quiet rural setting (per Table 6.1 of the guidance), the sum of construction and baseline Ldn is then 47 dBA, which is equal to the suggested mitigation noise level of 47 dBA Ldn. The estimate of 47 dBA for noise levels from construction considers only distance attenuation and is therefore a conservative estimate. In reality, ground attenuation, vegetation, and foliage between the work site and the receptor would further reduce this noise impact. Furthermore, simultaneous usage of all the equipment stated in Section 4.3.3.1 of the Environmental Assessment for 15 hours per day during construction is unlikely. During the operations phase of the Project, it is expected that the same number and nature of equipment that is currently being used at the landfill will continue to be used; therefore no significant increase in noise will occur. For closure and reclamation, similar equipment to the construction phase, albeit fewer of them, will be used; therefore, noise impacts are expected to be lower than the construction phase. Based on this screening analysis, it is not expected that there will be any health impacts to human receptors during the short construction period, nor any subsequent phase of the Project.

These noise sources represent the baseline noise levels in the vicinity of the proposed Project expansion.

8.4.8 Naturally Occurring Radioactive Materials

NORMs can accumulate in waste streams from the oil and gas industry at levels greater than background. Within the subsurface formations from which oil and gas are extracted, the source of NORMs are primarily naturally occurring uranium-238 (U-238) and thorium-232 (Th-232) (Smith 1992). Of most concern is the radium-226 (Ra-226) isotope, which is a decay product of U-238. Radon-222 (Rn-222) (a decay product of Ra-226) and lead-210 (Pb-210) (a decay product of Rn-222) may also be present (Smith 1992). Depending on the geographic source, the original concentrations of U-238 and Th-232 in the formation, and the waste stream, levels of NORMs can vary widely (Smith 1992). All waste loads are screened for NORMs prior to acceptance at the landfill and known NORM waste loads must have proof of analysis prior to acceptance. NORMs may occur in the oil and gas waste streams accepted at the proposed Project expansion, including decommissioned infrastructure materials, such as spent catalyst and refractory brick. As per Silverberry's *EMA* Permit, 17150, the maximum acceptable radioactive concentration for NORMs is 70 becquerels per gram (Bq/g), with a maximum radioactive concentration due to Ra-226 of 5 Bq/g.

8.4.9 Community Health

Community health is linked to aspects of the proposed Project expansion that have potential to affect quality of life such as air quality, surface and groundwater quality, noise, visual quality, traffic, employment and training opportunities, housing and commercial accommodation, accidents and malfunctions, and human health. An environmental stressor, such as construction and operations of a landfill, can affect an individual's physical, mental and social well-being. Even though this particular stressor may not pose an immediate threat to an individual, constant worry about the potential adverse effects from construction and operations can affect one's perception of the environment and overall quality of life. Not all individuals or communities perceive development in the same way, and concerns or issues can be unique to each community or Aboriginal group. An important consideration in limiting effects on community health is that the proposed Project expansion will be confined within the existing fence line of the existing operating landfill and will require a limited construction workforce of up to 20 personnel. Overall, in the context of Tervita's existing operating landfill, the increased potential or perceived effects on community health from the proposed Project expansion are anticipated to be negligible.

Aspects of community health are, nevertheless, incorporated throughout this assessment under VCs including Air Quality (Section 4.2), Acoustic Environment (Section 4.3), Surface Water (Section 4.4), Groundwater (Section 4.5), Community Services (Section 6.2), and Community Infrastructure (Section 6.3), in addition to other KIs assessed under the Human Health VC.

8.4.10 Traditional Knowledge Shared

BRFN expressed concerns that the landfill will affect water, air and collected, gathered or harvestable consumables that in turn will affect BRFN member health. BRFN indicated that whether or not levels are below standard levels is one KI, but another KI is the extent to which perception leads to avoidance of country foods leading to adverse health impacts. To date, although opportunities were provided to share traditional knowledge both directly and through the Working Group, DRFN have not provided any traditional knowledge related to human health effects.

8.5 Human Health Effects Assessment

This subsection describes potential effects, mitigation measures, residual effects and their significance, reference to the associated KIs: drinking water quality; soil quality; leachate; country foods quality; respiratory health; noise; and NORMs. Information on existing economic conditions in the Health RAA which provides context for the Environmental Assessment is located in the Appendix 11.

8.5.1 Identification of Potential Effects, Mitigation Measures and Residual Effects

Table 8.5-1 identifies the potential adverse effects of the proposed Project expansion on the Human Health VC, mitigation measures, and potential residual effects.

The identification of potential adverse effects of the proposed Project expansion on the Human Health VC is based on the results of the applicable biophysical sections of the Application:

- Soil Quality: Section 4.1 Terrain and Soil Effects Assessment
- Air Quality: Section 4.2 Air Quality Effects Assessment
- Noise: Section 4.3 Acoustic Environment Effects Assessment
- Surface Water: Section 4.4 Surface Water Effects Assessment
- Groundwater: Section 4.5 Groundwater Effects Assessment

Additional sources used to inform the assessment of the Human Health VC include the following:

- A desktop SLHHRA (Appendix 11)
- Desktop review of publicly available information
- Interviews with regional and municipal government, health authorities and community organizations

The health assessment methodology was developed through a literature review as well as consultation and engagement with government agencies and the professional experience of the assessment team.

The proposed Project expansion is anticipated to interact with the Human Health VC during the following construction, operations and closure/reclamation activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Leachate management, stormwater management and ongoing monitoring
- Cell capping
- Postclosure maintenance and monitoring

The summary of recommended mitigation measures provided in Table 8.5-1 was developed in accordance with industry and provincial regulatory guidelines and in a manner consistent with Section 3.5 of this Application. Through the implementation of these measures, it is expected that the proposed

Project expansion will meet the objectives relating to drinking water quality, soil quality, leachate, country foods quality, respiratory health, noise, and NORMs. The description of mitigation measures provided in Table 8.5-1 is based on proposed mitigation measures to avoid or reduce potential adverse effects on the Surface Water VC (refer to Section 4.4), the Groundwater VC (refer to Section 4.5), the Terrain and Soils VC (refer to Section 4.1), the Air Quality VC (refer to Section 4.2), and the Acoustic Environment VC (refer to Section 4.3).

Table 8.5-1. Potential Effects, Mitigation Measures and Residual Effects of the Proposed Project Expansion on Human Health

Project Phase	Potential Effect	Spatial Boundary	Key Recommendation/ Mitigation Measures	Mitigation Tier [a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect(s)
Surface Water							
Construction, Operations and Closure/Reclamation	Change in drinking water quality	Surface Water LAA and RAA	• Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria	Minimization	During all Project phases	High	No residual effects have been identified.
Groundwater							
Construction, Operations and Closure/Reclamation	Change in drinking water quality	Groundwater LAA and RAA	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system)	Minimization	During all Project phases	High	No residual effects have been identified.
			• Existing quarterly groundwater monitoring program will be applied to the proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable)	Minimization	During all Project phases	High	
Soil							
Construction, Operations and Closure/Reclamation	Potential adverse human health effects due to the disturbance of contaminated soil	Terrain and Soil LAA and RAA	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system)	Minimization	During all Project phases	High	No residual effects have been identified.
			• Existing mitigation measures such as dust suppression at the Project will be implemented for the proposed Project expansion	Minimization	Immediate	High	
			• Workers must comply with occupational health and safety requirements (for example, use of PPE)	Avoidance	Immediate	High	
Leachate							
Construction, Operations and Closure/Reclamation	Leachate effects on surface water, groundwater, or soil quality	Surface Water LAA and RAA, Surface Water LAA and RAA. Terrain and Soil LAA and RAA	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system)	Minimization	During all Project phases	High	No residual effects have been identified.
			• Workers must comply with occupational health and safety requirements (for example, use of PPE)	Avoidance	Immediate	High	
Country Foods							
Construction, Operations and Closure or Reclamation	Decreased quality of country foods in plant gathering areas, hunting sites and fishing areas	Terrain and Soil LAA and RAA	• Existing mitigation measures such as dust suppression at the landfill will be implemented for the proposed Project expansion	Minimization	Immediate	High	No residual effects have been identified.
		Groundwater LAA and RAA	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system)	Minimization	During all Project phases	High	No residual effects have been identified.
			• Existing quarterly groundwater monitoring program will be applied to the proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable)	Minimization	During all Project phases	High	
		Surface Water LAA and RAA	• Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria	Minimization	During all Project phases	High	No residual effects have been identified.
Respiratory Health							
Construction, Operations and Closure/Reclamation	Air quality effects on respiratory and cardiovascular health	Air Quality RAA	• All construction equipment will adhere to low-emission Tier 4 engine specifications	Minimization	Immediate	High	No residual effects have been identified.

Table 8.5-1. Potential Effects, Mitigation Measures and Residual Effects of the Proposed Project Expansion on Human Health

Project Phase	Potential Effect	Spatial Boundary	Key Recommendation/ Mitigation Measures	Mitigation Tier [a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect(s)
Noise							
Construction, Operations and Closure/Reclamation	Noise disturbance to nearby Land Users/First Nations	Noise LAA and RAA	• Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m.	Avoidance	Immediate	High	No residual effects have been identified.
			• Equipment will be well-maintained with properly functioning mufflers; operators will take reasonable measures to control construction-related noise	Minimization	Immediate	High	
NORMs							
Construction, Operations and Closure/Reclamation	Potential adverse human health effects due to the disturbance of contaminated soil	Maximum extent of the Terrain and Soil, Air, Surface Water and Groundwater LAA and RAA	• Dust suppression measures to minimize dust generated from vehicular traffic	Minimization	Immediate	High	No residual effects have been identified.
			• Air filter monitoring at the property boundary	Minimization	Immediate	High	
			• Workers must comply with occupational health and safety requirements (for example, use of PPE)	Avoidance	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

Note:
PPE = personal protective equipment

8.5.2 Residual Effects and Their Significance

No potential residual effects were identified for drinking water quality, soil quality, country foods quality, and respiratory health. Potential risks associated with the construction and operation of the proposed Project expansion are generally low or unlikely. Furthermore, occupational health and safety requirements and risk mitigation measures currently in place at the existing landfill will be implemented for the proposed Project. With the implementation of the proposed mitigation described in Table 8.5-1, no potential residual effects on the Human Health VC due to the decommissioning or abandonment of the proposed Project expansion have been identified.

Construction noise levels were estimated based on simultaneous operation of several pieces of equipment expected to be used during cell preparation:

- Two CAT D6T dozers
- Two CAT 330F excavators
- Six 30-ton CAT 735C rock trucks
- Two CAT 815K compactors

The operations stage of the proposed Project expansion will require the use of similar equipment in the same quantities as what is currently being used at the existing landfill.

According to the U.S. Department of Transportation, Federal Highway Administration, *Construction Noise Handbook* (2017), the equipment listed above have measured and averaged sound pressure level measurements at 15 m as follows: compactor (83 dBA), dozer (82 dBA), dump truck (76 dBA), and excavator (81 dBA). It is highly unlikely that all equipment will be used simultaneously, and construction is only anticipated during the daylight hours. The noise levels are conservatively expected to attenuate to less than 55 dBA within 1 km of the Project footprint and will not affect sensitive receptors to levels greater than BC noise guidelines. The noise effects of construction are expected to be temporary, localized, and reversible. There may be land users, including First Nations, within the Acoustic Environment LAA on an intermittent basis and a limited number of users within the Acoustic Environment RAA (that is, a 5-km radius extending outwards from the Project footprint boundary). The noise levels within the Acoustic Environment LAA during the construction stage are expected to be within BC noise guideline acceptable levels; therefore, the levels within the RAA will also be acceptable.

8.5.2.1 Risk Analysis

On the basis of the known risks associated with construction and operation of the proposed Project expansion, the potential environmental effects and associated risks to the Human Health VC, along with consideration of occupational health and safety requirements and risk mitigation measures currently in place at the existing landfill, the potential adverse effects of the proposed Project expansion on Human Health do not require additional risk analysis.

The SLHHRA was conducted to provide a conservative evaluation of potential risks to human health associated with the proposed Project. The SLHHRA evaluated chemical concentrations in applicable environmental media (that is, soil, groundwater, leachate, and surface water) and compared analytical data against the applicable BC CSR Standards (BC MOE 1996). The BC CSR Standards are derived using conservative exposure assumptions to be sufficiently protective of the general public within each land use category. Air, noise, and NORMs have also been evaluated in the SLHHRA using applicable BC and Health Canada criteria. To identify COPCs, the SLHHRA compared the maximum measured concentration or highest detection limit (if greater than the maximum measured value) of chemical parameters against the most stringent BC CSR Standard for each environmental media to provide the most conservative approach to characterize onsite conditions.

8.5.3 Summary of Assessment of Potential Effects on the Human Health VC

Based on the CSMs and data and information available, this qualitative SLHHRA predicts that there are not significant risks of adverse health effects to human receptors from the proposed Project expansion. All pathways are predicted to have risks that are low or unlikely.

The risk assessment paradigm specifies that for a risk of adverse effects to human health to be plausible, three components are required to be present: a stressor (for example, COPC in environmental media) at a concentration or magnitude that can present a hazard; an exposure pathway for the stressor to contact the receptor; and, a human receptor. The SLHHRA qualitatively evaluated the level of risk by considering potential receptor of concern (that is, workers, land users, First Nations), the potential hazard of COPCs in an environmental media and the level of exposure. Finally, the SLHHRA considered occupational health and safety requirements and risk management measures currently in place at the existing landfill that will mitigate risks of adverse effects to human health. The conclusions of the SLHHRA are likely to be consistent with the conclusions of a quantitative human health risk assessment. Therefore, a quantitative human health risk assessment is not warranted at this time.

8.5.3.1 Cumulative Effects Assessment

No residual effects have been identified for the Human Health VC; therefore, a cumulative effects assessment is not required.

8.5.4 Follow-up Strategy

A follow-up strategy should be considered where a residual effect and/or cumulative effect has been identified. There are no residual or cumulative effects identified for the Human Health VC; therefore, a follow-up strategy is not required.

9. Accidents and Malfunctions

Accidents or malfunctions are unplanned events that can result in adverse environmental, economic, social, heritage or health effects. While the proposed Project expansion has rigorous standards and practices in place to make accidents or malfunctions unlikely, the potential consequences of an accident or malfunction are evaluated so that emergency response and contingency planning can be identified to reduce risk. Tervita is committed to designing, constructing and operating the proposed Project expansion in a safe and environmentally responsible manner that respects land users and the landscape within which it operates.

9.1 Context

Potential accidents and malfunctions that may occur during proposed Project expansion activities include traffic-related accidents; release or spill of contaminants such as hydrocarbons, hazardous materials and NORM-containing materials (terrestrial, surface water or groundwater); structural failure of a landfill component during construction or operations; onsite fires; and damage to existing Silverberry landfill infrastructure. Consequences of these events potentially include effects on human health, and contamination of onsite surface water, soil and groundwater and release of contaminants to air, adversely affecting nearby terrestrial and aquatic habitats.

9.1.1 Traditional Knowledge Shared

Through the Working Group, BRFN has not identified any concerns or provided any traditional knowledge specific to accidents and malfunctions, but has identified concerns with respect to soils, surface water, groundwater, vegetation, and wildlife, should accidents and malfunctions occur. DRFN has expressed concerns about elevated barium levels in soils outside the footprint of the existing landfill and requested that further studies be conducted to determine the sources of these exceedances.

9.2 Risk Evaluation

Table 9.2-1 describes the definitions for each category of likelihood and consequence used in the risk evaluation for each accident or malfunction. The definitions for likelihood and consequence were adapted from the University of New South Wales Environmental Risk Rating Procedure and were revised to align with the assessment criteria definitions for characterizing potential residual adverse effects (University of New South Wales 2010).

Table 9.2-1. Definitions for each Category of Likelihood and Consequence

	Category	Description
Likelihood	Almost Certain	Is expected to occur in most circumstances and has a history of occurrence. Occurrence can be expected once or more per year.
	Likely	Will probably occur in most circumstances. Occurrence is expected once in 1 to 3 years.
	May	Could occur at some point. Occurrence is expected once in every 3 to 5 years.
	Unlikely	Not likely to occur in normal circumstances. Occurrence is expected only once during the life of the proposed Project expansion.
	Rare	Could occur only in exceptional circumstances. Occurrence is not expected during the life of the proposed Project expansion.
Consequence	Severe	Resulting adverse environmental, social, economic, heritage and health effects are considered severe and will take more than 10 years to reverse.
	Major	Resulting adverse environmental, social, economic, heritage and health effects are considered major and can be reversed in less than 10 years.
	Moderate	Resulting adverse environmental, social, economic, heritage and health effects are detectable and can be reversed in less than or equal to 1 year.
	Minor	Resulting adverse environmental, social, economic, heritage and health effects are barely detectable and can be reversed in less than or equal to 1 month.

Table 9.2-1. Definitions for each Category of Likelihood and Consequence

	Category	Description
Consequence (cont'd)	Negligible	Resulting adverse environmental, social, economic, heritage and health effects are barely to not detectable and can be reversed in 2 days or less.

The methodology used to assess the potential risk of an accident or malfunction will involve the use of a risk evaluation matrix (Table 9.2-2).

Table 9.2-2. Risk Evaluation Matrix

		Consequence				
Likelihood		***Severe***	***Major***	***Moderate***	***Minor***	***Negligible***
	Almost Certain	Very High	Very High	High	Medium	Low
	Likely	Very High	High	High	Medium	Low
	May	High	High	Medium	Low	Low
	Unlikely	Medium	Medium	Medium	Low	Low
	Rare	Medium	Low	Low	Low	Low

The risk evaluation matrix was adapted from the Risk Management Guideline for the BC Public Sector document and was revised to consider the consequence of an accident or malfunction associated with the proposed Project expansion (Province of BC Risk Management Branch and Government Security Office 2012).

Level of confidence was determined by the availability of data, precedents and degree of scientific uncertainty or other factors beyond the control of the assessment team. Conclusion will be based on either a low, moderate or high level of confidence for each potential adverse effect. These determinations will be made on the basis of the following factors:

- Low: Prediction is based on incomplete understanding of cause-effect relationships and incomplete data pertinent to the proposed Project expansion area.
- Moderate: Prediction is based on good understanding of cause-effect relationships using data from outside the proposed Project expansion area or incompletely understood cause-effect relationships using data pertinent to the proposed Project expansion area.
- High: Assessment is based on good understanding of cause-effect relationships and data pertinent to the proposed Project expansion area.

Where uncertainty exists in the conclusion of risk, appropriate follow up and monitoring programs are provided.

Table 9.2-3 represents the potential risk that could result from accidents and malfunctions and conservatively outlines the unmitigated likelihood and consequence of such an event, level of confidence, and the mitigation that addresses the risk and the potential residual adverse effects that remain after mitigation. Since waste is screened for NORMs prior to being accepted at the existing landfill and materials containing NORM are accepted in accordance with all provincial and federal regulatory requirements, no accidents or malfunctions related to NORMs are anticipated. The potential effects of NORMs on human health are assessed in Section 8.5 Human Health.

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application and have been incorporated into Project design and the Operations Plan based on regulatory requirements, standard industry practice, and Project-specific requirements. The proposed mitigation measures are predicted to have high effectiveness as they reflected Tervita's experience in operating Secure Landfills in

northeast BC region. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in avoiding or reducing potential adverse effects of accidents and malfunctions.

Table 9.2-3. Potential Effects, Mitigation Measures and Risk Evaluation of the Proposed Project expansion on Accidents and Malfunctions

Project Phase	Potential Effect	Potentially Affected VC	Likelihood	Consequence	Confidence	Key Recommendation/ Mitigation Measures	Mitigation Tier [a]	Mitigation Timeline	Effectiveness[b]	Potenti
Construction and Operations	Traffic-related accidents	Community Infrastructure	Unlikely	Minor to severe	High	• Implement measures to reduce traffic-related accidents provided under Community Infrastructure Table 6.3-2.	Minimization	Immediate	High	Low to mediu
Construction, Operations, Closure or Reclamation, and Postclosure	Accidental release or spill of contaminants such as hydrocarbons or hazardous materials to the terrestrial environment	Terrain and Soils Air Quality Terrestrial Vegetation Wildlife and Wildlife Habitat Human Health	May to unlikely	Minor to moderate	High	• Design standards for the liner and leachate system will be in accordance with regulatory requirements.	Avoidance	Immediate	High	Low to mediu
						• A leak detection program for the liner system will be installed and monitored.	Restoration	Immediate	High	
						• Design failures will be monitored and tracked through the following: – Leak detection monitoring. – Inspection and monitoring of surface water and leachate controls. – Weekly inspection of cover controls to monitor erosion, vegetation growth, and other integrity issues. Any integrity issues will be documented in inspections and rectified as soon as possible.	Restoration	Immediate	High	
						• Tervita will adhere to applicable BC spill regulations during all phases of the Project.	Avoidance	Immediate	High	
						• Wastes transported to the Project site will be covered to minimize loss during transit.	Minimization	Immediate	High	
						• Waste resulting from clean-up of spilled and released material shall be collected, stored and characterized appropriately.	Avoidance	Immediate	High	
						• Fuel tanks brought to site will be double walled or must be in secondary containment that is 110% of the volume of the tank. Fuel tanks onsite will follow the provincial guidelines in *A Field Guide to Fuel Handling, Transportation and Storage*.	Avoidance	Immediate	High	
						• A spill prevention program will be implemented, where any spills that occur are cleaned up using absorbent materials, and with the use of any other required remedial actions.	Avoidance	Immediate	High	
						• Spill and release equipment and supplies will be available onsite, such as PPE, first aid kit(s), a fire extinguisher, a tool box (with tools), a commercial spill kit (absorbent sheets/pillows, absorbent socks, disposal bags, disposal bags, splash goggles, nitrile gloves), absorbent booms, and a shovel.	Restoration	Immediate	High	
						• Employees and contractors will be trained and made aware of their roles and responsibilities in the event of a spill or release.	Minimization	Immediate	High	
						• Soil sampling will be conducted at the closure/reclamation phase in order to identify contaminated soils requiring remediation.	Restoration	Immediate	High	
						• Waste resulting from cleanup of spilled and released material shall be collected, stored, and characterized appropriately.	Minimization	Immediate		
						• Fuel tanks brought to site will be double walled or must be in secondary containment that is 110% of the volume of the tank.	Avoidance	Immediate		
						• A spill prevention program will be implemented, where any spills that occur are cleaned up using absorbent materials, and with the use of any other required remedial actions.	Restoration	Immediate		
						• Spill and release equipment and supplies will be available onsite, such as PPE, first aid kit(s), a fire extinguisher, a tool box (with tools), a commercial spill kit (absorbent sheets/pillows, absorbent socks, disposal bags, disposal bags, splash goggles, and nitrile gloves), absorbent booms, and a shovel.	Restoration	Immediate		

Table 9.2-3. Potential Effects, Mitigation Measures and Risk Evaluation of the Proposed Project expansion on Accidents and Malfunctions

Project Phase	Potential Effect	Potentially Affected VC	Likelihood	Consequence	Confidence	Key Recommendation/ Mitigation Measures	Mitigation Tier [a]	Mitigation Timeline	Effectiveness[b]	Potenti
Construction, Operations, Closure or Reclamation, and Postclosure (cont'd)	See above	See above	See above	See above	See above	• Employees and contractors will be trained and made aware of their roles and responsibilities in the event of a spill or release.	Minimization	Immediate	High	See a
						• Chemical and fuel storage during the construction phase will be limited to small volumes in temporary areas (for example, truck mounted fuel tanks for excavating equipment, cases of lube oil stored in equipment storage locker).As a precaution to deal with the potential for a significant release, Tervita will require the construction contractor to maintain a spill response plan to manage the surface assessment, mitigation and remediation, including notification to the appropriate regulatory authority (BC MECCS).	Minimization	Immediate	High	
						• A leak detection program for the liner system will be installed and monitored. The leak detection system between the primary composite liner and secondary CCL will consist of high flow geonet synthetic drainage media connected to a drain system and collection sump.	Restoration	Immediate	High	
						• The leachate collection and removal system will consist of a permeable granular layer across the entire base of the landfill cell. Leachate filtering through the waste will drain laterally through the granular drainage layer to the collection trenches and from there to a collection sump where automatic pumping systems will extract the leachate and direct it to the leachate ponds for storage. At less frequent intervals, the leachate will be removed from storage and trucked or moved via pipeline to an approved facility for treatment or disposal.	Avoidance	Immediate	High	
						• Design standards for the liner and leachate system will be in accordance with regulatory requirements.	Avoidance	Immediate	High	
						• The landfill cell final cover has been designed to prevent surface water from coming into contact with waste soils. The surface water run-off will instead flow to the surrounding environment, minimizing continued leachate production.	Avoidance	Immediate	High	
						• Water within the cell will be treated as leachate prior to release of water.	Avoidance	Immediate	High	
						• Implement additional measures provided in the Leachate Management Plan, the Landfill Leak Detection Monitoring Plan and the Emergency Preparedness and Response Plan.	Minimization	Immediate	High	
Construction, Operations, Closure/Reclamation, and Postclosure	Accidental release or spill of contaminants such as hydrocarbons or hazardous materials to the groundwater environment	Groundwater Human Health	Rare to unlikely	Minor to severe	Moderate	• As a precaution to deal with the potential for a significant release, Tervita will require the construction contractor to maintain a spill response plan to manage the surface assessment, mitigation and remediation, including notification to the appropriate regulatory authority (BC MECCS).	Avoidance	Immediate	High	Low to mediu
						• Design standards for the liner and leachate system will be in accordance with regulatory requirements.	Avoidance	Immediate	High	
						• A leak detection program for the liner system will be installed and monitored.	Avoidance	Immediate	High	
						• Water within the cell will be treated as leachate prior to its release.	Avoidance	Immediate	High	
						• Install additional groundwater wells in accordance with the *Groundwater Protection Regulations*.	Avoidance	Construction	High	
						• Incorporate the proposed Project expansion into the existing Groundwater Monitoring Program.	Minimization	Immediate	High	
						• Implement additional measures provided in the Accidents and Malfunction Plan.	Minimization	Immediate	High	
Construction and Operations	Structural failure of a landfill component during construction or operations resulting in terrestrial contamination	Terrain and Soils Air Quality Terrestrial Vegetation Wildlife and Wildlife Habitat Human Health	Rare to unlikely	Minor to moderate	High	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Avoidance	Immediate	High	Low to mediu
Construction and Operations	Structural failure of a landfill component during construction or operations resulting in surface water contamination	Surface Water Human Health	Rare to unlikely	Minor to severe	High	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Avoidance	Immediate	High	Low to mediu

Table 9.2-3. Potential Effects, Mitigation Measures and Risk Evaluation of the Proposed Project expansion on Accidents and Malfunctions

Project Phase	Potential Effect	Potentially Affected VC	Likelihood	Consequence	Confidence	Key Recommendation/ Mitigation Measures	Mitigation Tier [a]	Mitigation Timeline	Effectiveness[b]	Potenti
Construction and Operations	Structural failure of a landfill component during construction or operations resulting in groundwater contamination	Groundwater Human Health	Rare to unlikely	Minor to severe	High	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Avoidance	Immediate	High	Low to mediun
Construction and Operations	Onsite fires	Community Services Human Health	Rare to unlikely	Minor to moderate	High	• There will be no open fires allowed on the site.	Avoidance	Immediate	High	Low to mediun
						• In the event of a wildfire, implement measures in the Emergency Response Plan.	Minimization	Immediate	High	
						• As part of the Emergency Response Plan, there will be fire suppression equipment onsite, and personnel will have undergone training in the use of the equipment.	Avoidance	Immediate	High	
						• All fires detected will be extinguished immediately upon detection. Complete procedures for dealing with fires during operation are specified in the Fire Control section of the Operations Plan. Portable fire equipment will be available at the site and marked appropriately.	Minimization	Immediate	High	
						• There will also be annual drills conducted to test and train personnel, which will be recorded and reported.	Minimization	Immediate	High	
Construction and Operations	Damage to existing landfill infrastructure	Terrain and Soils Air Quality Surface Water Groundwater Terrestrial Vegetation Wildlife and Wildlife Habitat Human Health	Rare to unlikely	Minor to moderate	High	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid damage to existing landfill infrastructure.	Avoidance	Immediate	High	Low to mediun

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

The BC HWR governs approval and development of Secure Landfills in the province of BC. As with other existing Tervita landfills in Canada, the existing landfill design is intended to exceed minimum prevailing regulatory requirements with respect to overall objectives for secure long-term containment of wastes within the landfill.

In order to ensure ongoing compliance with the BC HWR and minimize the likelihood and magnitude of any accidents or malfunctions, Tervita personnel and third-party contractors are required to adhere to specific operating procedures, policies and information provided in Tervita's Operations Plan for the existing Silverberry Landfill. The Operations Plan covers construction, operations and closure/reclamation phases of the existing landfill and will be updated to accommodate the landfill expansion. Materials provided within the Operations Plan that will be reviewed and updated to accommodate the expansion activities include:

- **Main design elements** including detailed descriptions, specifications and drawings of the liner system and liner material, leachate management system and disposal, stormwater management, final cover system, and monitoring of groundwater, surface water, leachate and any liquids accumulating in the leak detection system.
- **Construction Quality Assurance Plan** implemented for construction of each landfill cell to ensure the final outcome fully meets the design intent and outlines the roles, responsibilities and qualification requirements of contract personnel as well as the requirements for as-built surveys and construction summary reports for each cell.
- **Operational Report – Landfill Policy** that provide detailed operating procedures and policy including an Organization Structure Plan, waste acceptance protocol, waste documentation and tracking, fire control, occupational health and safety program, Emergency Response Plan, onsite communication and awareness procedures, operating regulatory requirements, staff training requirements and general housekeeping requirements.
- **Recordkeeping** including documentation of all visitors and vehicles to the site, a waste stream filing system, detailed waste records, landfill operator diaries updated daily, regulatory and permitting records, audits and internal inspection reports, construction summary reports and annual waste management reports.
- **Leachate collection and removal** including detailed descriptions, specifications and procedures related to leachate management and monitoring, leachate removal and disposal, and leak detection.
- **Spill response program** including provisions of a spill kit, regular site and general waste containment measures and machinery inspection, and response procedures, including appropriate contacts and reporting.
- **Risk Management Plan** that comprises a Due Diligence/Liability Plan, Compliance Response Plan, and Remediation Contingency Plan.

The Operations Plan will be updated to reflect the expanded landfill, and as frequently as necessary during operation to maintain up to date information and to accurately reflect current policy. All Tervita staff involved in landfill operations are encouraged to provide comments and input which can then be considered in preparing future Operations Plan iterations.

9.3 Summary of Risk Evaluation of Accidents and Malfunctions

As identified in Table 9.2-3, the likelihood of any accidents and malfunctions occurring ranges from may to unlikely, while consequence ranges from minor to severe. Confidence ranges from high to moderate and is based on Tervita's extensive experience operating hazardous waste landfills throughout western Canada, including the safe and successful operational history of the existing Silverberry landfill, as well as the effectiveness of mitigation including Tervita's Operations Plan, as well as professional judgment. For all potential effects assessed, the risk rating was determined to range from low to medium after implementation of mitigation. There are no situations where likelihood and consequence would result in a very high risk or high risk accident or malfunction taking place.

10. Effects of the Environment on the Project

10.1 Context

Tervita operates the largest number of Class II and Secure Landfills in Western Canada. Tervita has been operating Secure Landfills in northeast BC since 2003, and the existing landfill since 2003, and is aware of the normal environmental conditions experienced at the site. This knowledge is reflected in the engineering design and mitigation proposed to address these environmental conditions.

10.1.1 Changing Climate Trends

Depending upon the nature and extent of changing climatic trends, certain operational activities could be delayed and stormwater management systems may need modification. For example, warmer temperatures during the spring and higher levels of rainfall may result in localized flooding, altering hydrologic regimes (Section 10.1.2), while changes in summer temperatures and reduced summer rainfall could lead to an increase in wildfires (Section 10.1.3).

10.1.2 Extreme Weather Events

Extreme weather events such as heavy or persistent precipitation could lead to hydrotechnical hazards such as localized flooding (that is, ponding), scour and erosion. Other forms of extreme weather events such as high winds and lightning have the potential to affect the proposed Project expansion power supply and damage above ground infrastructure (that is, office buildings and other construction or operational infrastructure), and ignite wildfires (see Section 10.1.3).

The risk of a major flood occurring is low since the proposed Project expansion is not located on a floodplain, however, localized flooding (that is, ponding) has the potential to occur as a result heavy snow melt and/or intense rainfall. High winds could result in the suspension of some construction or operational activities such as soil handling. Heavy or persistent precipitation could also delay cell construction if soil salvage activities have not been completed, or if wet soil conditions create safety or traffic-related problems. Extremely cold temperatures and lightning create safety hazards for workers, and also have the potential to delay construction or operational activities over a short-term duration. Unexpected snowfall or snowfall early in the season may also affect operational activities, while frost and freezing temperatures can potentially cause damage to equipment and facilities.

10.1.3 Wildfire

Wildfires result either from anthropogenic causes such as campfires or from natural causes such as lightning. On average, approximately 7,600 forest wildfires occur annually in Canada. Of these, just over half are started by people, most by accident, and just under half by lightning (Canadian Encyclopedia 2015). The total number of wildfires and total hectares burned vary annually. In 2017, 1,353 wildfires occurred in BC, burning a total of 1.2 million ha, well above the 10-year average of 151,041 ha. On average, approximately 43 percent of fires of the last years were human-caused (Province of BC 2018e).

The proposed Project expansion is located in forested region where wildfires caused by lightning strikes or anthropogenic sources are frequent, with several historical wildfires documented in close proximity to the existing landfill. More recently, in May 2016, an approximately 15,700 ha human-caused wildlife fire burned much of the surrounding area to the south of the existing landfill (Province of BC 2018a). During the fire, the existing landfill was secured and closed and personnel were evacuated. The wildfire did not spread onto the landfill, with operations recommencing after the wildfire was contained and extinguished.

In addition to the combustion of woody and plant materials, wildfires may also cause soil to burn. In extreme cases, this could result in ignition of flammable landfill waste. Factors that influence the probability and magnitude of wildfires include vegetation type, ignition source and weather conditions, relative humidity, air temperature, forest moisture, precipitation, wind speed, and wind direction. Conditions in BC change continuously according to these factors.

10.1.4 Environmental Conditions Not Considered

The following environmental conditions were not considered to have the potential to adversely affect the proposed Project expansion either during construction or operation or both:

- Flooding
- Landslides and Slumping
- Seismic activity

10.1.4.1 Flooding

Although there is a possibility for localized flooding (that is, ponding) from snow melt and/or heavy rainfall, extensive flooding from nearby water bodies is not anticipated since the proposed Project expansion is not located on a floodplain, nor is it located near any water bodies susceptible to major flood events.

10.1.4.2 Landslides and Slumping

The proposed Project expansion is located on level terrain and there are no nearby slope hazards with the potential to result in landslides affecting the proposed Project expansion. The potential for slope instability is considered extremely low due to the stable soil stratigraphy and minimal average slopes. Engineering and design of the proposed Project expansion has taken into consideration the potential for slumping at the site. During construction and operation, stormwater management and erosion control systems will be installed to control subsurface and surface water flow. These measures are designed to direct water off the site, thereby reducing the potential for erosion and sudden mass movements of soil. Other mitigation will be implemented where the potential for localized terrain instability exists (Section 4.1). In the event areas of potential terrain instability are identified, the site(s) will be monitored through regular inspections construction or operation and remedial action will be promptly undertaken, where warranted. To date, no terrain instability has been documented at the existing landfill.

10.1.4.3 Seismic Activity

The seismic hazard at the existing landfill is low (NRCan 2015) and no adverse effects on the proposed Project expansion are anticipated to result from seismic activity.

10.1.5 Effects of the Environment on the Project Effects Assessment

10.1.5.1 Identification of Potential Effects, Mitigation Measures, and Potential Residual Effects

The identification and assessment of the potential effects of the environment on the proposed Project expansion are based on the results of results of previous studies and experience from the existing landfill, consultation and engagement, and professional judgement.

Effects of the environment on the Project have the potential to interact with any phases and activities related to proposed Project expansion construction, operations, closure/reclamation, and postclosure.

Table 10.1-1 identifies the potential effects of the environment on the proposed, as well as mitigation measures, and potential residual effects. Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. The proposed mitigation measures focus on avoidance and minimization and are predicted to have high effectiveness as they reflected Tervita's experience in operating Secure Landfills in northeast BC region and its knowledge of the normal environmental conditions experienced at the adjacent existing landfill. As these mitigation measures would be implemented prior to the initiation of, or during, activities associated with the construction, operations, and closure/reclamation phases of the proposed Project expansion, they are expected to be effective immediately in avoiding or reducing potential adverse effects of changing climatic trends, extreme weather events, and wildfires on the proposed Project expansion.

Table 10.1-1. Effects of the Environment on the Project – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Phase	Potential Effect	Spatial Boundary	Mitigation Measures	Mitigation Tier[a]	Mitigation Timeline	Effectiveness[b]	Potential Residual Effect
Construction, Operations, and Closure/ Reclamation	Changing climate trends	International	• In the event of a wildfire, flood or other natural hazard, implement measures in the Tervita Silverberry Site Emergency Response Plan	Minimization	Immediate	High	Extreme weather events could delay Project activities, or damage or impair operating infrastructure Depending upon the severity, a wildfire has the potential to delay Project activities, or damage or impair operating infrastructure
	Extreme weather events	Soil and Terrain RAA and Surface Water RAA	• Implement measures for erosion control and stormwater management identified in Sections 4.1 and 4.4.	Refer to Sections 4.1 and 4.4.			Extreme weather events could delay Project activities, or damage or impair operating infrastructure
			• Precipitation falling on the uncovered portions of the active landfill cells, therefore coming into contact with the waste soils, will be managed as leachate. The leachate management system will be designed to handle at minimum, a 1 in 25 year storm event, as required by the HWR. However, the actual design will exceed this minimum requirement.	Avoidance	Immediate	High	
			• Buildings (and other Site structures, including tanks), will be built to comply with local building codes and other regulatory requirements in order to minimize the potential for snow damage.	Minimization	Immediate	High	
			• Equipment onsite will be stored or winterised to prevent damage, including draining fluids that might freeze and cause spills or damage. When the site begins operation again, exposed liners, berms and general site facilities will be inspected for signs of damage due to frost heaves.	Avoidance	Immediate	High	
	Wildfire	Vegetation RAA	• There will be no open fires allowed on the site.	Avoidance	Immediate	High	Depending upon the severity, a wildfire has the potential to delay Project activities, or damage or impair operating infrastructure
			• In the event of a wildfire, implement measures in the Emergency Response Plan.	Minimization	Immediate	High	
			• As part of the Emergency Response Plan, there will be fire suppression equipment onsite, and personnel will have undergone training in the use of the equipment.	Avoidance	Immediate	High	
			• All fires detected will be extinguished immediately upon detection. Complete procedures for dealing with fires during operation are specified in the Fire Control section of the Operations Plan. Portable fire equipment will be available at the site and marked appropriately.	Minimization	Immediate	High	
			• There will also be annual drills conducted to test and train personnel, which will be recorded and reported.	Minimization	Immediate	High	
			• Provision of firebreaks shall be carried out to the satisfaction of the Director.	Avoidance	Immediate	High	

[a] Mitigation tiers:

- Avoidance: measures taken to avoid creating potential effects from the outset, such as considering spatial or temporal factors in Project design. These measures are taken in order to avoid potential effects on certain VCs.
- Minimization: measures taken to reduce the duration, intensity or extent of potential effects that cannot be completely avoided, as far as is practically feasible.
- Restoration (onsite): measures taken in response to potential residual adverse effects where these effects cannot be completely avoided or reduced.
- Enhancement: an enhancement measure is defined as a recommendation that aims to promote the likelihood of potential positive environmental or socio-economic residual effects.

[b] Mitigation effectiveness:

- High effectiveness: the mitigation measure is expected to noticeably reduce or alleviate the effect or noticeably improve the condition of the VC.
- Moderate effectiveness: the mitigation measure is expected to moderately reduce the effect or moderately improve the condition of the VC.

10.1.5.2 Characterization and Significance of Potential Residual Effects

Residual effects identified in Table 10.1-1 are a delay of proposed Project expansion activities, or damage or impair operating infrastructure as a result of extreme weather events or wildfires.

Table 10.1-2 provides a summary of the significance evaluation of the residual effects associated with effects of the environment on the Project and considers the probability for significance in the evaluation as outlined in Section 3.

Table 10.1-2. Residual Effects Significance Evaluation for Effects of the Environment on the Project

Predicted Residual Effects	Spatial Boundary	Temporal Context			Magnitude	Probability	Confidence	Significance
		Duration	Frequency	Reversibility				
a) Extreme weather events could delay Project activities, or damage or impair operating infrastructure	Soil and Terrain RAA and Surface Water RAA	Immediate to short-term	Occasional to rare	Reversible	Low to medium	Low	Moderate	Not significant
b) Depending upon the severity, a wildfire has the potential to delay Project activities, or damage or impair operating infrastructure	Vegetation RAA	Short-term	Rare	Reversible	Low to high	Low	Moderate	Not significant

10.1.5.3 Extreme Weather Events

Infrastructure will be built in accordance with the HWR to reduce the risk of damage due to extreme weather events such as excess precipitation, snow melt, high winds and lightning. Construction materials, equipment, and instruments used for proposed Project expansion construction and operations will be suitable for the climate conditions, including unusually extreme temperatures and precipitation, to ensure system integrity.

As part of Tervita's operational monitoring and maintenance procedures, Tervita will routinely monitor the condition of runoff and erosion control systems after any extreme weather events to look for potential damage and, where warranted, remediate any damage to protect the integrity of the proposed Project expansion.

The potential effects vary depending upon the timing, location and magnitude of the event. However, given the implementation of the proposed mitigation, the probability of potential adverse effects such as these is low. The magnitude of damage to the proposed Project expansion is considered to be low to medium given the variability of residual effects but immediate to short-term in duration and reversible. As a result, the predicted residual effect is not significant (Table 10.1-2, point [a]).

10.1.5.4 Wildfires

Factors that influence the probability and magnitude of wildfires include vegetation type, ignition source and weather conditions, relative humidity, air temperature, forest moisture, precipitation, wind speed, and wind direction. Conditions in northeast BC change continuously according to these factors. Tervita's emergency response program will be implemented in the event of a wildfire potentially affecting the proposed Project expansion. Tervita will maintain portable fire suppression equipment on site and ensure personnel will have undergone training in the use of the equipment. Regular operational monitoring and maintenance procedures including regular site inspections and vegetation control will help reduce potential risk and severity of any damage to the site resulting from nearby wildfires.

In the event of a wildfire, Tervita will report wildfires and relevant information to the BC Wildfire Service, the PRRD and applicable local fire departments. Efforts of fire control will be limited, if warranted, due to safety issues and will take into consideration fire conditions, safety, fitness of personnel, and equipment availability. Construction or operational activities and related traffic would be suspended if conditions were considered to be unsafe by Tervita or if requested by the appropriate authority.

The probability of a wildfire affecting proposed Project expansion activities is low, and potential delays in the construction or operation schedule caused by a wildfire can likely be recuperated over the course of the proposed Project expansion. As a result, the predicted effect is not significant (Table 10.1-2, point [b]).

Part C: Aboriginal Consultation

Part C of the Application provides a summary of Aboriginal consultation activities undertaken in support of the EAC and their outcomes for the proposed Project expansion. Details on the methodology and approach to Aboriginal consultation activities are provided in Tervita's Aboriginal Consultation Plan as approved by the BC EAO.

The information provided in Part C follows the requirements set out in the AAIR for the proposed Project expansion issued January 23, 2019 by the BC EAO.

11. Aboriginal Consultation

11.1 Overview of Aboriginal Interests

This section provides an overview of the Aboriginal engagement activities for the Project as outlined in the Project's First Nations Consultation Plan (the Plan). The section provides a summary of past and planned consultation activities conducted by Tervita since July 2014 and ongoing engagement activities with First Nations.

The BC EAO directed Tervita to consult with the BRFN and the DRFN. In addition, Tervita identified the following Treaty 8 First Nations for engagement in the Plan:

- Halfway River First Nations (HRFN)
- West Moberly First Nations
- Saulteau First Nations (SFN)
- Prophet River First Nations (PRFN)
- McLeod Lake Indian Band
- Fort Nelson First Nation

On July 14, 2014, Tervita attended a Chiefs Gathering at the Treaty 8 Tribal Association Office to informally notify the Chiefs of Tervita's intention to expand the facility. Since that time, Tervita has met with BRFN, DRFN, HRFN, SFN, and PRFN. DRFN and SFN chose to conduct site visits on October 2 and 7, 2014, respectively. Tervita continues to provide all First Nation groups with updates to Amendment information and processes as outlined in the Plan.

In accordance with the AAIR, Tervita has conducted further consultation with BRFN and DRFN. Consultation activities involved meetings to:

- Review documents and technical information
- Attending community meetings and public open houses
- Participation in Working Group meetings
- Responding to written submissions, including comments or information requests pertaining to the Application

No changes have been made to the Plan. Follow-up consultation involved addressing issues of concern through Working Group meetings (see issue summary table in Appendix 13). A summary of BRFN consultation is provided in Section 11.2 and a summary of DRFN consultation is provided in Section 11.3. A map with First Nations territories located near the proposed Project is provided in Figure 1.2-1

11.2 Blueberry River First Nations

11.2.1 Summary of Past and Planned Consultation

Tervita initiated discussions with BRFN Chief and Council on April 14, 2015. At this meeting Tervita provided general information about the Silverberry expansion. Since then, the following engagement activities have occurred with BRFN.

- May 4, 2015: Meeting between Tervita's Chief Executive Officer and BRFN.
- May 20, 2015: Meeting between Tervita and Blueberry River Enterprises GP Ltd. (Blueberry River Enterprises) to discuss opportunities to work together during Project construction and possible future expansion.
- June 30, 2015: Tervita notified BRFN about the Application in an in-person meeting with BRFN Council.

- August 27, 2015: Tervita circulated the draft Consultation Plan. No feedback has been received to date.
- October 2015: Tervita committed to work with BRFN to mitigate concerns, assist with community initiatives, provide capacity development, and enhance awareness about Tervita operations as stated in the First Nations Consultation Plan for the Proposed Silverberry PAC Amendment WD02-01.
- January 13, 2016: BRFN provided Tervita comments on the draft VCs and Tervita responded on January 23, 2016.
- January 27, 2016: BRFN attended the Working Group meeting for the draft VCs. Tervita responded to BRFN concerns raised during the Working Group meeting on February 23, 2016.
- May 16, 2016: Meeting between Tervita and BRFN to discuss the environmental assessment (EA) Application. Action items from this meeting included the following:
  - Tervita circulated the air study work plan to BRFN for comment (June 22, 2016)
  - Tervita circulated the soil sampling work plan to BRFN for comment (June 22, 2016)
  - Tervita addressed potential changes in the surface water discharge point
  - Tervita circulated enhanced wildlife survey plan.
  - Tervita discussed and provided comments on BRFN's proposed TLU and socio-economic survey (June 17, 2016)
  - Tervita sent the revised draft VCs (June 8, 2017)
- September 8, 2016: Tervita contacted BRFN to provide an opportunity for BRFN participation in wildlife studies.
- BRFN participated in January 24 to 25, 2017 early-mid winter snow tracking (Appendix 6) and March 14, 2017: late-winter snow tracking wildlife studies (Appendix 7).
- June 7, 2017: BRFN provided comments on the draft VCs. Tervita responded to BRFN's comments on August 3, 2017.
- January 31, 2018: Meeting between Tervita's leadership (Chief Operating Officer, Vice President of Health, Safety and Environment, BC Area Manager, Silverberry Facility Manager and Community and Aboriginal Advisor) and BRFN's Chief and Council. Tervita introduced themselves to new council members and discussed the Silverberry Project and related Traditional Use Study (TUS) and socio-economic studies.
- September 12, 2018, October 31, 2018, November 14, 2018, and December 6, 2018: BRFN provided comments on the dAAIRs. Tervita provided responses on September 18, November 1 and 22, 2018, and January 4, 2019, respectively.
- November 9, 2018: Meeting between Tervita, the EAO and BRFN to discuss concerns regarding the dAAIR. Tervita committed to giving BRFN the opportunity to comment first on the draft Application.
- March 29, 2019: Tervita circulated the draft Application to BRFN for comment.
- April 23, 2019: BRFN confidentially provided Tervita with comments on the draft Application.
- July 8, 2019: Tervita provided a response to BRFN outlining where and how comments received from BRFN on the draft Application had been incorporated into the Application, or where comments were not incorporated, an explanation of why comments were not incorporated.

11.2.2 Summary of Key Issues Raised

Key issues that have been raised by BRFN to date are identified in Table 11.2-1.

Table 11.2-1. Summary of Key issues raised by BRFN and Tervita Responses

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Potential effects of the Project on Aboriginal rights	BRFN expressed concern that the original VC selection did not contemplate Project impacts on Aboriginal peoples or their treaty rights practices.	Tervita and EAO will engage with BRFN to address applicable impacts to BRFN treaty rights.	Addressed in response.
Potential effects of the Project on TLU activities	BRFN expressed concerns about desirability/ accessibility to plant species used for traditional purposes.	Tervita remains willing to work with BRFN on a Traditional Knowledge and Use Study. To date no Traditional Knowledge and Use Study has been provided by BRFN.	Addressed in response.
	BRFN expressed concern that Tervita has a narrow understanding of TLU that is restricted to extractive uses or travel patterns associated with extractive uses. A full suite of nonextractive uses exist that may be affected by the Project including: • Experience of the land/sense of place associated with food and water taste, quality and abundance, • Sense of cultural identity associated with place, place quality and ability to exercise traditional practices • Intergenerational cultural transmission • Spirituality and stewardship		
Potential effects on culturally important wildlife, including noise, potential contamination and loss of habitat.	BRFN expressed concerns that the wildlife species selected for the assessment were not reflective of species important to BRFN such as furbearers and ungulates, and particularly moose.	Tervita will engage BRFN to identify wildlife valued by BRFN. To date, BRFN has not provided Tervita with traditional knowledge information.	Addressed in response.
	BRFN expressed concerns about the field program for collecting information on wildlife and requested additional cameras be installed, and requested additional information about fall, winter and spring surveys and that BRFN community members be involved in wildlife field studies.	Tervita installed two additional wildlife cameras, provided additional information about the fall, winter and spring surveys and provided opportunities to engage BRFN as monitors during field surveys.	Addressed with follow-up actions.
	BRFN requested clarification as to how information obtained in field surveys would be used to develop mitigation measures.	Wildlife mitigation measures will be developed following the supplemental field surveys and informed by survey results.	Addressed with follow-up actions and in Section 4.8.4 of the Application.
	BRFN expressed concerns regarding the use of the Project Area by ungulates including moose, deer and elk. BRFN is concerned about animals browsing shrubs and using lick sites or getting water from areas immediately downstream and down gradient.	Tervita conducted wildlife surveys and installed cameras to determine wildlife activity in the area and used the results of the field program to develop mitigation measures to address effects on wildlife.	Addressed with follow-up actions and in Section 4.8.4 of the Application.
Potential effects on fish and fish habitat	BRFN expressed concerns that fish and fish habitat could be affected by the Project and asked for a more fulsome justification for the exclusion of fish and fish habitat as a VC.	Tervita added fish and fish habitat as a VC.	Addressed in Section 4.7 of the Application.

Table 11.2-1. Summary of Key issues raised by BRFN and Tervita Responses

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Potential effects on air quality including contamination and odour effects	BRFN expressed concerns that the Project may result in the release of particulates which may contain NORMs. Specifically, BRFN expressed concern that atmospheric transport will lead to deposition of these materials beyond the selected LSA for this VC with consequent effects on soil quality, surface and groundwater quality, vegetation quality, wildlife health and traditional use of resources.	Tervita provided BRFN with justification for the spatial boundaries chosen for the air quality VC.	Addressed in response.
	BRFN expressed concern about odour from the existing facility because it has an effect on the experience of the land and can lead to avoidance/alienation.	Tervita assessed the effects of the Project on air quality including odour in Section 4.2.	Addressed in Section 4.2 of the Application.
Potential effects of noise and light pollution	BRFN expressed concern that noise was not originally included as a VC since noise could have an impact on wildlife. BRFN also requested that % Annoyance be added to the indicators for assessing the effects of Project noise.	Tervita added noise as a VC and assessed the effects of the Project on noise in Section 4.3. Tervita added level of annoyance to Section 4.3.	Addressed in Section 4.3 of the Application.
	BRFN expressed concern that artificial night lighting can affect night sky viewing by BRFN community members and can have a disruptive effect on birds and wildlife.	The existing conditions adjacent to the Project is an operational facility, including visual disturbance and light emissions. There are no expected changes to visual quality or light emissions for the Project.	Addressed in response.
Potential effects on groundwater and surface water	BRFN expressed concern about the spatial boundaries for groundwater and surface water quality.	Tervita provided BRFN with justification for the spatial boundaries chosen for the groundwater and surface water VCs.	Addressed in response.
	BRFN requested that “taste and smell” be added to the indicators for groundwater and surface water since the perceived value and safety of water, as experienced through water taste and smell, is central to Aboriginal values.	Tervita altered the water quality parameters in Section 4.4 to include perceived taste and smell.	Addressed in Section 4.4 of the Application.
Human Health	BRFN expressed concerns that the landfill is, or will, affect water, air, and collected, gathered or harvested consumables that in turn will affect BRFN member health. Whether or not contaminants are below regulated levels is one important KI, a second KI is the extent to which perception leads to avoidance of country foods, leading to adverse health and economic effects of reliance on store bought foods.	The human health effects assessment is based on pathways of potential effects from air quality, terrain and soils, noise and surface water and groundwater VCs. Effects on human health are assessed in Section 8.5.	Addressed in Section 8.5 of the Application.
Potential cumulative effects.	BRFN expressed concern about the cumulative effects of development and reported that BRFN’s territory is already heavily impacted and efforts to reduce further impact should underpin all future activities.	Tervita conducted a cumulative effects assessment for VCs where residual effects were identified.	Addressed in various sections of the Application.

Details of these key issues and Tervita's response to these issues are provided in a summary table in Appendix 13. Tervita approached BRFN about providing TLU early in 2017, and discussed funding for a TLU and socio-economic studies. An agreement was signed on April 11, 2017. To date, BRFN has not provided Tervita with Project-specific TLU information, but has provided comments on how BRFN defines TLU and appropriate spatial boundaries for assessing the effects of the Project on TLU. Tervita incorporated BRFN's understanding of TLU into the assessment, but does not have site-specific information from BRFN. Tervita continues to work with BRFN to address differences in definition of spatial boundaries and to allow BRFN to provide Project-specific information.

11.2.3 Background Information

BRFN is located in northeastern BC, 80 km northwest of Fort St. John, in the PRRD (Province of BC 2019a; PRRD 2019). The Nation has two reserves, Blueberry River (IR No. 205) which is approximately 5 km north of the Project and the South Parcel of Beatton River (IR No. 204) which is located approximately 20 km northwest of the Project, covering a total of 1,505.8 ha (Indigenous and Northern Affairs Canada 2019a). The total registered population as of June 2019, is 506, of which 195 are reported to reside predominantly on the Blueberry River reserve (Indigenous and Northern Affairs Canada 2019a).

BRFN belongs to the Dane-zaa language group and is one of four communities of the Peace River region who speak Dane-zaa (also known as the Beaver Language), which is classified as a Northern Athapaskan language (BC EAO 2016; BRFN 2012). The Athapaskan people have been associated with the Peace River region and referred to as the "Beaver People" since the earliest historical documents relating to the area (BRFN 2012).

BRFN is a signatory of Treaty 8, which was signed in 1899, and were part of the Fort St. John Band until 1977 when the band was split into BRFN and DRFN (Province of BC 2019a).

BRFN followed a 2-year election cycle in accordance with the *Indian Act* from 1978 until 2017 (Canada Gazette 2017). In 2017 BRFN adopted a resolution requesting that the Minister of Indian Affairs and Northern Development terminate the election provisions of the *Indian Act* and replace it with a custom electoral process developed and ratified by the community (Canada Gazette 2017). On September 13, 2017 the Minister approved the *Order Amending the Indian Bands Council Elections Order* for BRFN (Canada Gazette 2017). The custom electoral system divided the band into five main family groups, with each group electing a family councillor to serve as their representative on Band Council (Chipesia v. BRFN [Vancouver. 2019[1]]). The family councillors select a Chief by way of majority vote among them (Chipesia v. BRFN [Vancouver. 2019]). The election code does not include a process for the placement of individual band members into a family group (Chipesia v. BRFN [Vancouver. 2019]). Subsequently, a group of members filed a Notice of Application seeking judicial review of the BRFN Election Code in 2017, however on January 11, 2019 the Court dismissed the Application because the applicants neither challenged the section 74(1) Order, nor named the Minister as the respondent (Chipesia v. BRFN [Vancouver. 2019]).

According to the most recent census data available, 160 BRFN members were 15 years of age or older in 2016 (Indigenous and Northern Affairs Canada 2019a). Educational attainment rates in 2016 were as follows: 10 individuals (6 percent) possessed a university certificate; 10 individuals (6 percent) completed a trade, apprenticeship or other non-university certificate; 35 individuals (22 percent) completed high school, and 110 (69 percent) individuals had not completed high school (Indigenous and Northern Affairs Canada 2019a). The labour force participation rate in 2016 was 43.8 percent, with an employment rate of 28.1 percent and an unemployment rate of 35.7 percent (Indigenous and Northern Affairs Canada 2019a). The top industries were business services, manufacturing, construction, health, education, agriculture and other (Indigenous and Northern Affairs Canada 2019a). The most common occupations were sales and service, followed by management, social services, and trades (Indigenous and Northern Affairs Canada 2019a).

[1] Chipesia v. BRFN, 2019 FC 41, T-1681-17 (Vancouver. 2019). https://decisions.fct-cf.gc.ca/fc-cf/decisions/en/item/361486/index.do

BRFN owns and operates Blueberry River Enterprises, which specializes in the construction, alteration, repair and development of any type of earthwork (BC Assembly of First Nations 2019a). Blueberry River Enterprises was created with the goal of competing in the oil and gas, construction, maintenance and logging industries by developing projects in a safe, environmentally friendly and regulatory compliant manner (Blueberry River Enterprises 2019). The business develops well sites, plant sites, roads, clean-ups, right of way, and seismic clearing (BC Assembly of First Nations 2019a).

BRFN is also a partner in Six Nation Ventures, a limited partnership between six Treaty 8 communities that operates the log yard at Peace Valley Orientated Strand Board plant (TransCanada 2014). However, the plant is scheduled to shut down in 2019 due to poor market conditions (Alaska Highway News 2019). Other BRFN-owned businesses include a convenience store and gas station and an electrical company to service oil patch operations (TransCanada 2014).

11.2.4 Traditional Ecological Knowledge and Traditional Land Use

To date, BRFN has not provided Project-specific Traditional Ecological Knowledge (TEK) and TLU information. The results of a review of publicly available literature are included herein. The information in this section was used to identify culturally important resources, key issues and potential effects of the Project on BRFN rights and interests.

The traditional territory of BRFN includes a broad area in northeastern BC, identified by BRFN as the area in which members traditionally carried out activities central to their way of life (Macdonald 2016). The territory is defined as extending approximately from south of Tumbler Ridge, to south of the Sikanni Chief River in the north, west to the height of land in the Rocky Mountains, and east to the Alberta border (BRFN 2012). This area is also shared and relied upon by other First Nations under Treaty 8 (Macdonald 2016). Dane-zaa oral history describes events and people in the area prior to the arrival of European explorers and there is archaeological evidence from the Charlie Lake caves showing that people occupied the area from 10,500 years ago (Olsen 2017).

Historically, BRFN's economic activities and social organization were closely tied to the resources and conditions of their environment (BRFN 2012). There are many historical trails in the region that were used for travel and hunting, many of which were documented in a 1915 map of the Peace River Block and later used by a BC Land Surveyor in 1930 (BRFN 2012).

BRFN traditionally viewed hunting as a complex pattern of connection between the trails of people, animals, and spiritual guidance (BRFN 2012). TEK extends to the identification, management, and monitoring of game, using animal tracks, trails, the numbers of animals observed, the thickness of a beaver lodge, the slope of a moose's neck, and the colour of its innards, as indicators of the state of the environment (BRFN 2012). Such knowledge about the health of the environment was a matter of life and death, both individually and culturally (BRFN 2012).

Harsh winters, regular movement of herds and the uncertainty of hunting dictated a seasonal cycle of aggregation and dispersal related to the availability of resources (BRFN 2012). In his 1979 research of the Dane-zaa, Martin Weinstein identified consistent movement patterns based on five seasons, rather than four (BRFN 2012). These consisted of the following.

1) Fall: Larger bands divided into smaller hunting groups to hunt game, primarily moose, and deer, for dry meat and grease during the winter.
2) Early Winter: Family groups dispersed to winter hunting and trapping areas for fur-bearing mammals.
3) Late Winter: Hunting and trapping would shift toward predatory species.
4) Early Spring: Winter furs were traded and hunting would shift to beaver.
5) Summer: Larger groups would congregate at summer camps and travel to summer hunting, fishing, and berry-picking areas.

This research also recognized a diverse economy, which included 8 species of ungulates, 2 bear, 4 small game animals, 4 grouse, 13 types of fur-bearing mammals, 13 ducks, 2 geese, 1 swan, and 15 species of

fish (BRFN 2012). Bison was a key staple prior to the 1900s, however, overhunting by trappers and traders caused a sharp decline in their numbers (Olsen 2017). Subsequently, the Dane-zaa people replaced bison with moose and caribou as a dietary and cultural staple (Olsen 2017). Similarly, caribou was an important species, but as populations have also been declining, BRFN members have self-imposed a harvesting moratorium (Olsen 2017).

During the 19th century, trade increased for food products such as flour, sugar, tea, rice, and potatoes (Olsen 2017). Today, BRFN members still hunt moose, elk, deer, bear and mountain sheep (Traditions Consulting Services, Inc. 2013). Moose is the preferred species for meat, with the hide being used for making moccasins and other leather work (Traditions Consulting Services, Inc. 2013). Fish caught by BRFN members include dolly varden, rainbow trout, bull trout, kokanee, jackfish, pickerel, suckers, whitefish, lingcod, and grayling (Traditions Consulting Services, Inc. 2013). Small game, including rabbit and beaver, is hunted for food and pelts (Traditions Consulting Services, Inc. 2013).

BRFN community members harvest plants and berries throughout the Peace River valley (Traditions Consulting Services, Inc. 2013). These include blackberries, Saskatoon berries, chokecherries, cloud berries, white berries, huckleberries, blueberries, strawberries, and cranberries (BRFN 2012; Traditions Consulting Services, Inc. 2013). Other plant foods harvested include wild rhubarb, wild carrot, wild potatoes, and cow parsnip (BRFN 2012). The banks of Halfway River are important for harvesting mint and Labrador tea, both commonly used for brewing beverages (BRFN 2012; Traditions Consulting Services, Inc. 2013). Many areas traditionally used for harvesting plants and medicines have been impacted by development and are no longer productive (BRFN 2012). Today, BRFN members have difficulty maintaining access to lands and resources that are uncontaminated and capable of sustaining the patterns of economic activity, land use, and occupation essential to their livelihood (Macdonald 2016). Despite these changes to their traditional territory and reductions in subsistence resources, BRFN members continue to actively pursue hunting, trapping, fishing, gathering, learning on the land, and having cultural gatherings to the extent possible (Olsen 2017). However, they often have to travel to other regions of their traditional territory to do so (Traditions Consulting Services, Inc. 2013).

11.2.5 Potential Effects on Blueberry River First Nations Aboriginal Interests

This section describes the potential Project-related effects identified by BRFN on Aboriginal interests.

The identification of the potential effects of the proposed Project expansion on BRFN Aboriginal interests is based on the results of the desktop review of provincial and regional information sources outlined above; to date, BRFN have not provided Project-specific TLU information to inform the assessment.

The proposed Project expansion is anticipated to interact with the Aboriginal interests of BRFN during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Cell capping
- Postclosure maintenance and monitoring

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. The mitigation measures to address the effects on BRFN's Aboriginal interests have been outlined and discussed in the following VC sections: Land and Resource Use VC, Acoustic Environment VC, Wildlife and Wildlife Habitat VC, Air Quality VC, Terrestrial Vegetation VC, Surface Water VC, Groundwater VC, and Human Health VC. These mitigation measures are designed to reduce the effects of the Project on the resources and environment that are used by BRFN in support of their traditional activities. The efficacy of these mitigation measures is discussed and outlined in the respective VC sections and is not repeated in this section.

Table 11.2-2 identifies the potential effects of the proposed Project expansion on Aboriginal interests identified by BRFN, as well as mitigation measures and potential residual effects. In addition to the summary of mitigation provided herein, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on TLU activities. Specific effects outlined are sensory disturbance (noise, odour, light and visual effects) and effects on sense of place, cultural identity and intergenerational transfer of knowledge	Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted. Mitigation measures for the Acoustic Environment VC include: • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise. Mitigation measures for the Air Quality VC include: • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan. • The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. Mitigation measures for potential effects of Light Pollution include: • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • All incoming waste will be prebooked before arrival at the landfill site and will be received during daylight hours unless it's an emergency situation. • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m.	Sensory disturbance of traditional land and resource users.

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on TLU activities. Specific effects outlined are sensory disturbance (noise, odour, light and visual effects) and effects on sense of place, cultural identity and intergenerational transfer of knowledge (cont'd)	Tervita will continue to work with BRFN to develop mitigation measures for the intangible aspects of TLU activities if any are identified.	See above
Effects on resources used for TLU activities including water, culturally important vegetation, fish, and wildlife	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented. Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible.	Effect on culturally important resources such as wildlife.

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on resources used for TLU activities including water, culturally important vegetation, fish, and wildlife (cont'd)	• Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or a catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting.	See above

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on resources used for TLU activities including water, culturally important vegetation, fish, and wildlife (cont'd)	• The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment. Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.	See above
Effects on traditional economy	The following are mitigation measures designed to reduce the effects of the Project on TLU activities and the resources used for TLU activities, which in turn will reduce the effects on traditional economy. Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted. Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period.	The effects on traditional economy are captured in effects on TLU activities and resources, and no effect is anticipated on the ability to barter and trade resources; therefore, no residual effect is anticipated.

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on traditional economy (cont'd)	• Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented. Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs.	See above

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on traditional economy (cont'd)	• To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant.	See above

Table 11.2-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on traditional economy (cont'd)	• Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment. Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted. Mitigation measures for the Culture and Heritage VC include: • If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch – Immediately stop work within the site – Implement any other measures identified by the BC Archaeology Branch – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014) – Prohibit the collection of historical resources by Project personnel.	See above

[a] Referenced sections refer to the draft EA.

Project activities, such as transportation and mobilization of equipment and workers to the site, clearing of vegetation, excavation, construction of cells and associated infrastructure and waste acceptance, placement, and compaction, have the potential to affect BRFN TLU activities, including a sense of place, cultural identity, and intergenerational transfer of knowledge. Noise, odour, lighting, and visual disturbance could potentially alter the experience of the land for BRFN community members. Potential effects on TLU activities through sensory disturbance and effects on sense of place, cultural identify, and intergenerational transfer of knowledge will be reduced by constructing the proposed Project expansion footprint on Tervita-owned, fenced land adjacent to the existing landfill. Since the land is Tervita-owned, private land, BRFN is not currently using the footprint for TLU activities. However, the Project will extend the life of the landfill; therefore, the effects on BRFN TLU activities will continue beyond the life of the existing facility. Tervita will provide BRFN with advanced notification of the construction schedule and continue consultation with BRFN regarding mitigation measures, as required. No additional land will be taken from use by First Nations and operational activities are not expected to change the magnitude of the effects on BRFN's TLU activities from the levels that already exist as a result of the existing landfill. With the use of private land and the implementation of the mitigation measures identified in Table 11.2-2, the effects of the Project on TLU are expected to be not significant.

Project activities, such as transportation and mobilization of equipment and workers to the site, clearing of vegetation, excavation, construction of cells and associated infrastructure and waste acceptance, placement, and compaction, have the potential to affect the resources traditionally harvested by BRFN. Tervita has developed a suite of mitigation measures for the resources used by BRFN in conducting TLU activities. A summary of mitigation measures is provided in Table 11.2-2 with additional details provided in Section 4.8 for Wildlife and Wildlife Habitat, Section 4.6 for Terrestrial Vegetation, and Sections 4.5 and 4.4 for Groundwater and Surface Water, respectively, which include the resources identified by BRFN in conducting TLU activities. As outlined in Sections 4.6 Terrestrial Vegetation, Section 4.7 Fish and Fish Habitat, and Section 4.8 Wildlife and Wildlife Habitat, the Project is not anticipated to significantly affect the resources available for TLU activities. The Project will extend the life of the landfill; however, Project activities are not expected to change the magnitude of effects on resources harvested by BRFN beyond the levels that already exist as a result of the existing landfill; therefore, with the implementation of the mitigation measures identified in Table 11.2-2 for the resources traditionally harvested by BRFN, the effects of the Project on TLU are expected to be not significant.

Project activities have the potential to affect BRFN's traditional economy indirectly through effects on traditional harvesting areas and resources harvested by BRFN. As previously stated, mitigation measures designed to reduce the effects of the Project on TLU activities and the resources used in TLU activities will in turn reduce the effects of the Project on the traditional economy, and harvest levels should not be affected. Tervita does not anticipate that the Project will affect BRFN's ability to share and barter resources as part of the traditional or barter economy; therefore, with the implementation of the mitigation measures identified in Table 11.2-2 for the traditional economy of BRFN, the effects of the Project on the traditional economy are expected to be not significant.

11.2.6 Outstanding Aboriginal Interests

BRFN have currently not provided a TLU report but have identified interests in their comments on the VCs for the Project.

To date BRFN has identified concerns with the assessment methodology including the VCs to be assessed, spatial boundaries used in the assessment and cumulative effects assessment but has not identified specific traditional land and resource sites and activities that will be affected by the Project. Tervita has been in discussions with BRFN to resolve these issues. When BRFN provides Tervita with Project-specific traditional land and resource information, Tervita will incorporate this information into Project planning. Tervita has mitigation measures in place to reduce the effects of the Project on the resources used by BRFN for conducting TLU activities and the sensory disturbance of TLU users and will work with BRFN to resolve outstanding concerns.

11.2.7 Commitments and Arrangements

No commitments or arrangements have currently been made with BRFN concerning TLU.

11.3 Doig River First Nation

11.3.1 Summary of Past and Planned Consultation

Tervita initiated discussions with DRFN on July 14, 2014. Since then, the following engagement activities have occurred with DRFN.

- October 2, 2014: DRFN Elders, land staff and youth toured the operating facility.
- April 16, 2015: Meeting between Tervita and DRFN Chief and Council for preliminary discussions.
- June 3, 2015: Tervita notified DRFN of the Application in an in-person meeting with DRFN Chief and Council.
- August 27, 2015: Tervita circulated the draft Consultation Plan. No feedback has been received to date.
- October 2015: Tervita committed to continue working with DRFN to mitigate concerns, assist with community initiatives, provide capacity development and enhance awareness about Tervita operations as stated in the First Nations Consultation Plan for the Proposed Silverberry PAC Amendment WD02-01.
- DRFN participated in January 24 to 25, 2017 early-mid winter snow tracking (Appendix 6) and March 14, 2017 late-winter snow tracking wildlife studies (Appendix 7).
- December 18, 2017: DRFN submitted a TUS to Tervita.
- January 15, 2018: Meeting between Tervita, Jacobs, UrbanSystems, and DRFN to discuss the TUS and its incorporation into the Application. Tervita and DRFN discussed working with Doig when placing final cover, to ensure the proper vegetation is planted to help support local wildlife populations. Tervita will work with local First Nations on the appropriate seed mix for revegetation and capping. DRFN also expressed concern of the deforestation around Silverberry affecting Caribou populations. Tervita and DRFN discussed the potential of restoration at a later date. Lastly, DRFN expressed concern about the amphibians found at site. Tervita will perform amphibian surveys prior to expansions construction.
- March 29, 2019: Tervita provided the draft Application to DRFN for comment.
- May 28, 2019: DRFN provided Tervita with comments on the draft Application.
- July 8, 2019: Tervita provided a response to DRFN outlining where and how comments received from DRFN on the draft Application had been incorporated into the Application, or where comments were not incorporated, an explanation of why comments were not incorporated.

11.3.2 Summary of Key Issues Raised

Key issues that have been raised to date are provided in a summary table in Appendix 13. A summary of concerns that have been identified by DRFN is provided in Table 11.3-1.:

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Methodology – Confidence and Risk	DRFN noted that Section 3.9 states that additional risk analyses were not required. However, in Section 4.1 Terrain and Soils, there is a potential risk to environmental receptors outside the fence line associated with metal concentrations that exceed guidelines for barium, molybdenum, mercury, and arsenic.	Tervita acknowledges the potential risk to environmental receptors outside the fenceline. Through the mitigation measures described in the Application, Tervita will minimize impacts to environmental receptors. With implementation of effective mitigation and Tervita's experience in operating the existing landfill, potential effects of the proposed expansion are alleviated or reduced. As stated, potential adverse effects resulting from accidents or malfunctions are assessed in Section 9. Further investigation of the sources of the exceedances for soils will occur and additional mitigation measures will be developed if warranted. Potential health risk on receptors are assessed in Section 8. Pathways of potential health effects are predicted to have risks that are low or unlikely based on results of the qualitative SLHHRA.	Addressed in Section 4.1.2 of the Application.
Terrain and Soils – Spatial Boundaries	DRFN noted that no LAA has been identified for soils. This is potentially a significant omission given potential effects outside the fence line. Without an LAA, residual effects are discussed in a regional context, which may be misleading.	The RAA captures any effects that would be captured in the LAA.	Addressed in response.
Terrain and Soils – Potential Effects	DRFN indicated that there were exceedances in soil concentrations for Arsenic, Barium, Molybdenum, and Mercury recorded outside the fence line and included the following observations: • Only 1 area outside the fence line was sampled. Exceedances in other areas around the fence line are possible and remain uncertain. • Additional investigation for the source of these metals has not been conducted. • Additional mitigation to prevent ongoing deposition to areas outside the fence line is likely required, but not identified in the Application.	Tervita acknowledges the sources of the exceedances require further investigation. Tervita will describe in detail the mitigation measures being implemented to minimize environmental impacts.	Addressed in Section 4.1 of the Application.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Terrain and Soils – Potential Effects (cont'd)	• With the expansion of the Project, ongoing deposition is likely and the ongoing implementation of current mitigations are ineffective, potentially resulting in higher metal concentrations over time. • A discussion of potential environmental receptors outside the fence line has not been conducted. For example, there are 11 wetlands adjacent to the property, and associated biota that may rely on those wetlands are unknown. • It is unclear whether water quality has been impacted similarly to soils. • Tervita is proposing extensive soil sampling to guide remediation efforts, but not until closure, which delays addressing the issue for 25 years and allows deposition to continue. This poses an unnecessary risk to the surrounding environment. • As a result, the characterization of residual effects may be inaccurate. • Given the above, a risk assessment should be done to evaluate exposure to these metals, sources identified, and adaptive management and mitigations implemented to prevent further deposition associated from the existing project and the expansion.	See above	See above
Terrain and Soils – Follow-up Strategy	DRFN noted that an appropriate follow-up strategy has not been developed to deal with exceedances in soil metal concentrations outside the fence line.	Further investigation is required to determine whether the exceedances are a result of Tervita's landfill operations.	Addressed in response.
Air quality	DRFN expressed concern about benzene surpassing applicable guidelines.	Tervita assessed the effects of the Project on air quality in Section 4.2.	Addressed in Section 4.2 of the Application.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Air Quality – Spatial Boundaries	DRFN noted that an LAA has not been identified for the Air Quality VC. The discussion on dust attenuation and uncertainties around deposition outside the fence line require an assessment at the LAA scale.	The RAA captures any effects that would be captured in the LAA. The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (PM), and to a lesser extent various minor combustion tailpipe emissions. The Air Quality RAA is expected to be sufficient to capture the area of such low-lying releases and potential cumulative interactions with other activities not related to the proposed Project.	Addressed in response.
Air Quality – Residual Effects	DRFN stated that significance determination based on RAA is not appropriate for the following reasons: • The RAA is 10 km, but the Application states there are no industrial activities within 1 km of the site; it's not clear whether industrial air emissions sources within the RAA were considered. • The regional reference site is 46 km away, well outside the RAA boundary. • There is only 1 reference site, which may be inadequate to characterize current conditions. • The absence of an LAA is potentially misleading, particularly considering soil metal concentrations outside the fence line. • PM_{10} will attenuate within a local area, necessitating an LAA. • Composition of PM_{10} dust is unknown. • Distance that $PM_{2.5}$ is traveling is unknown. • Composition of $PM_{2.5}$ dust is unknown. • The assessment relies on the absence of receptors; however, vegetation, wetlands, soils, wildlife are adjacent to the property. • It's not clear whether traditional use sites are in close proximity to the property and may be exposed to dust.	Tervita is able to minimize potential residual effects through effective mitigation measures. The RAA captures any effects that would be captured in the LAA. The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (PM), and to a lesser extent various minor combustion tailpipe emissions. The Air Quality RAA is expected to be sufficient to capture the area of such low-lying releases and potential cumulative interactions with other activities not related to the proposed Project.	Addressed in response.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Air Quality – Cumulative Effects	DRFN noted that the characterization of residual effects may be inaccurate, in the absence of an LAA and given the uncertainties expressed above. The cumulative effects assessment may need to be revisited once these uncertainties have been addressed.	Tervita is able to minimize potential residual effects through effective mitigation measures. The RAA captures any effects that would be captured in the LAA. The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (PM), and to a lesser extent various minor combustion tailpipe emissions. The Air Quality RAA is expected to be sufficient to capture the area of such low-lying releases and potential cumulative interactions with other activities not related to the proposed Project.	Addressed in response.
Air Quality – Follow-up Strategy	DRFN noted that a follow-up strategy is required to mitigate air quality effects and dust deposition.	Tervita will include a mitigation strategy to mitigate air quality effects and dust deposition in the Application.	Addressed in Section 4.2.5 of the Application.
Acoustic Environment – Residual Effects	DRFN noted that quantitative modeling of noise attenuation was not conducted, which may lead to some uncertainty over potential receptors in the area as noise attenuation is unknown. Section 4.3.5 only discusses a residential receptor at 2.5 km away. Wildlife and land and resource users mentioned as sub-components but not considered in the assessment. Noise data from existing landfill would inform the assessment of the expansion, as it is reasonable to assume that noise would be similar.	A study to measure noise levels specific to operations is planned for later in 2019 and results can be shared with DRFN upon request. Sources of noise are described in Section 4.4.3.1 and include trucks and heavy equipment.	Addressed in the response and in Section 4.4.3.1 of the Application.
Acoustic Environment – Cumulative Effects	DRFN stated that Section 4.3.6 may need to be revisited based on discussions related to the characterization of Project residual effects and a clearer understanding of noise sources in the RAA.	Tervita will be able to minimize potential residual effects through our effective mitigation measures.	Addressed in Table 4.3-2 and Section 4.3.4.4 the Application.
Acoustic Environment – Follow-up Strategy	DRFN stated that a follow-up strategy may be required pending the resolution of the above comments.	If a follow-up strategy is required Tervita will engage DRFN to ensure adequacy.	Addressed in response.
Surface Water – Mitigation Measures	DRFN asked what mitigation is planned for sediment pond sludge.	If Tervita needs to remove sediment from out surface water pond, it will be dredged and the sediment dewatered in appropriate containment. The dewatered sediment will be tested and the appropriate disposal location found.	Addressed in response.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Groundwater – Mitigation Measures	DRFN asked how leachate will be treated.	Currently any recoverable oil is skimmed from leachate. Tervita is exploring thermal evaporation of leachate and is running trials in Alberta.	Addressed in response.
Terrestrial Vegetation – Spatial Boundaries	DRFN stated that the LAA may be too small and should be related to potential dust deposition. See additional comments on dust and air quality regarding dust and potential effects to environmental receptors.	The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (PM), and to a lesser extent various minor combustion tailpipe emissions. The Air Quality RAA is expected to be sufficient to capture the area of such low-lying releases and potential cumulative interactions with other activities not related to the proposed Project.	Addressed in response.
Terrestrial Vegetation – Existing Conditions	DRFN asked what the results of previous invasive plant monitoring were.	Tervita will update the Application to contain a summary of the results.	Addressed in Section 4.6 of the Application.
Terrestrial Vegetation – Mitigation Measures	DRFN noted that Section 4.6.4 refers to mitigations for wetlands, but effects to wetlands are not addressed in the assessment despite their location adjacent to the property. Wetlands are first mentioned in the wildlife section.	Wetlands were excluded as a VC. Effects will be addressed under Terrestrial Vegetation and Surface Water VCs.	Addressed in Section 4.6 of the Application.
Terrestrial Vegetation – Residual Effects	DRFN noted that Section 4.6.5 may need to be revisited based on resolution of spatial boundaries and uncertainties associated with dust deposition and composition.	Tervita will review the dust deposition information and supplement the Application if necessary.	Addressed in Section 4.6 of the Application.
Terrestrial Vegetation – Cumulative Effects	DRFN stated that Section 4.6.6 may need to be revisited based on updated characterization of residual effects.	Tervita will adequately describe residual effects and follow up with DRFN as required.	Addressed in Section 4.6 of the Application.
Terrestrial Vegetation – Follow-up Strategy	DRFN stated that a follow-up strategy may be required pending the resolution of the above comments.	If follow-up is required Tervita will engage DRFN to ensure adequacy.	Addressed in response.
Wildlife – Existing Conditions	DRFN stated that there are 11 wetlands near the Project, but they are first mentioned in the wildlife section. Given soil metal concentrations, it seems possible that wetlands (and the wildlife that rely on those wetlands) may be at risk of exposure. This is not considered in the EA. Wildlife use of the wetlands is not discussed and wildlife surveys of the wetlands were not undertaken. The class and function of the wetlands are not described in the EA. Wildlife surveys appear to be at a reconnaissance level and may be inadequate to document wildlife activity in the vicinity of the Project.	No permanent wetlands are currently present within 250 m of the Project footprint. Therefore, any potential Project effects will be addressed under Terrestrial Vegetation and Surface Water VCs. There is no potential surface water or groundwater connectivity from the Project footprint to wetlands, based on the separation distance and Tervita's commitment to groundwater and surface water control. Surface water will be tested for contamination prior to discharge and discharged into a well-vegetated upland area.	Addressed in the response and in Section 4.8 of the Application.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Wildlife – Existing Conditions (cont'd)	The identification of a juvenile western toad indicates the potential for breeding in the area, but follow-up surveys were not undertaken. It is not clear whether potential interaction with bears were considered. It is not clear what trails and riparian areas were investigated and the results.	See above	See above
Wildlife – Potential Effects and Mitigation Measures	DRFN noted that in the absence of a wetland delineation, it is not clear where amphibians would be salvaged to if the need arose. Is there evidence of nesting in the Project site? Construction is scheduled for summer and fall, but mitigations table suggests that construction will be avoided from May 1 to July 31.	Tervita will perform bird surveys and amphibian surveys prior to construction of new cells in the expansion area.	Addressed in response.
Wildlife – Residual Effects	DRFN indicated that it's not clear whether the correct effects pathways were considered. The expansion is within the fence line so presumably habitat loss, movement, and mortality risk was evaluated in the original assessment. There is unlikely to be a substantive change. However, effects outside of the fence line may not be completely captured, (that is, wildlife health associated with dust and metals). Additionally, it is not clear how habitat alteration was measured, particularly if noise and dust attenuation was not quantified or modelled.	Through effective mitigation measures Tervita is able to minimize dust impacts, thus minimal habitat alterations.	Addressed in response.
Wildlife – Cumulative Effects	DRFN indicated that Section 4.8.6 may need to be revisited based on updated characterization of residual effects.	Tervita will adequately describe residual effects and follow up with DRFN as required.	Addressed in Section 4.8.4 of the Application.
Wildlife – Follow-up Strategy	A follow-up strategy may be required pending the resolution of the above comments.	If follow-up is required Tervita will engage DRFN to ensure adequacy.	Addressed in response.
Effects on TLU activities	DRFN identified the Project Area as a location of value for continued practice of DRFN Aboriginal rights and was concerned about potential effects on accessibility to TLU sites.	Tervita assessed the effects of the Project on DRFN TLU activities.	Addressed in Section 11.3.5 of the Application.
Healthy watersheds	DRFN stated that access to a healthy ecosystem that supports hunting, trapping, and peaceful enjoyment of the land is integral to DRFN culture.	Tervita assessed the effects of the Project on DRFN TLU activities.	Addressed in Section 11.3.5 of the Application.

Table 11.3-1. Key Issues Raised by DRFN and Tervita Response

Key Issue	Specific Issues Raised by BRFN	Tervita Response	Status of Resolution
Culturally important wildlife, fish, and plants	DRFN identified culturally important wildlife, such as moose, elk, and deer, and plants, such as berries and medicinal plants, in their Traditional Use Study.	Tervita assessed the effects of the Project on DRFN TLU activities.	Addressed in Section 11.3.5 of the Application.
Groundwater and surface water quality	DRFN expressed concern about elevated levels of boron and barium in groundwater.	Tervita will conduct quarterly groundwater monitoring.	Addressed in response.

Source: DRFN screening comments and the Tervita Silverberry Non-Confidential Desktop Traditional Use Study.

- Details of these key issues and Tervita's response to these issues are provided in a summary table in Appendix 13. Tervita continues to work with DRFN to resolve outstanding issues such as effects on Aboriginal rights and TLU activities.

Details of these key issues and Tervita's response to these issues are provided in a summary table in Appendix 13. Tervita continues to work with DRFN to resolve outstanding issues such as effects on Aboriginal rights and TLU activities.

11.3.3 Background Information

DRFN is located 30 km northeast of Fort St. John, in electoral area B of the PRRD (Province of BC 2019b; PRRD 2019). The Nation has two reserves, Doig River (IR No. 206) and Beaton River (IR No. 204) (Indigenous and Northern Affairs Canada 2019b). Doig River is located 40 km east of the Project site and Beaton River is located 24 km northeast of the Project site. The total registered population as of June 2019 is 548 individuals, of which 133 are reported to reside predominantly on the Doig River reserve (Indigenous and Northern Affairs Canada 2019b).

DRFN is part of the Dane-Zaa language group, which is an Athapaskin language, also known as the Beaver language (BC Assembly of First Nations 2019a; The Firelight Group 2015). The word Dane-zaa means "Real People" in Dane-zaa Záágé (The Firelight Group 2015).

DRFN is a signatory of Treaty 8, signed in 1900 as part of the Fort St. John Band (The Firelight Group 2015). DRFN is governed by a Chief and three Councillors, who are selected through the electoral system outlined in the *Indian Act* (Indigenous and Northern Affairs Canada 2019b). Chief and Council are elected every two years and the current election cycle ends on November 23, 2019 (Indigenous and Northern Affairs Canada 2019b).

According to the most recent census data available, 100 DRFN members were 15 years of age or older in 2016 (Indigenous and Northern Affairs Canada 2019b). Educational attainment rates for 2016 were as follows: 35 individuals (35 percent) had completed a trades, apprenticeship or other non-university certificate; 10 individuals (10 percent) completed high school, and 55 individuals (55 percent) had no degree, certificate or diploma (Indigenous and Northern Affairs Canada 2019b). The labour force participation rate in 2016 was 60 percent, with an employment rate of 45 percent and an unemployment rate of 33 percent (Indigenous and Northern Affairs Canada 2019b). The top industries were agriculture, health, and education, while the most common occupations were management, trades, other, social services, and sales (Indigenous and Northern Affairs Canada 2019b).

DRFN has identified subsistence harvesting and hunting as an important way of life and culture. Historically fur trade has been an important source of income and still accounts for a portion of income today. Currently, DRFN works to achieve sustainable economic development that allows its membership to prosper while not detracting from their ability to use their land and exercise their treaty rights. In recent years, DRFN has entered into a number of agreements, alongside other neighboring Treaty 8 First

Nations, centering around natural gas development as well as the BC Hydro Site C hydroelectric project (BC Assembly of First Nations 2019b).

11.3.4 Traditional Ecological Knowledge and Traditional Land Use

A review of the desktop TUS provided by DRFN has given an overview of their traditional knowledge, land use, occupancy and resources in the context of the Project. The information in this section was used to identify culturally important resources, key issues and potential effects of the Project on DRFN rights and interests.

DRFN has traditionally used the area for travel routes; habitation sites; harvesting berries, plants, and medicines, as well as hunting, trapping and fishing (Urban Systems 2017). Having access to healthy ecosystems that support TLU is integral to the DRFN way of life, particularly with respect to knowledge transfer and cultural continuity (Urban Systems 2017).

The Project Area provides habitat for a variety of wildlife including caribou, moose, elk, deer, black and grizzly bears, fox, beaver, porcupine, and migratory birds (Urban Systems 2017).

The DRFN territory is home to a large population of caribou, which were traditionally harvested for food and cultural uses. The region, known as the Chinchanga range, is occupied by a herd of caribou that members of DRFN have been familiar with through generations of tracking and hunting (Urban Systems 2017). The boreal caribou is listed under the Species at Risk Public Registry as threatened, due to increased predation and habitat loss (Government of Canada 2019). As a result, DRFN has self-imposed a ban on caribou hunting and developed a list of management recommendations to address cumulative effects in the region (Urban Systems 2017).

Moose are also culturally significant species to DRFN. Moose has been a dietary staple with historical records of 10 moose per family being hunted annually (Urban Systems 2017). Moose is used for the meat and hides, the processing of which plays a significant cultural role in intergenerational knowledge transfer (Urban Systems 2017). Much like the caribou, DRFN has noticed a decline in moose populations and have self-regulated hunting as a result (Urban Systems 2017).

Many waterways in the area are used for fishing. Members often fish for rainbow trout, speckled trout, grayling, whitefish, pickerel, salmon, and jackfish (Urban Systems 2017). The Peace River was used for generations to travel between the mountains and the plains and is still used by members today (Urban Systems 2017). Many camping sites and pack trails are located along the river and much of the oral history takes place along the river's shores (Urban Systems 2017).

11.3.5 Potential Effects on Aboriginal Interests

This section describes the potential Project-related effects identified by DRFN on TLU.

The identification of the potential effects of the proposed Project expansion on DRFN TLU is based on the results of the TLU report received from DRFN, and discussions with DRFN.

The proposed Project expansion is anticipated to interact with the TLU for DRFN during the following construction, operations, closure/reclamation, and postclosure activities:

- Transportation/mobilization of equipment and workers to the site
- Clearing of vegetation, excavation, construction of cells, and construction of associated infrastructure
- Waste acceptance, placement, and compaction
- Cell capping
- Postclosure maintenance and monitoring

Mitigation measures have been identified in a manner consistent with Section 3.5 of this Application. The mitigation measures to address the effects on DRFN's Aboriginal interests have been outlined and discussed in the following VC sections: Land and Resource Use VC, Acoustic Environment VC, Wildlife and Wildlife Habitat VC, Air Quality VC, Terrestrial Vegetation VC, Surface Water VC, and Groundwater

VC. These mitigation measures are designed to reduce the effects of the Project on the resources and environment that are used by DRFN in support of their traditional activities. The efficacy of these mitigation measures is discussed and outlined in the respective VC sections and is not repeated in this section.

Table 11.3-2 identifies the potential effects of the proposed Project expansion on Aboriginal interests, as well as mitigation measures and potential residual effects. In addition to the summary of mitigation provided herein, further measures are provided in the management planning documents (see Section 13) and the Silverberry Operations Plan.

Table 11.3-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on TLU activities specifically sensory disturbance (noise and dust)	Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted. Mitigation measures for the Acoustic Environment VC include: • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise. Mitigation measures for the Air Quality VC include: • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan. • The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. Additional mitigation will be developed in consultation with DRFN, if required.	Sensory disturbance of traditional land and resource users
Effects on resources used for TLU activities including water, culturally important vegetation, trees, and wildlife	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible.	Effects on culturally important resources such as wildlife

Table 11.3-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on resources used for TLU activities including water, culturally important vegetation, trees, and wildlife (cont'd)	• Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment. Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure. Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	See above

Table 11.3-2. Aboriginal Interests Effects Assessment – Potential Effects, Mitigation Measures, and Potential Residual Effects

Project Concern and Impact	Mitigation[a]	Potential Residual Effect
Effects on resources used for TLU activities including water, culturally important vegetation, trees, and wildlife (cont'd)	• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented. Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.	See above

[a] Referenced sections refer to the draft EA.

Project activities, such as transportation and mobilization of equipment and workers to the site, clearing of vegetation, excavation, construction of cells and associated infrastructure and waste acceptance, placement, and compaction, have the potential to affect DRFN TLU activities through sensory disturbance. Noise, odour, lighting, and visual disturbance could potentially alter the experience of the land for DRFN community members while conducting TLU activities. Potential effects on TLU activities through sensory disturbance will be reduced by constructing the proposed Project expansion footprint on Tervita-owned, fenced land adjacent to the existing landfill. Since the land is Tervita-owned, private land, DRFN is not currently using the footprint for TLU activities. However, the Project will extend the life of the landfill; therefore, the effects on DRFN TLU activities will continue beyond the life of the existing facility. Tervita will provide DRFN with advanced notification of the construction schedule and will continue consultation with DRFN regarding mitigation measures, as required. No additional land will be taken from use by First Nations, and operational activities are not expected to change the magnitude of the effects on DRFN's TLU activities from the levels that already exist as a result of the existing landfill. With the use of private land and the implementation of the mitigation measures identified in Table 11.2-2, the effects of the Project on TLU are expected to be not significant.

Project activities, such as transportation and mobilization of equipment and workers to the site, clearing of vegetation, excavation, construction of cells and associated infrastructure and waste acceptance, placement, and compaction, have the potential to affect the resources traditionally harvested by DRFN. Tervita has developed a suite of mitigation measures for the resources used by DRFN in conducting TLU activities. A summary of mitigation measures is provided in Table 11.2-2 with additional details provided in Section 4.8 for Wildlife and Wildlife Habitat, Section 4.6 for Terrestrial Vegetation, and Sections 4.5 and 4.4 for Groundwater and Surface Water, respectively, which include the resources identified by DRFN in conducting TLU activities. As outlined in Sections 4.6 Terrestrial Vegetation, Section 4.7 Fish and Fish Habitat, and Section 4.8 Wildlife and Wildlife Habitat, the Project is not anticipated to significantly affect the resources available for TLU activities. The Project will extend the life of the landfill; however, Project activities are not expected to change the magnitude of effects on resources harvested by DRFN beyond the levels that already exist as a result of the existing landfill; therefore, with the implementation of the mitigation measures identified in Table 11.2-2 for the resources traditionally harvested by DRFN, the effects of the Project on TLU are expected to be not significant.

11.3.6 Outstanding Aboriginal Interests

On January 19, 2018, Tervita and DRFN met to discuss issues raised by DRFN in their TLU report. Tervita will continue to work with DRFN to resolve outstanding concerns. Tervita and DRFN discussed working with DRFN when placing final cover, to ensure the proper vegetation is planted to help support local wildlife populations. Tervita will work with local First Nations on the appropriate seed mix for revegetation and capping. DRFN also expressed concern of the deforestation around Silverberry affecting Caribou populations. Tervita and DRFN discussed the potential off restoration at a later date. Lastly, DRFN expressed concern about the amphibians found at site. Tervita will perform amphibian surveys prior to expansions construction.

11.3.7 Commitments and Arrangements

No commitments or arrangements have currently been made with DRFN concerning TLU.

11.4 Other Matters of Concern to Aboriginal Groups

BRFN raised concerns with respect to the selection of VCs, spatial boundaries for elements, field programs to establish a baseline and assessment methodologies particularly with respect to cumulative effects assessment. These issues have been captured in the previously noted key issues table and Tervita's responses to these requests are captured in Table 11.2-1. No other matters of concern have been raised by BRFN, other than those outlined in the Aboriginal interests section.

DRFN raised concerns with respect to potential effects on soil, air quality, vegetation, wildlife, and TLRU, as well as noise effects. These issues have been captured in the previously noted key issues table and

Tervita's responses to these requests are captured in Table 11.3-1. No other matters of concern have been raised by DRFN, other than those outlined in the Aboriginal interests section.

11.5 Issue Summary Table

Table 11.5-1 identifies the Aboriginal interests identified by participating Aboriginal groups and the mitigation measures to avoid, mitigate or manage the effects of the Project.

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN	Review of draft VCs; Wildlife Survey; and draft AAIR.	Potential effects on Aboriginal rights	In selecting the VCs, the Project team considered the original EAC Application, information collected during the operation of the existing landfill, and the BC EAO Guideline for the Selection of Valued Components. The VCs considered in this Application were selected based on the known interactions of landfill activities, and were refined through input from Aboriginal groups, the public, and government agencies. See Section 3.1 for more details on the VC selection process. • The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	See above
			• The Land and Resource Use effects assessment included First Nation land and resource use, including but not limited to, hunting and trapping, as well as travel to First Nation land and resource use sites. The assessment included a description of BRFN and DRFN current land use, identified the activities in all phases of the Project that could interact with the Land and Resource Use VC, and determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 6.1 for more details on the assessment of effects to the Land and Resource Use VC.	Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted.	

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Culture and Heritage effects assessment included an assessment of archaeological and historical sites. The closest known archaeological site to the landfill is HdRg-2, located approximately 7.2 km to the south-southeast, along St. John Creek. An Archaeological Impact Assessment, submitted as part of the PAC Application for the existing landfill, was completed under a *Heritage Conservation Act* Section 14 Inspection Permit and no archaeological resources were found on the Project footprint. Therefore, there is low potential to encounter previously undiscovered heritage resources during proposed Project expansion construction. The assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 7 for more details on the assessment of effects to the Heritage and Culture VC.	Mitigation measures for the Culture and Heritage VC include: • If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch. – Immediately stop work within the site. – Implement any other measures identified by the BC Archaeology Branch. – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014). – Prohibit the collection of historical resources by Project personnel. • Additional mitigation will be developed in consultation with BRFN, if required.	See above
	Review of draft AAIR	Potential effects on TLU activities including the intangible values associated with these activities	• The Land and Resource Use effects assessment included First Nation land and resource use, including but not limited to, hunting and trapping, as well as travel to First Nation land and resource use sites. The assessment included a description of BRFN and DRFN current land use, identified the activities in all phases of the Project that could interact with the Land and Resource Use VC, and determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 6.1 for more details on the assessment of effects to the Land and Resource Use VC.	Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation.. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted.	See above
			• The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited.	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	See above
			• The Terrestrial Vegetation effects assessment included an assessment of plants species of concern, including rare plant species and plant species used for traditional purposes, vegetation communities of concern, and invasive plant species. Shared Traditional Knowledge identified that DRFN actively picks and harvests berries, medicinal plants, and other plants and fungi throughout their traditional territory. Culturally important species include lily pads, spruce gum, devils club, Labrador tea and yarrow. The assessment identified the activities in all phases of the Project that could interact with the Terrestrial Vegetation VC, and determined that postmitigation residual effects include loss or alteration of native vegetation. See Section 4.6 for more details on the assessment of effects to the Terrestrial Vegetation VC.	Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs.	

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	• Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Fish and Fish Habitat effects assessment included fish species of management interest and their habitat, including fish species of concern to Aboriginal groups. The assessment characterized the existing conditions for the Fish and Fish Habitat VC, considering Traditional Knowledge shared, including the species fished by DRFN in their traditional territory and further knowledge to be provided by BRFN with respect to species presence, abundance and distribution. However, to date, BRFN has not provided Traditional Knowledge specific to fish and fish habitat. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted. See Section 4.7 for more details on the assessment of effects to the Fish and Fish Habitat VC.	The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Culture and Heritage effects assessment included an assessment of archaeological and historical sites. The closest known archaeological site to the landfill is HdRg-2, located approximately 7.2 km to the south-southeast, along St. John Creek. An Archaeological Impact Assessment, submitted as part of the PAC Application for the existing landfill, was completed under a *Heritage Conservation Act* Section 14 Inspection Permit and no archaeological resources were found on the Project footprint. Therefore, there is low potential to encounter previously undiscovered heritage resources during proposed Project expansion construction. The assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 7 for more details on the assessment of effects to the Heritage and Culture VC.	Mitigation measures for the Culture and Heritage VC include: • If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch. – Immediately stop work within the site. – Implement any other measures identified by the BC Archaeology Branch. – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014). – Prohibit the collection of historical resources by Project personnel.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of wildlife survey	Potential effects on culturally important wildlife, including noise, potential contamination and loss of habitat	• The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	See above
			• The Acoustic Environment effects assessment included noise levels and levels of annoyance with respect to wildlife and land and resource use. The assessment provided a description of the major sources of noise contributing to existing sound levels, the nearest noise-sensitive receptors, and identified the activities in all phases of the Project that could interact with the Acoustic Environment VC. Traditional Knowledge shared included effects of noise levels to wildlife and traditional land and resource use. The spatial boundaries for the noise effects assessment are the same as those for the Wildlife and Wildlife Habitat and Land and Resource Use VCs. It was determined that the postmitigation residual effects are increased noise emissions during all phases of the Project. See Section 4.3 for more details on the assessment of effects to the Acoustic Environment VC.	Mitigation measures for the Acoustic Environment VC include: • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Terrain and Soils effects assessment included terrain, soils, soil quality and erosion. The assessment provided a description of the existing conditions including environmental context, the ALR, soil quality, erosion, and identified the activities in all phases of the Project that could interact with the Terrain and Soils VC. No Traditional Knowledge was shared regarding terrain and soils. It was determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.1 for more details on the assessment of effects to the Terrain and Soils VC.	Mitigation measures for the Terrain and Soils VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under the following conditions: – Wet or frozen field conditions which can result in the loss, admixing, degradation or compaction of topsoil or subsoil – High wind velocities which can create the potential for the loss of topsoil or subsoil – Any other field conditions which could result in the admixing, degradation or loss of topsoil or subsoil • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to provide vegetation cover to minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Topsoil and subsoil will be stockpiled and re-used for site reclamation. Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under wet or frozen field conditions which can result in the admixing, degradation or compaction of topsoil or subsoil. • Implement two-lift soil handling for topsoil salvage. In this process, the topsoil material is stripped in the first lift and stored onsite for replacement after the life of the Project. The second lift includes all of the remaining subsoil material. • Maintain an adequate separation between topsoil and subsoil piles. • Replace the topsoil and subsoil in the same manner as it was excavated, avoiding admixing of soils. • An Erosion and Sediment Control Plan will be implemented to prevent erosion (see Section 13.1 for summary). • A Soil Conservation Plan will be implemented to avoid or reduce potential loss of surface soil material through wind or water erosion (see Section 13.2 for summary). • A Dust and Odour Control Plan will be implemented to prevent conditions conductive to dust generation and to suppress dust (see Section 13.9 for summary).	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of draft VC's and draft AAIR	Potential effects on fish and fish habitat	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Resolved

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Fish and Fish Habitat effects assessment included fish species of management interest and their habitat, including fish species of concern to Aboriginal groups. The assessment characterized the existing conditions for the Fish and Fish Habitat VC and considered Traditional Knowledge shared, including the species fished by DRFN in their traditional territory and further knowledge to be provided by BRFN with respect to species presence, abundance and distribution. However, to date, BRFN has not provided Traditional Knowledge specific to fish and fish habitat. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted. See Section 4.7 for more details on the assessment of effects to the Fish and Fish Habitat VC.	• Assessment of the Fish and Fish Habitat VC is not warranted. • The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of draft VC's and AAIR	Potential effects on air quality including contamination and odour effects	• The Air quality effects assessment included dust, odours, emissions from combustion, fugitive emissions, and emissions from other sources. The assessment provided a description of existing conditions including COPC, ambient air quality in the region, and identified the activities in all phases of the Project that could interact with the Air Quality VC. Traditional Knowledge shared identified that odour from the existing landfill has a profound affect on the experience of the land for community members and leads to avoidance and alienation from lands. To date, although opportunities were provided to share Traditional Knowledge both directly and through the Working Group, DRFN has not provided any Traditional Knowledge related to air quality. It was determined that postmitigation residual effects are an increase in air emissions during all phases of the Project. See Section 4.2 for more details on the assessment of effects to the Air Quality VC.	Mitigation measures for the Air Quality VC include: • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan. • The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of draft AAIR	Potential effects of noise and light pollution	• The Acoustic Environment effects assessment included noise levels and levels of annoyance with respect to wildlife and land and resource use. The assessment provided a description of the major sources of noise contributing to existing sound levels, the nearest noise-sensitive receptors, and identified the activities in all phases of the Project that could interact with the Acoustic Environment VC. Traditional Knowledge shared included effects of noise levels to wildlife and traditional land and resource use. The spatial boundaries for the noise effects assessment are the same as those for the Wildlife and Wildlife Habitat and Land and Resource Use VCs. It was determined that the postmitigation residual effects are increased noise emissions during all phases of the Project. See Section 4.3 for more details on the assessment of effects to the Acoustic Environment VC. • The Night Time Light Management Plan includes measures to minimize potential light nuisance from the proposed Project expansion activities, including those relevant mitigation measures for effects on public health and wildlife. These mitigation measures include restricting most Project activities to daylight hours.	Mitigation measures for the Acoustic Environment VC include: • Construction and operational work will be done in daylight hours only. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise. Mitigation measures for potential effects of Light Pollution include: • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • All incoming waste will be prebooked before arrival at the landfill site and will be received during daylight hours unless it's an emergency situation. • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of draft VC's and AAIR	Potential effects on groundwater and surface water	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	Review of draft AAIR	Potential cumulative effects	Cumulative effects assessments were conducted for VC's determined to have residual effects that may interact with past, present and reasonably foreseeable projects in the RAA. These include Air Quality, Acoustic Environment, Terrestrial Vegetation and Wildlife and Wildlife Habitat. • The Air quality effects assessment included dust, odours, emissions from combustion, fugitive emissions, and emissions from other sources. The assessment provided a description of existing conditions including COPC, ambient air quality in the region, and identified the activities in all phases of the Project that could interact with the Air Quality VC. Traditional Knowledge shared identified that odour from the existing landfill has a profound affect on the experience of the land for community members and leads to avoidance and alienation from lands. To date, although opportunities were provided to share Traditional Knowledge both directly and through the Working Group, DRFN has not provided any Traditional Knowledge related to air quality. It was determined that postmitigation residual effects are an increase in air emissions during all phases of the Project. See Section 4.2 for more details on the assessment of effects to the Air Quality VC.	Mitigation measures for the Air Quality VC include: • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan. • The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Acoustic Environment effects assessment included noise levels and levels of annoyance with respect to wildlife and land and resource use. The assessment provided a description of the major sources of noise contributing to existing sound levels, the nearest noise-sensitive receptors, and identified the activities in all phases of the Project that could interact with the Acoustic Environment VC. Traditional Knowledge shared included effects of noise levels to wildlife and traditional land and resource use. The spatial boundaries for the noise effects assessment are the same as those for the Wildlife and Wildlife Habitat and Land and Resource Use VCs. It was determined that the postmitigation residual effects are increased noise emissions during all phases of the Project. See Section 4.3 for more details on the assessment of effects to the Acoustic Environment VC.	Mitigation measures for the Acoustic Environment VC include: • Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	• The Terrestrial Vegetation effects assessment included an assessment of plants species of concern, including rare plant species and plant species used for traditional purposes, vegetation communities of concern, and invasive plant species. Shared Traditional Knowledge identified that DRFN actively picks and harvests berries, medicinal plants, and other plants and fungi throughout their traditional territory. Culturally important species include lily pads, spruce gum, devils club, Labrador tea and yarrow. The assessment identified the activities in all phases of the Project that could interact with the Terrestrial Vegetation VC, and determined that postmitigation residual effects include loss or alteration of native vegetation. See Section 4.6 for more details on the assessment of effects to the Terrestrial Vegetation VC.	Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized.	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	See above
			• The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities.	

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	See above
			• To avoid and reduce the potential adverse effects associated with the proposed Project expansion, Tervita has a number of management plans in place that describe environmental protection measures, instructions for carrying out proposed Project expansion activities, environmental permit and approval conditions and other environmental commitments, as well as applicable environmental laws and regulations that will be implemented by Tervita and their contractors during construction, operations and closure/reclamation.	The following Management Plans have been developed to addressed potential adverse effects of the Project: • Erosion and Sediment Control Plan • Soil Conservation Plan • Traffic Management Plan • Emergency Preparedness and Response Plan • Noxious Weeds Plan • Vegetation Management Plan • Wildlife Management Plan • Air quality Monitoring Plan	

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
BRFN (cont'd)	See above	See above	See above	• Dust and Odour Control Plan • RPP • Groundwater Monitoring Plan • Leachate Management Plan • Stormwater Management Plan • Landfill Leak Detection Monitoring Plan • Night time Light Management Plan • Monitoring and Follow-up Programs	See above
DRFN	Review of draft Application	Potential effects on TLU activities	• The Land and Resource Use effects assessment included First Nation land and resource use, including but not limited to, hunting and trapping, as well as travel to First Nation land and resource use sites. The assessment included a description of BRFN and DRFN current land use, identified the activities in all phases of the Project that could interact with the Land and Resource Use VC, and determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 6.1 for more details on the assessment of effects to the Land and Resource Use VC.	Mitigation measures for the Land and Resource Use VC include: • The proposed Project expansion footprint is currently fenced and not being used by agricultural, recreational users or First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations, forest tenure holders and trappers and consider specific requests for mitigation. • Place signage on access roads in the vicinity of the construction activities notifying road users that construction activities are taking place. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	See above	• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	See above
			• The Terrestrial Vegetation effects assessment included an assessment of plants species of concern, including rare plant species and plant species used for traditional purposes, vegetation communities of concern, and invasive plant species. Shared Traditional Knowledge identified that DRFN actively picks and harvests berries, medicinal plants, and other plants and fungi throughout their traditional territory. Culturally important species include lily pads, spruce gum, devils club, Labrador tea and yarrow. The assessment identified the activities in all phases of the Project that could interact with the Terrestrial Vegetation VC, and determined that postmitigation residual effects include loss or alteration of native vegetation. See Section 4.6 for more details on the assessment of effects to the Terrestrial Vegetation VC.	Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill).	

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	See above	• Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Fish and Fish Habitat effects assessment included fish species of management interest and their habitat, including fish species of concern to Aboriginal groups. The assessment characterized the existing conditions for the Fish and Fish Habitat VC and considered Traditional Knowledge shared, including the species fished by DRFN in their traditional territory and further knowledge to be provided by BRFN with respect to species presence, abundance and distribution. However, to date, BRFN has not provided Traditional Knowledge specific to fish and fish habitat. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted. See Section 4.7 for more details on the assessment of effects to the Fish and Fish Habitat VC.	The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Culture and Heritage effects assessment included an assessment of archaeological and historical sites. The closest known archaeological site to the landfill is HdRg-2, located approximately 7.2 km to the south-southeast, along St. John Creek. An Archaeological Impact Assessment, submitted as part of the PAC Application for the existing landfill, was completed under a Heritage Conservation Act Section 14 Inspection Permit and no archaeological resources were found on the Project footprint. Therefore, there is low potential to encounter previously undiscovered heritage resources during proposed Project expansion construction. The assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 7 for more details on the assessment of effects to the Heritage and Culture VC.	Mitigation measures for the Culture and Heritage VC include: • If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch – Immediately stop work within the site – Implement any other measures identified by the BC Archaeology Branch – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014) • Prohibit the collection of historical resources by Project personnel.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	Review of draft Application	Potential effects on watershed health	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	Mitigation measures for the Groundwater VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	Review of draft Application	Potential effects on culturally important wildlife, fish and plants	• The Wildlife and Wildlife Habitat effects assessment included moose and other ungulates, black bear and other fur-bearers, mature forest birds, early seral forest birds and the western toad. The assessment identified activities in all phases of the Project that could interact with the Wildlife and Wildlife Habitat VC and provided a description of existing conditions, including winter track surveys, spring and summer surveys, and wildlife species of conservation concern. Traditional Knowledge shared included wildlife species of cultural importance, observations of changes to wildlife and wildlife habitat, and suggested best practices and mitigation measures. It was determined that postmitigation residual effects include loss or alteration of wildlife habitat, changes to wildlife movement, and increased wildlife mortality risk. See Section 4.8 for more details on the assessment of effects to the Wildlife and Wildlife Habitat VC.	Mitigation measures for the Wildlife and Wildlife Habitat VC include: • Schedule construction activities outside the migratory bird nesting period. • Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented. • Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis during daylight hours. • The feeding or harassment of livestock or wildlife will be prohibited. • Construction and operations personnel will not be permitted to have firearms or pets on the Project site.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Fish and Fish Habitat effects assessment included fish species of management interest and their habitat, including fish species of concern to Aboriginal groups. The assessment characterized the existing conditions for the Fish and Fish Habitat VC and considered Traditional Knowledge shared, including the species fished by DRFN in their traditional territory and further knowledge to be provided by BRFN with respect to species presence, abundance and distribution. However, to date, BRFN has not provided Traditional Knowledge specific to fish and fish habitat. The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted. See Section 4.7 for more details on the assessment of effects to the Fish and Fish Habitat VC.	• Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site will be reported and reasonable corrective measures will be put in place prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented. • The assessment determined that the proposed Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required, and further assessment of the Fish and Fish Habitat VC is not warranted.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Terrestrial Vegetation effects assessment included an assessment of plants species of concern, including rare plant species and plant species used for traditional purposes, vegetation communities of concern, and invasive plant species. Shared Traditional Knowledge identified that DRFN actively picks and harvests berries, medicinal plants, and other plants and fungi throughout their traditional territory. Culturally important species include lily pads, spruce gum, devils club, Labrador tea and yarrow. The assessment identified the activities in all phases of the Project that could interact with the Terrestrial Vegetation VC, and determined that postmitigation residual effects include loss or alteration of native vegetation. See Section 4.6 for more details on the assessment of effects to the Terrestrial Vegetation VC.	Mitigation measures for the Terrestrial Vegetation VC include: • Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Areas of Noxious weeds/invasive plants will be noted during weekly inspections, especially during times of high vegetation growth. • The PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. • If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). • Prior to mobilization and demobilization, construction equipment will be cleaned. • When seed is being used for revegetation at site, best efforts will be made to source local seed to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized.	See above

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	See above	• Use a cover crop to assist in weed and erosion control, where warranted. • Equipment to use low-sulphur diesel. • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Implement additional measures provided in the Dust and Odour Control and the Air Quality Monitoring Plan.	See above
	Review of draft Application	Potential effects on air quality	• The Air quality effects assessment included dust, odours, emissions from combustion, fugitive emissions, and emissions from other sources. The assessment provided a description of existing conditions including COPC, ambient air quality in the region, and identified the activities in all phases of the Project that could interact with the Air Quality VC. Traditional Knowledge shared identified that odour from the existing landfill has a profound affect on the experience of the land for community members and leads to avoidance and alienation from lands. To date, although opportunities were provided to share Traditional Knowledge both directly and through the Working Group, DRFN has not provided any Traditional Knowledge related to air quality. It was determined that postmitigation residual effects are an increase in air emissions during all phases of the Project. See Section 4.2 for more details on the assessment of effects to the Air Quality VC.	Mitigation measures for the Air Quality VC include: • Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and Air Quality Monitoring Plan. • The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible.	Addressed

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Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	Review of draft Application	Potential effects on soil quality	• The Terrain and Soils effects assessment included terrain, soils, soil quality and erosion. The assessment provided a description of the existing conditions including environmental context, the ALR, soil quality, erosion, and identified the activities in all phases of the Project that could interact with the Terrain and Soils VC. No Traditional Knowledge was shared regarding terrain and soils. It was determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.1 for more details on the assessment of effects to the Terrain and Soils VC.	Mitigation measures for the Terrain and Soils VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under the following conditions: – Wet or frozen field conditions which can result in the loss, admixing, degradation or compaction of topsoil or subsoil – High wind velocities which can create the potential for the loss of topsoil or subsoil – Any other field conditions which could result in the admixing, degradation or loss of topsoil or subsoil • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to provide vegetation cover to minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible.	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	See above	• Topsoil and subsoil will be stockpiled and re-used for site reclamation. Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under wet or frozen field conditions which can result in the admixing, degradation or compaction of topsoil or subsoil. • Implement two-lift soil handling for topsoil salvage. In this process, the topsoil material is stripped in the first lift and stored onsite for replacement after the life of the Project. The second lift includes all of the remaining subsoil material. • Maintain an adequate separation between topsoil and subsoil piles. • Replace the topsoil and subsoil in the same manner as it was excavated, avoiding admixing of soils. • An Erosion and Sediment Control Plan will be implemented to prevent erosion (see Section 13.1 for summary). • A Soil Conservation Plan will be implemented to avoid or reduce potential loss of surface soil material through wind or water erosion (see Section 13.2 for summary). • A Dust and Odour Control Plan will be implemented to prevent conditions conductive to dust generation and to suppress dust (see Section 13.9 for summary).	See above

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	Review of draft Application	Potential effects on groundwater and surface water quality	• The Surface Water effects assessment included water quality and quantity as well as sediment, concentrations of metals and hydrocarbons, perceived taste and smell and volume and movement. The assessment included a description of existing conditions including environmental context, stormwater management, leachate management and identified the activities in all phases of the Project that could interact with the Surface Water VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.4 for more details on the assessment of effects to the Surface Water VC.	Mitigation measures for the Surface Water VC include: • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • Onsite erosion control will be utilized if extreme conditions warrant. • Implement additional measures provided in the Erosion and Sediment Control Plan and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Addressed

Table 11.5-1. Summary Table of the Results of Aboriginal Consultation Related to Aboriginal Interests/Other Matters of Concern to Aboriginal Groups

Aboriginal Group	Consultation Stage/Information Source	Issue/Aboriginal Interest	Analysis of Potential Effect	Proposed Measures to Mitigate or Otherwise Manage Effects	Status of Issue
DRFN (cont'd)	See above	See above	• The Groundwater effects assessment included water quality and quantity as well as concentrations of inorganic ions, dissolved metals, other contaminants, perceived taste and smell, volume and movement. The assessment included a description of existing conditions including environmental context, groundwater monitoring, leachate management and identified the activities in all phases of the Project that could interact with the Groundwater VC. Traditional Knowledge shared included the connectivity between waterways identified in the LAA for the proposed Project expansion and the importance of mitigation water contamination, as well as the perceived safety value and quality of water, including taste and smell. The effects assessment determined that potential residual effects are expected to be avoided through the implementation of mitigation measures. See Section 4.5 for more details on the assessment of effects to the Groundwater VC.	• Mitigation measures for the Groundwater VC include: – Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. – Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	See above

Part D: Public Consultation

Part D of the Application provides a summary of public consultation activities undertaken in support of the EAC and their outcomes for the proposed Project expansion. Details on the methodology and approach to public consultation activities are provided in Tervita's Public Consultation Plan as approved by the BC EAO.

The information provided in Part D follows the requirements set out in the AAIR for the proposed Project expansion issued January 23, 2019 by the BC EAO.

12. Public Consultation

12.1 Background

During the pre-application stage of the proposed Project expansion, Tervita developed a Public Consultation Plan (the Plan) for engaging with stakeholders and interested parties regarding the Application for the proposed Project expansion. The Plan was developed to meet the consultation requirements of the BC *EA Act* and Regulations for the Application. The Plan was designed to engage stakeholders and interested parties early in the development process and to provide them with an opportunity to participate and comment. It includes details on Tervita's consultation principles; planned consultation activities for the amendment; information delivery methods; estimated timelines; tracking and reporting procedures; and a list of identified stakeholders.

The plan utilized a 3,200-m consultation radius and 5,000-m notification radius (see Figure 12.1-1). Tervita reviewed BC OGC guidelines and Alberta Energy Regulator guidelines for similar projects and chose the larger consultation and notification radii from these guidelines to be more inclusive. Identified stakeholders consist of municipal governments (that is, City of Fort St. John, the PRRD, and the Community of Buick); provincial government agencies (that is, BC MECCS and the BC EAO); the CEA Agency; industry organizations; and residences, occupants, landowners and the general public. Methods of information sharing involved information sessions, existing landfill tours, in person meetings, information packages, status report newsletters, and a dedicated public feedback and information request email account. Details of public consultation activities occurred for the proposed Project expansion as well as key issues raised and their resolution are provided in Sections 12.2 and 12.3. Tervita is committed to maintain continued communication and stakeholder engagement throughout the Application process and during the course of the proposed Project expansion.

12.2 Summary of Public Consultation and Issues Raised

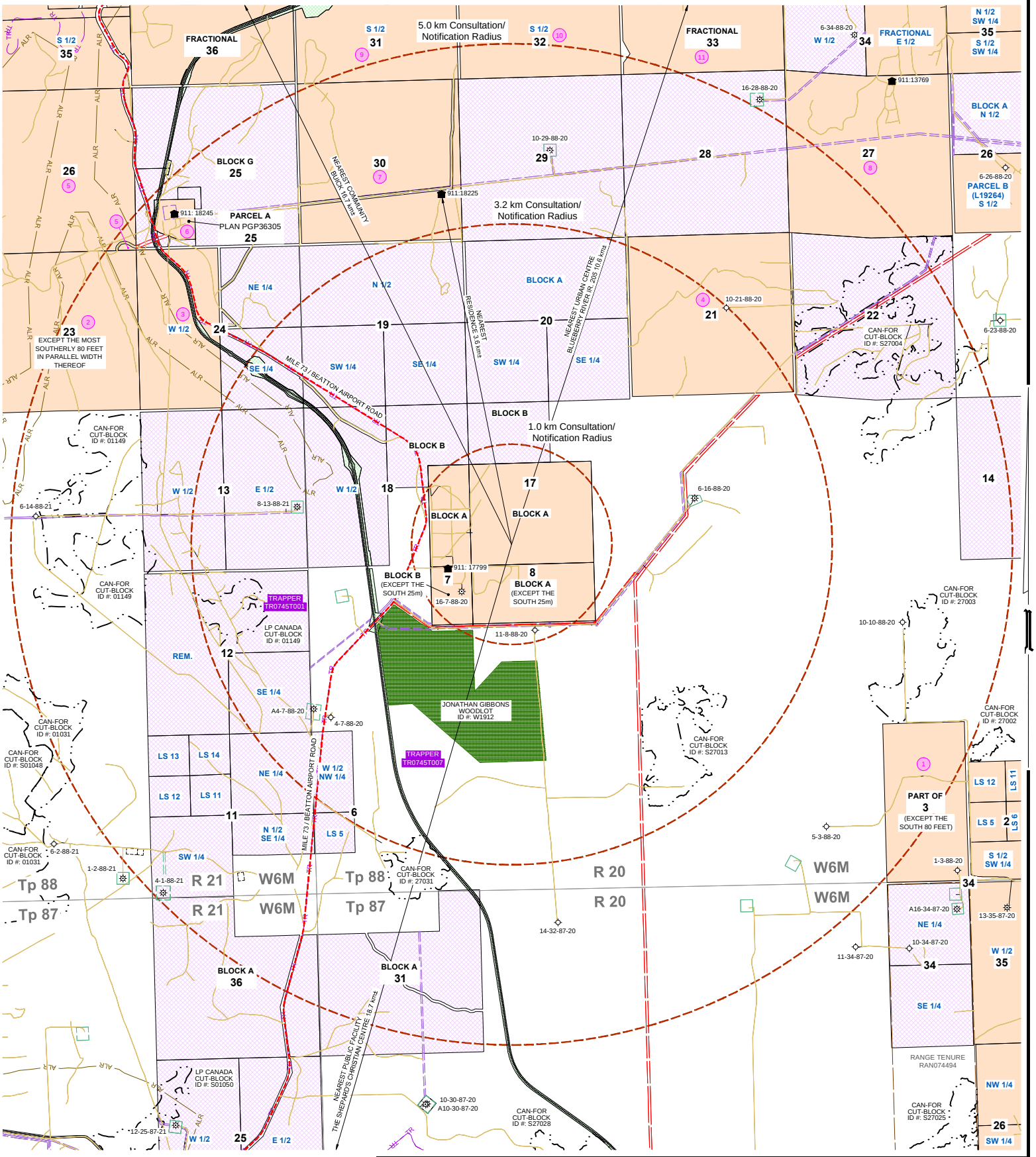
Tervita initiated public consultation on July 1, 2015. Residences, occupants and landowners within 3,200 m of the Project were consulted in-person and by phone on September 9 and 10, 2015. Residences, occupants and landowners within 5,000 m of the Project were notified by registered mail on September 10, 2015. An open house was held in the Community of Buick on February 16, 2016. The concerns raised during the open house held in the Community of Buick on February 16, 2016 include landfill material on public highway, dirt and mud on roadways, speed of trucks, general concerns for residential or private property impacts, and landfill reclamation. These raised concerns were responded to during the open house and are addressed in the Application. An "Invitation to Comment" by the BC EAO was posted on the May 11, 2017, Alaska Highway News seeking public comments on the draft VCs. Tervita hosted a second open house in November, to determine any outstanding community concerns. Tervita will maintain continued communication and stakeholder engagement throughout the Application process and during the course of the Project.

12.3 Planned Public Consultation Activities

Ongoing and planned public consultation activities for the proposed Project expansion include, but not are not limited to:

- An open house in Buick, BC planned by Tervita in the upcoming months
- Notices in the local media inviting public comment on the Application, and any further notifications as may be required by the BC EAO
- Distribution of copies of the Application documents necessary for review purposes
- Providing the BC EAO with electronic copies of all Application documentation to facilitate internet access to the Application
- Addressing any issues that are raised during and after the review period

- Ongoing communication and stakeholder engagement by Tervita throughout the Application process and during the course of the proposed Project expansion



LEGEND:

WELL HEAD:
ABANDONED WELL:
RESIDENCES:
PID IDENTIFIER:
MAIN ROAD:
OTHER ROADS:
RAILWAY:
POWERLINE:
PIPELINE:
RANGE TENURE:
TRAPPER BOUNDARY: TR
RAILWAY RIGHT OF WAY:
SURVEYED CROWN LAND:
WOODLOT:

SCALE 1:25 000

SURFACE LOCATION COORDINATES:
UTM ZONE 10 NAD 83 (CSRS)

UTM	GEOGRAPHIC
N: 6277375.5 E: 612908.5	N: 56° 37' 37.02" W: 121° 09' 34.59"

DWG No.: FB-0041-15-J1-25K-CNM	
CLIENT FILE: 310-0000009552	
CLIENT AFE:	
WELL AUTHORITY No.:	
CROWN FILE:	
FIELD: SILVERBERRY	
RANGE TENURE: NONE	
TRAPPER: TR0745T001, TR0745T007	
GUIDE/OUTFITTER: NONE	

TERVITA CORPORATION

CONSULTATION & NOTIFICATION MAP FOR SILVERBERRY LANDFILL WITHIN SEC 7, 8, 17, & 18 OF Tp 88, R 20, W6M PEACE RIVER DISTRICT

BCGS MAP SHEET - 94A.065

SHEET 1 OF 1

No.	DATE	REVISION / ISSUED	JOB No.
0	Jun. 23, 2015	Plan Issued	FB-0041-15

SURVEYED BY: | CALC'D BY: | DWN BY: PJP

MIDWEST SURVEYS
LAND SURVEYING LTD.
11003 Alaska Road
Fort St. John, BC
V1J 6P3
Tel: 250-785-3902

FB-0041-15-J1

Part E: Management Plans and Follow-up Programs

Part E of the Application provides information on the Environmental Management Plans (EMP) for the proposed Project expansion (Section 13), as well as follow-up programs and monitoring (Section 14).

The information provided in Part E follows the requirements set out in the AAIR for the proposed Project expansion issued January 23, 2019 by the BC EAO.

13. Management Plans

To avoid or reduce the potential adverse effects and risk of adverse effects on the proposed Project expansion, Tervita has a number of management plans in place that describe environmental protection measures, instructions for carrying out proposed Project expansion activities, environmental permit and approval conditions and other environmental commitments, as well as applicable environmental laws and regulations that will be implemented by Tervita and their contractors during construction, operations and closure/reclamation. A list and brief summary of management plans for all phases of the proposed Project expansion are provided herein. These management plans will be included in the Operations Plan for the proposed Project expansion.

13.1 Erosion and Sediment Control Plan

The Erosion and Sediment Control Plan includes measures to prevent soil stockpile erosion, landfill cap erosion and surface water erosion, including but not limited to the following:

- Suspending topsoil and subsoil salvage under excessive wet or frozen conditions and high winds
- Confirming that final slopes of landfill caps do not exceed 33 percent and are seeded as soon as possible, inspected weekly and covered as needed with matting to prevent water erosion
- Conducting weekly inspections of surface water control works and/or immediately after a major storm or catastrophic event, repairing as needed and implementation erosion control measures (for example, rock riprap, matting) as soon as possible

13.2 Soil Conservation Plan

The Soil Conservation Plan includes measures to avoid or reduce potential loss of surface soil material through wind or water erosion and potential reduction in soil productivity due to loss or mixing of topsoil and subsoil during the proposed Project expansion activities. Measures include but are not limited to the following:

- Where practical, topsoil and subsoil are salvaged and stockpiled separately. The stockpiles are located in a stable area unaffected by landfilling operations and are separated by a minimum of 3 m. All topsoil stockpiles are located on undisturbed topsoil and all subsoil stockpiles are located on undisturbed subsoil.
- Relocation of existing stockpiles may be required as part of landfill development and additional clearing activity may be required for stockpile relocation.
- The topsoil stockpiles are contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion.
- Topsoil and subsoil salvage are immediately suspended for the preservation of topsoil and subsoil as per the following examples:
  - Wet or frozen field conditions will result in the admixing, degradation or compaction of topsoil or subsoil
  - High wind velocities create the potential for the loss of topsoil or subsoil
  - Any other field conditions will result in the admixing, degradation or loss of topsoil or subsoil
- During the placement of final cover on cells, the stockpiled soil and subsoil will be used as part of the final cover system. Subsoil and topsoil will be placed in 400-mm and 100-mm-thick layers respectively before being revegetated.

13.3 Traffic Management Plan

The Traffic Management Plan includes measures to manage vehicles and equipment within the landfill, as well as those entering and exiting the landfill, to improve safety and reduce environmental impacts. Measures include but are not limited to the following:

- Prebooking all incoming waste and receiving during daylight hours to reduce noise, exhaust, and light impacts from traffic
- Constructing during daylight hours
- Assessing fugitive dust during dry conditions watering roads on an as-needed basis to reduce traffic related dust impacts
- Posting and enforcement of speed limits
- Reporting wildlife collisions and, if needed, implementing suitable measures to reduce the number of collisions, such as reduced speed limits

13.4 Emergency Preparedness and Response Plan

The Emergency Preparedness and Response Plan includes measures to avoid and respond to hazardous spills, including but not limited to the following:

- Measures for fueling and fuel storage procedures, including measures for parking and preparing for fueling, inspecting and using fuel equipment, and completing fueling and cleanup
- Measures for spills and release prevention, including identifying controls to prevent spills and releases, establishing spills and release prevention and response controls, implementing spill and release prevention and response controls, and processes for documentation, communication and review

13.5 Noxious Weeds Plan

The Noxious Weeds Plan includes measures to prevent and manage the spread of weeds, including but not limited to the following:

- Conducting weekly inspections, especially during times of high vegetation growth (May to August) for Noxious weeds listed under the provincial Weed Control Regulation and regional Noxious weeds and invasive species identified by the PRRD's Invasive Plant Program Strategic Plan and Profile
- Bringing in a certified pesticide applicator on an as need basis where weeds are identified
- Preventing the spread of Noxious and invasive weeds by cleaning vehicles and equipment as best as reasonably possible (before entering/exiting the landfill)
- Sourcing local seed to reduce the risk of introducing invasive plant species from other regions and retailing a Certificate of Seed Analysis

13.6 Vegetation Management Plan

The Vegetation Management Plan includes measures to restore and manage vegetation at the landfill, including but not limited to the following:

- Immediately stabilizing and seeding disturbed soils due to construction to prevent soil loss and Noxious weed spread
- Immediately cutting trees and shrubs growing on the final cover or treatment pad liners to maintain the long-term integrity of liner and cover systems

13.7 Wildlife Management Plan

The Wildlife Management Plan includes measures to prevent and avoid wildlife interactions, including but not limited to the following:

- Fencing and maintaining the fence line around the active landfill area as required by Section 8(a)(i) of the HWR, limiting wildlife interactions
- Maintaining good housekeeping to prevent and minimize food attractants at site
- Minimizing light and noise effects on wildlife by not actively accepting waste during night

13.8 Air Quality Monitoring Plan

The purpose of the Air Quality Monitoring Plan will be to verify that ambient air quality associated with emissions from the site complies with BC AAQOs. Air quality monitoring will only be implemented if it is determined that air quality is an issue at the site. In the event that dust (that is, particulate emissions) and/or odours are well controlled or are not identified to be an issue at the landfill, the air monitoring plan will not be implemented unless as directed by BC MECCS. If implemented, Tervita proposes that the monitoring be conducted for a period of 3 to 12 months, depending on the monitoring results, which will be reviewed by a qualified air quality specialist. The monitoring program would include the following:

- Wind speed and direction: continuous wind speed and wind direction data will be collected and hourly averages will be calculated. This information is very useful for determining the source(s) of elevated air contaminant concentrations and/or odours.
- PM: short-term monitoring will be conducted on an annual or semi-annual basis for PM less than PM_{10} to verify that the 24-hour BC limit of 50 µg/m^3 is not exceeded.
- H_2S: short-term H_2S concentrations will be monitored on an annual or semi-annual basis and will be compared to the Alberta AAQOs of 14 and 4 µg/m^3 as hourly and 24-hour averages, respectively, noting that BC MECCS does not have any objective for H_2S at this time.
- VOCs: VOCs will be monitored continuously if hydrocarbon odours are identified as a concern.

In the event that the air monitoring data indicate an air quality contravention, the following procedures will be undertaken:

- The contravention will be immediately reported to BC MECCS.
- An investigation will be undertaken in an attempt to determine the source of the unacceptable emission.
- Mitigative actions will be implemented as soon as possible to rectify the cause.
- Applicable Tervita personnel will be advised of the circumstances and discussions will be held to determine measures to prevent a reoccurrence, if applicable.

13.9 Dust and Odour Control Plan

The primary potential fugitive dust emission sources are associated with the following work areas and/or tasks: soil excavation and backfill activities, site grading and compacting activities, exposed excavation faces or disturbed areas where vegetation has been removed, soil and fill stockpiles, vehicular traffic on unpaved areas of the site, and loading and unloading operations.

Measure in the Dust and Odour Control Plan to prevent conditions conducive to dust generation and to suppress dust include, but are not limited to the following:

- When deemed necessary, exposed excavations, disturbed ground surfaces and unpaved traffic areas will be sprayed with water or chemical dust suppressant.
- Temporary cover and daily maintenance for soil or fill stockpiles will be used and/or these areas will be kept moist during construction. These areas will be inspected weekly and sprayed when

necessary once construction is complete until such time as the stockpiles/cover are seeded and vegetation growth is adequate for controlling dust.

- If high winds are evident at the close of a business day (or immediately prior to a weekend and/or holiday), site personnel will evaluate vulnerable areas and implement controls, as appropriate, to minimize off-hours emissions.

Potential odour sources include VOCs and/or H_2S emissions from contaminated soils, oilfield waste and leachate.

Measure in the Dust and Odour Control Plan to prevent conditions conducive to odour generation include, but are not limited to the following:

- Landfill personnel will perform inspections once per week around the perimeter of the property to determine if offsite odours are present.
- If a complaint is received during a typical workday, an investigation will be undertaken in an attempt to determine the source of the odour.
- Inert cover or soil will be used to cover sources that are identified to potentially be causing offsite odours and if necessary, these sources may also be sprayed with water and/or odour control neutralizer.
- Odour complaints will be logged to identify trends.

13.10 Radiation Protection Plan

The RPP is in place to confirm that all Tervita existing landfill employees and contractors engaged in any work activities where radiation hazards exist from NORM are fully knowledgeable of the correct procedures to be followed for worker protection. This is in compliance with the Silverberry BC MECCS Permit, BC Occupational Health and Safety Regulations and Health Canada's Guidelines for the Management of NORM. The radiation protection program includes the following elements:

- Management control over work practices including supervisory requirements to ensure adherence to the RPP
- Personnel qualifications and training
- Control of occupational and public exposure to radiation
- External gamma radiation monitoring and protection
- Contamination monitoring and controls
- Environmental monitoring and controls
- Waste management controls
- Recordkeeping

13.11 Groundwater Monitoring Plan

Tervita maintains a groundwater monitoring program at the Silverberry Landfill as required under the *EMA* Permit 17150 to provide long-term monitoring of groundwater conditions at the site, and to assess whether there are any effects on groundwater due to landfill activities. The program consists of collecting samples quarterly from 14 monitoring wells, as well as one leachate collection point and comparing the analytical results to background and/or historical results and regulatory criteria to determine if any changes in these conditions were the result of landfill activities onsite. The existing groundwater monitoring program will be expanded to accommodate the proposed Project expansion.

A Groundwater Monitoring Plan is in place with mitigation measures to protect groundwater quality at the proposed Project expansion site and includes details of the existing groundwater monitoring program such as the methodologies to be employed, the analyte list, the timing of monitoring activities, and procedures to be followed should performance indicators (including regulatory standards) be breached.

13.12 Leachate Management Plan

Leachate generated by the proposed Project expansion will be monitored as part of the groundwater monitoring program, similarly to the current operations at the existing landfill. A Leachate Management Plan is in place and includes mitigation measures to protect groundwater quality and to verify that leachate collection and leak detection systems are functioning as designed.

13.13 Stormwater Management Plan

The Stormwater Management Plan includes mitigation measures to protect surface water quality at the proposed Project expansion site and the surrounding area. These mitigation measures are to be implemented to control emissions to surface water associated with Project activities and a surface water quality monitoring program to guide further mitigation, if required. The Plan also includes details of the monitoring program, including the methodologies to be employed, the analyte list, the timing of monitoring activities, and procedures to be followed should performance indicators (including regulatory standards) be breached. The Stormwater Management Plan will be included in the Operations Plan for the proposed Project expansion.

13.14 Landfill Leak Detection Monitoring Plan

The Landfill Leak Detection Monitoring Plan includes procedures for inspection and maintenance of the containment and leak detection systems of the proposed Project expansion to verify that the systems are functioning as designed. The Plan specifies a methodology and schedule for inspection and maintenance of Project containment measures, including a process to be implemented should deficiencies in containment be identified. The Plan also includes a procedure for recordkeeping for inspection and maintenance activities. Landfill leak detection monitoring for the proposed Project expansion will be conducted as part of the groundwater monitoring program, similarly to the current operations at the existing landfill.

13.15 Night Time Light Management Plan

The Night Time Light Management Plan includes measures to minimize potential light nuisance from the proposed Project expansion activities, including those relevant mitigation measures for effects on public health and wildlife described in Section 4.8. These mitigation measures include restricting most Project activities to daylight hours.

14. Monitoring and Follow-up

Environmental monitoring refers to the procedures and activities that Tervita will implement as part of its environmental management systems to manage the environmental aspects of the proposed Project expansion. Environmental monitoring is a key component of Tervita's environmental compliance strategy and will be conducted by trained professionals including the Environmental & Regulatory Advisor, the Site Inspector and resource-specific specialists, as needed. Trained personnel will monitor, advise, and work with Tervita construction management, as necessary, throughout all phases of the proposed Project expansion, to ensure continuous and consistent compliance with the environmental protection and socio-economic commitments contained in the following:

- The Application
- The environmental management planning documents
- Permit and approval conditions
- Applicable environmental laws and regulations

The environmental monitors and trained personnel will be responsible for the following:

- Monitoring environmental and construction conditions and working with Tervita field management, when necessary, to ensure compliance with the proposed Project expansion's environmental commitments, approvals, permits and licenses
- Documenting the effectiveness of mitigation at reducing potential adverse environmental effects
- Recommending additional or alternative mitigation
- Identifying resource-specific issues
- Determining the status of environmental issues after construction

Reporting of environmental issues, associated mitigation and any follow-up will be incorporated in construction summary reports and submitted to BC MECCS per guidance contained in the Operations Plan.

Following construction activities, trained personnel will undertake PCM, including an assessment of reclamation, revegetation, erosion control and significant weed problems on the areas disturbed by construction of the proposed Project expansion. The objectives of PCM are as follows:

- Evaluate the effectiveness of environmental protection and mitigation during construction.
- Identify any new environmental issues that may have arisen after construction activities and during operation.
- Recommend, coordinate and implement any remedial measures that are warranted and any additional measures to address outstanding or new environmental issues.
- Compare the predicted effects and mitigation with actual documented effects.
- Document opportunities for procedural learnings and improvement.

PCM will be integrated with current operations and incorporated with other routine operational monitoring activities that will be expanded for the proposed Project expansion including monitoring of soil erosion and dust control, groundwater quality, surface water quality, leachate generation, and air monitoring for NORM activity. Any environmental issues, associated mitigation and follow-up will be incorporated into the annual operating reports and submitted to BC MECCS per guidance contained in the Operations Plan. Annual reclamation and closure reports will also be incorporated into the annual operating reports as needed, detailing reclamation activities such as drainage restoration, soil replacement, erosion control and revegetation, and associated follow-up, as needed.

While Tervita will integrate the proposed Project expansion into monitoring and reporting requirements currently in place for existing operations; Tervita will adhere to additional construction or PCM, follow-up and reporting requirements required under Certificate Conditions.

Part F: Conclusions

Part F of the Application for proposed Project expansion summarizes the Project design elements, residual adverse effects, cumulative adverse effects, and key mitigation measures for the proposed Project expansion.

The information provided in Part F follows the requirements set out in the AAIR for the proposed Project expansion issued January 23, 2019, by the BC EAO.

15. Conclusions

This Application has been prepared for Tervita to meet the assessment requirements specified in the AAIR issued by the EAO pursuant to Section 19 of the BC *EA Act* in order for Tervita to obtain an EAC Amendment for the proposed Project expansion. These requirements include identifying VCs and KIs for assessing potential proposed Project expansion effects, mitigation measures to eliminate, avoid or reduce these effects as well as characterizing and predicting the significance of potential residual effects and potential cumulative effects.

Based on the assessment results presented in this Application, Tervita concludes that the proposed Project expansion is not considered likely to result in significant residual adverse effects or cumulative effects. Furthermore, minor economic benefits are expected to be incurred by local businesses and by Project personnel employed from local communities. The proposed Project expansion is expected to continue to provide responsible waste management option for the oil and gas industry in northeastern BC, which is also considered a significant Project benefit. Therefore, Tervita requests that an EAC be issued for the proposed Project expansion.

Tervita will complete subsequent permitting/authorization processes where applicable prior to proceeding with proposed Project expansion construction, operation, and decommissioning.

15.1 Summary of Residual Effects

A summary of residual effects predicted for the proposed Project expansion is provided in Table 15.1-1.

15.2 Summary of Mitigation Measures

A summary of mitigation measures that are proposed to mitigate potential effects to VCs is provided in Table 15.2-1.

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Terrain and Soils	Loss of surface soil material through wind or water erosion	Construction, Operations, Closure/Reclamation, and Postclosure	Activities such as clearing and grubbing, and Project preparation can result in wind and water erosion and soil cover loss.	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under the following conditions: - Wet or frozen field conditions will result in the admixing, degradation or compaction of topsoil or subsoil - High wind velocities create the potential for the loss of topsoil or subsoil - Any other field conditions will result in the admixing, degradation or loss of topsoil or subsoil • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. High erosion areas in ditches may be armored with LLPDE. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • An Erosion and Sediment Control Plan will be implemented to prevent erosion (see Section 13.1 for summary). • A Soil Conservation Plan will be implemented to avoid or reduce potential loss of surface soil material through wind or water erosion (see Section 13.2 for summary). • A Dust and Odour Control Plan will be implemented to prevent conditions conductive to dust generation and to suppress dust (see Section 13.9 for summary).	No residual effect predicted	N/A	N/A
Terrain and Soils	Reduction in soil productivity due to loss or mixing of topsoil and subsoil	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing and grading activities can lead to a reduction in soil productivity.	• Topsoil and subsoil will be stockpiled and re-used for site reclamation. • Implement two-lift soil handling for topsoil salvage. In this process, the topsoil material is stripped in the first lift and stored onsite for replacement after the life of the Project. The second lift includes all of the remaining subsoil material. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Maintain an adequate separation between topsoil and subsoil piles. • Replace the topsoil and subsoil in the same manner as it was excavated, avoiding admixing of soils. • A Soil Conservation Plan will be implemented to avoid or reduce potential reduction in soil productivity (see Section 13.2 for summary).	No residual effect predicted	N/A	N/A
Air Quality	Increase in air emissions including dust	Construction, Operations, Closure/Reclamation	Fugitive dust from construction, and material unloading. Dust generated from traffic on roads.	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control and the Air Quality Monitoring Plan that will be submitted to BC MECCS for approval.	Increase in air emissions during all phases of the Project	Not significant	Not significant
Air Quality	Project contribution to GHG emission levels	Construction, Operations, Closure/Reclamation	Sources of air emissions include construction equipment and transportation of materials.	• The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible	Increase in GHG emissions during all phases of the Project	Not significant	Not significant
Acoustic Environment	Increase in noise levels	Construction, Operations, Closure/Reclamation, and Postclosure	Sound generated by construction equipment and trucks that service the landfill site.	• Construction work will be done in daylight hours and operational work will be done between the hours of 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	Increased noise emissions during all phases of the Project	Not significant	Not significant

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Surface Water	Increased sediment in stormwater runoff	Construction, Operations, Closure/Reclamation, and Postclosure	Construction activities could increase sediment in stormwater runoff	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • All surface water runs to a pond on the northwest portion of the existing landfill. Sediments will settle in the pond, and the water will be released as required. Onsite erosion control will be utilized if extreme conditions warrant. • Throughout the operation period, prior to final capping, waste is placed a minimum of 1.0 m below the top of berm (top of liner) elevation. Interior grading is maintained such that surface water run-off from the waste is contained within the cell(s). • Implement additional measures provided in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	No residual effect expected	N/A	N/A
Groundwater	Alteration of Groundwater Hydrogeology	Construction, Operations, Closure/Reclamation		• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	No residual effects predicted	N/A	N/A
Terrestrial Vegetation	Introduction or spreads of Noxious weeds	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing, grubbing and Project preparation activities can lead to introduction or spread of Noxious weeds	• Areas of Noxious weeds/invasive plants (as designated on Schedule A of the *Weed Control Regulation*) will be noted during weekly inspections, especially during times of high vegetation growth (May-August). • To supplement the list of Noxious and invasive plants, the PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). Prior to mobilization and demobilization, construction equipment will be cleaned. Any equipment leaving site will utilize the following tools to remove soil prior to exiting: – Track shovels – Brooms – Air Compressor (if available) • When seed is being used for revegetation at site, best efforts will be made to source local seed in consultation with local First Nations to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot.	No residual effects predicted	N/A	N/A
Terrestrial Vegetation	Vegetation uptake of contaminants from air quality and dust dispersion and deposition	Construction, Operations, Closure/Reclamation, and Postclosure	Fugitive dust from construction, and material unloading. Dust generated from traffic on roads.	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will confirm that equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	Loss or alteration of native vegetation	Not significant	Not significant
Terrestrial Vegetation	Loss or alteration of native vegetation	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing, grubbing and Project preparation activities can lead to loss or alteration of native vegetation.	• Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Use a cover crop to assist in weed and erosion control, where warranted. • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Loss or alteration of native vegetation	Not significant	Not significant

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Fish and Fish Habitat	Change in habitat and change in mortality risk	None	N/A	The Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required.	N/A	N/A	N/A
Wildlife and Wildlife Habitat	Loss or alteration of wildlife habitat	Construction, Operations, Closure/Reclamation and Postclosure.	Clearing, grubbing and Project preparation activities can alter wildlife habitat	• Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat (for example, dens and nests) are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented in consultation with a Wildlife Resource Specialist and the appropriate government authority, if applicable. • Existing mitigation measures such as dust suppression at the landfill will be implemented for the proposed Project expansion, including: – Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. – Contractor will confirm that equipment is well-maintained – Reduce idling of equipment, where possible. – Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. – Equipment to use low-sulphur diesel, as appropriate. – Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. • Implement measures in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan to prevent sediment, contaminants, waste materials or leachate from being released to surface or subsurface water outside the Project footprint.	Loss or alteration of wildlife habitat	Not significant	Not significant
Wildlife and Wildlife Habitat	Changes to wildlife movement	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing, grubbing and Project preparation activities and operations traffic can lead to changes in wildlife movement.	• The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis from 7 a.m. to 7 p.m.	Changes to wildlife movement	Not significant	Not significant
Wildlife and Wildlife Habitat	Increased wildlife mortality risk	Construction, Operations, Closure/Reclamation, and Postclosure	Exposure to contaminants may occur and increased operations traffic could increase wildlife mortality risk.	• The feeding or harassment of livestock or wildlife will be prohibited. Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • If amphibians are found, Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site must be immediately reported to the Facility Manager. The root causes of the collision will be recorded and reasonable corrective measures put in place to try and prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	Increased wildlife mortality risk	Not significant	Not significant
Economy	Increased contract and procurement opportunities	Construction, Operations, and Closure/Reclamation	Construction and operation will require contract and procurement services	• Inform appropriate municipalities, Aboriginal groups and economic development agencies of the Project developments and workforce details, as warranted. • Engage with the local and regional business community to notify businesses of Project contracting, subcontracting and employment opportunities and requirements.	Increased contract procurement and employment opportunities	Not significant	N/A
Economy	Increased local, provincial and federal revenue	Construction, Operations, and Closure/Reclamation	Construction and operation may generate income	• Increase government revenue by promoting local labour income and expenditure	Increased revenue for local, regional, provincial and federal governments.	Not significant	N/A

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Land and Resource Use	Potential disruption of resource use activities including agriculture, timber harvesting, industrial use and trapping activities	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing, grubbing and Project preparation activities and heavy equipment use during construction can disrupt land and resource activities. During operations traffic and associated effects can disrupt land and resource users.	• The proposed Project expansion footprint is currently fenced and not being used by agricultural or recreational users. • Provide forest tenure holders and trappers with information and protocols regarding the timeframe for construction. • Consult with forest tenure holders and trappers and consider specific requests for mitigation. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted	No residual effects predicted	N/A	N/A
Land and Resource Use	Potential disruption of First Nation land and resource use including access to lands	Construction, Operations, Closure/Reclamation, and Postclosure	Clearing, grubbing and Project preparation activities and heavy equipment use during construction can disrupt land and resource activities. During operations traffic and associated effects can create sensory disturbance for land and resource users.	• The proposed Project expansion footprint is currently fenced and not being used by First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations and consider specific requests for mitigation. • Refer to Section 4.8 for mitigation measures relating to Wildlife and Wildlife Habitat. • Refer to Section 4.8 for mitigation measures relating to Wildlife and Wildlife Habitat. • Refer to Section 4.6 for mitigation measures relating to Terrestrial Vegetation. • Refer to Section 4.5 and Section 4.4 for mitigation measures relating to Groundwater and Surface Water. • As no effects have been identified for fish and fish habitat (Section 4.7), no mitigation measures are required.	No residual effects predicted	N/A	N/A
Community Services	Disruption of community life by temporary workers	Construction, Operations, Closure/Reclamation, and Postclosure	The presence of construction workforce in the community can disrupt community life.	• Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • Adhere to Tervita's Alcohol and Drug Policy. • Adhere to Tervita's HSE Program. • See mitigation to address potential effects related to Land and Resource Use in Section 6.1. • See mitigation to address the potential effects on Community Infrastructure in Section 6.3. • See mitigation to address potential effects related to Human Health in Section 8.1. • See enhancement measures relate to Economy in Section 5.1	No residual effects predicted	N/A	N/A
Community Infrastructure	Increased traffic volumes as a result of transporting workers, supplies, equipment and incoming waste for disposal	Construction, Operations, and Closure/Reclamation	Construction and operations traffic will increase demand on community infrastructure.	• Restrict all construction and operations activities to the approved designated survey area. All Project-related traffic will adhere to safety and traffic regulations. • Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • All incoming waste will be prebooked before arrival at the landfill site and will be received between 7 a.m. and 7 p.m. unless it's an emergency situation. • Implement traffic management measures outlined in the Operations Plan. • Adhere to Tervita's Alcohol and Drug Policy. • Adhere to Tervita's HSE Program. • See mitigation to address potential effects related to Land and Resource Use in Section 6.1. • See mitigation to address potential effects related to Human Health in Section 8.1.	No residual effects predicted	N/A	N/A
Culture and Heritage	Disturbance of previously unidentified cultural or heritage resources during construction or operations	Construction and Operations	Clearing, grubbing and Project preparation.	• If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: - Immediately notify the BC Archaeology Branch - Immediately stop work within the site - Implement any other measures identified by the BC Archaeology Branch - Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014) • Prohibit the collection of historical resources by Project personnel.	No residual effect predicted.	N/A	N/A

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Human Health	Change in drinking water quality.	Construction, Operations, and Closure/Reclamation	Construction, operations and closure/reclamation activities.	• Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria. • Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing quarterly groundwater monitoring program will be applied to the proposed Project proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable).	No residual effect predicted	N/A	N/A
Human Health	Potential adverse human health effects due to the disturbance of contaminated soil	Construction, Operations, and Closure/Reclamation	Construction, operations and closure/reclamation activities	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing mitigation measures such as dust suppression at the Project will be implemented for the proposed Project expansion. • Workers must comply with occupational health and safety requirements (for example, use of PPE).	No residual effect is predicted	N/A	N/A
Human Health	Leachate effects on surface water, groundwater, or soil quality	Construction, Operations, and Closure/Reclamation	Construction, operations and closure/reclamation activities.	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Workers must comply with occupational health and safety requirements (for example, use of PPE).	No residual effect predicted	N/A	N/A
Human Health	Decreased quality of country foods in plant gathering areas, hunting sites and fishing areas	Construction, Operations, and Closure/Reclamation	Construction, operations and closure/reclamation activities.	• Existing mitigation measures such as dust suppression at the Project will be implemented for the proposed Project expansion. • Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing quarterly groundwater monitoring program will be applied to the proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable) • Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria.	No residual effect predicted	N/A	N/A
Human Health	Air quality effects on respiratory health	Construction, Operations, and Closure/Reclamation	Construction traffic and releases during operations and closure/reclamation	• All construction equipment will adhere to low-emission Tier 4 engine specifications.	No residual effect predicted	N/A	N/A
Human Health	Noise disturbance to nearby Land Users/First Nations	Construction, Operations, and Closure/Reclamation	Traffic from construction, operations and closure/reclamation activities	• Construction work will be done in daylight hours only and operational work will be done between 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise..	No residual effect predicted	N/A	N/A
Human Health	Potential adverse human health effects due to the disturbance of contaminated soil associated with NORMs	Construction, Operations, and Closure/Reclamation	Construction, operations and closure/reclamation activities	• Dust suppression measures to minimize dust generated from vehicular traffic. • Air filter monitoring at the property boundary. • Workers must comply with occupational health and safety requirements (for example, use of PPE).	No residual effect predicted	N/A	N/A
Accidents and Malfunctions	Traffic related accidents	Construction and Operations	Construction and operations traffic.	• Implement measures to reduce traffic-related accidents provided under Community Infrastructure Table 6.3-2.	Potential Risk: Low to medium	N/A	N/A

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Accidents and Malfunctions	Accidental release or spill of contaminants such as hydrocarbons or hazardous materials to the terrestrial environment	Construction, Operations, Closure/Reclamation, and Postclosure	Construction, Operations, Closure/Reclamation, and Postclosure activities	• Design standards for the liner and leachate system will be in accordance with regulatory requirements. • A leak detection program for the liner system will be installed and monitored. • Design failures will be monitored and tracked through the following: – Leak detection monitoring. – Inspection and monitoring of surface water and leachate controls. – Weekly inspection of cover controls to monitor erosion, vegetation growth, and other integrity issues. Any integrity issues will be documented in inspections and rectified as soon as possible. • Tervita will adhere to applicable BC spill regulations during all phases of the Project. • Wastes transported to the Project site will be covered to minimize loss during transit. • Waste resulting from clean-up of spilled and released material shall be collected, stored and characterized appropriately. • Fuel tanks brought to site will be double walled or must be in secondary containment that is 110% of the volume of the tank. Fuel tanks onsite will follow the provincial guidelines in *A Field Guide to Fuel Handling, Transportation and Storage*. • A spill prevention program will be implemented, where any spills that occur are cleaned up using absorbent materials, and with the use of any other required remedial actions. • Spill and release equipment and supplies will be available onsite, such as PPE, first aid kit(s), fire extinguisher, tool box (with tools), commercial spill kit (absorbent sheets/pillows, absorbent socks, disposal bags, disposal bags, splash goggles, nitrile gloves), absorbent booms and shovel. • Employees and contractors will be trained and made aware of their roles and responsibilities in the event of a spill or release. • Soil sampling will be conducted at the closure/reclamation phase in order to identify contaminated soils requiring remediation.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Accidental release or spill of contaminants such as hydrocarbons or hazardous materials to the surface water environment	Construction, Operations, Closure/Reclamation, and Postclosure	Construction, Operations, Closure/Reclamation, and Postclosure activities	• Wastes transported to the Project site will be covered to minimize loss during transit. • Waste resulting from clean-up of spilled and released material shall be collected, stored and characterized appropriately. • Fuel tanks brought to site will be double walled or must be in secondary containment that is 110% of the volume of the tank. • A spill prevention program will be implemented, where any spills that occur are cleaned up using absorbent materials, and with the use of any other required remedial actions. • Spill and release equipment and supplies will be available onsite, such as PPE, first aid kit(s), fire extinguisher, tool box (with tools), commercial spill kit (absorbent sheets/pillows, absorbent socks, disposal bags, disposal bags, splash goggles, nitrile gloves), absorbent booms and shovel. • Employees and contractors will be trained and made aware of their roles and responsibilities in the event of a spill or release. • Chemical and fuel storage during the construction phase will be limited to small volumes in temporary areas (for example, truck mounted fuel tanks for excavating equipment, cases of lube oil stored in equipment storage locker).As a precaution to deal with the potential for a significant release, Tervita will require the construction contractor to maintain a spill response plan to manage the surface assessment, mitigation and remediation, including notification to the appropriate regulatory authority (BC MECCS). • A leak detection program for the liner system will be installed and monitored. The leak detection system between the primary composite liner and secondary CCL will consist of high flow geonet synthetic drainage media connected to a drain system and collection sump. • The leachate collection and removal system will consist of a permeable granular layer across the entire base of the landfill cell. Leachate filtering through the waste will drain laterally through the granular drainage layer to the collection trenches and from there to a collection sump where automatic pumping systems will extract the leachate and direct it to the leachate ponds for storage. At less frequent intervals, the leachate will be removed from storage and trucked or moved via pipeline to an approved facility for treatment or disposal. • Design standards for the liner and leachate system will be in accordance with regulatory requirements. • The landfill cell final cover has been designed to prevent surface water from coming into contact with waste soils. The surface water run-off will instead flow to the surrounding environment, minimizing continued leachate production. • Water within the cell will be treated as leachate prior to release of water. • Implement additional measures provided in the Leachate Management Plan, the Landfill Leak Detection Monitoring Plan and the Accidents and Malfunctions Plan.	Potential Risk: Low to medium	N/A	N/A

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Accidents and Malfunctions	Accidental release or spill of contaminants such as hydrocarbons or hazardous materials to the groundwater environment	Construction, Operations, Closure/Reclamation, and Postclosure	Construction, Operations, Closure/Reclamation, and Postclosure activities	• As a precaution to deal with the potential for a significant release, Tervita will require the construction contractor to maintain a spill response plan to manage the surface assessment, mitigation and remediation, including notification to the appropriate regulatory authority (BC MECCS). • Design standards for the liner and leachate system will be in accordance with regulatory requirements. • A leak detection program for the liner system will be installed and monitored. • Water within the cell will be treated as leachate prior to its release. • Install additional groundwater wells in accordance with the *Groundwater Protection Regulations*. • Incorporate the proposed Project expansion into the existing Groundwater Monitoring Program. • Implement additional measures provided in the Accidents and Malfunction Plan.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Structural failure of a landfill component during construction or operations resulting in terrestrial contamination	Construction and Operations	Construction and Operations activities	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Structural failure of a landfill component during construction or operations resulting in surface water contamination	Construction and Operations	Construction and Operations activities	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Structural failure of a landfill component during construction or operations resulting in groundwater contamination	Construction and Operations	Construction and Operations activities	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid structural failure of any landfill components.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Onsite fires	Construction and Operations	Construction and Operations activities	• There will be no open fires allowed on the site. • In the event of a wildfire, implement measures in the Emergency Response Plan • As part of the Emergency Response Plan, there will be fire suppression equipment onsite, and personnel will have undergone training in the use of the equipment. • All fires detected will be extinguished immediately upon detection, if possible. Complete procedures for dealing with fires during operation are specified in the Fire Control section of the Operations Plan. Portable fire equipment will be available at the site and marked appropriately. • There will also be annual drills conducted to test and train personnel, which will be recorded and reported.	Potential Risk: Low to medium	N/A	N/A
Accidents and Malfunctions	Damage to existing landfill infrastructure	Construction and Operations	Construction and Operations activities	• Adhere to construction and operational procedures and protocols provided in the Operations Plan to avoid damage to existing landfill infrastructure.	Potential Risk: Low to medium	N/A	N/A
Effects of the Environment on the Project	Changing climate trends	Construction, Operations, and Closure/Reclamation	Construction, Operations, and Closure/Reclamation activities	• In the event of a wildfire, flood or other natural hazard, implement measures in the Tervita Silverberry Site Emergency Response Plan.	Extreme weather events could delay Project activities, or damage or impair operating infrastructure Depending upon the severity, a wildfire has the potential to delay Project activities, or damage or impair operating infrastructure	Not significant	Not significant

Table 15.1-1. Summary and Characterization of Residual Effects Predicted for the Proposed Project Expansion

VC	Potential Effects	Project Phase	Project Activity or Physical Work	Proposed Mitigation	Predicted Residual Effect	Significance of Residual Effect	Cumulative Effect
Effects of the Environment on the Project	Extreme weather events	Construction, Operations, and Closure/Reclamation	Construction, Operations, and Closure/Reclamation activities	• Implement measures for erosion control and stormwater management identified in Sections 4.1 and 4.4. • Precipitation falling on the uncovered portions of the active landfill cells, therefore coming into contact with the waste soils, will be managed as leachate. The leachate management system will be designed to handle at minimum, a 1 in 25 year storm event, as required by the HWR. However, the actual design will exceed this minimum requirement. • Buildings (and other Site structures, including tanks), will be built to comply with local building codes and other regulatory requirements in order to minimize the potential for snow damage. • Equipment onsite will be stored or winterised to prevent damage, including draining fluids that might freeze and cause spills or damage. When the site begins operation again, exposed liners, berms and general site facilities will be inspected for signs of damage due to frost heaves.	Extreme weather events could delay Project activities, or damage or impair operating infrastructure	Not significant	Not significant
Effects of the Environment on the Project	Wildfire	Construction, Operations, and Closure/Reclamation	Construction, Operations, and Closure/Reclamation activities	• There will be no open fires allowed on the site. • In the event of a wildfire, implement measures in the Emergency Response Plan. • As part of the Emergency Response Plan, there will be fire suppression equipment onsite, and personnel will have undergone training in the use of the equipment. • All fires detected will be extinguished immediately upon detection. Complete procedures for dealing with fires during operation are specified in the Fire Control section of the Operations Plan. Portable fire equipment will be available at the site and marked appropriately. • There will also be annual drills conducted to test and train personnel, which will be recorded and reported. • Provision of firebreaks shall be carried out to the satisfaction of the Director.	Depending upon the severity, a wildfire has the potential to delay Project activities, or damage or impair operating infrastructure	Not significant	Not significant

Table 15.2-1. Summary of Proposed Mitigation Measures

No.	VC Potential Effects	Proposed Mitigation Measures	Timing	Legal Requirement?	Responsible Agency
Environmental					
1.1 Terrain and Soils	Terrain and Soils – Loss of surface soil material through wind and water erosion	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Topsoil and subsoil salvage will be immediately suspended for the preservation of topsoil and subsoil under the following conditions: – Wet or frozen field conditions will result in the admixing, degradation or compaction of topsoil or subsoil – High wind velocities create the potential for the loss of topsoil or subsoil – Any other field conditions will result in the admixing, degradation or loss of topsoil or subsoil • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. High erosion areas in ditches may be armored with LLPDE. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • An Erosion and Sediment Control Plan will be implemented to prevent erosion (see Section 13.1 for summary). • A Soil Conservation Plan will be implemented to avoid or reduce potential loss of surface soil material through wind or water erosion (see Section 13.2 for summary). • A Dust and Odour Control Plan will be implemented to prevent conditions conductive to dust generation and to suppress dust (see Section 13.9 for summary).	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Terrain and Soils – Reduction in soil productivity due to loss or mixing of topsoil and subsoil	• Topsoil and subsoil will be stockpiled and re-used for site reclamation. • Implement two-lift soil handling for topsoil salvage. In this process, the topsoil material is stripped in the first lift and stored onsite for replacement after the life of the Project. The second lift includes all of the remaining subsoil material. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Maintain an adequate separation between topsoil and subsoil piles. • Replace the topsoil and subsoil in the same manner as it was excavated, avoiding admixing of soils. • A Soil Conservation Plan will be implemented to avoid or reduce potential reduction in soil productivity (see Section 13.2 for summary).	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
1.2 Air Quality	Air Quality – Increase in air emissions including dust	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Air Quality – Project contribution to GHG emission levels	• The Contractor will ensure equipment is well-maintained. • Reduce idling of equipment, where possible.	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
1.3 Acoustic	Acoustic Environment – Increase in noise levels	• Construction work will be done in daylight hours and operational work will be done between the hours of 7 a.m. and 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC EAO

Table 15.2-1. Summary of Proposed Mitigation Measures

No.	VC Potential Effects	Proposed Mitigation Measures	Timing	Legal Requirement?	Responsible Agency
1.4 Surface Water	Surface Water – Increased sediment in stormwater runoff	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. • Topsoil stockpiles will be contoured, stabilized and seeded to prevent soil loss by wind and water erosion. If necessary, stockpiles will be wetted to prevent wind erosion. • Surface water control works will be inspected weekly and/or immediately after a major storm or catastrophic event. • Erosion occurring on surface water control works will be repaired and mitigated as soon as possible. • Mitigation measures to prevent surface water erosion may include swales, hay bales, rock riprap, and/or coconut matting. • The final slopes of the landfill cap will not exceed 33% and will be seeded as soon as possible to ensure vegetation growth and minimize erosion. • The landfill cap will be inspected weekly and if erosion on the cap is noted it will be repaired and mitigated as soon as possible. • A ditch constructed around the perimeter will direct run off and run on water to the runoff pond which has a capacity of 15,000 m^3. • All surface water runs to a pond on the northwest portion of the existing landfill. Sediments will settle in the pond, and the water will be released as required. Onsite erosion control will be utilized if extreme conditions warrant. • Throughout the operation period, prior to final capping, waste is placed a minimum of 1.0 m below the top of berm (top of liner) elevation. Interior grading is maintained such that surface water run-off from the waste is contained within the cell(s). • Implement additional measures provided in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan. • Any additional requirements for reclamation will be discussed with BC MECCS pending final site assessment.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA,* HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
1.5 Groundwater	Groundwater – Alteration of groundwater hydrogeology	• Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized. Groundwater from monitoring wells will not be used during construction, operation or reclamation\closure.	Construction, Operations, and Closure/Reclamation	*EMA,* HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
1.6 Terrestrial Vegetation	Terrestrial Vegetation – Introduction or spread of Noxious weeds	• Areas of Noxious weeds/invasive plants (as designated on Schedule A of the *Weed Control Regulation*) will be noted during weekly inspections, especially during times of high vegetation growth (May-August). • To supplement the list of Noxious and invasive plants, the PRRD's Invasive Plant Program Strategic Plan and Profile will be reviewed annually to determine regionally important Noxious and invasive plants. • If areas of Noxious or invasive weeds are noted, a certified pesticide applicator will be brought in on an as-needed basis. If there is an infestation of Noxious/invasive plants, Tervita will document the infestation on the Provincial IAPP to help with future weed control programs. • To prevent the spread of Noxious and invasive weeds, Tervita vehicles and equipment will be cleaned as best as reasonably possible (before entering/exiting the landfill). Prior to mobilization and demobilization, construction equipment will be cleaned. Any equipment leaving site will utilize the following tools to remove soil prior to exiting: – Track shovels – Brooms – Air Compressor (if available) • When seed is being used for revegetation at site, best efforts will be made to source local seed in consultation with local First Nations to reduce the risk of introducing invasive plant species from another region. The Certificate of Seed Analysis will be kept on file and analyzed to ensure Noxious species and regional species of concern are not present in the seed lot.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC MECCS, BC EAO
	Terrestrial Vegetation – Vegetation uptake of contaminants from air quality and dust dispersion and deposition	• Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. • Contractor will confirm that equipment is well-maintained. • Reduce idling of equipment, where possible. • Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. • Equipment to use low-sulphur diesel, as appropriate. • Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC MECCS, BC EAO
	Terrestrial Vegetation – Loss or alteration of native vegetation	• Tervita will seek to reduce disturbance to native vegetation to the extent possible. • Use a cover crop to assist in weed and erosion control, where warranted. • Construct the landfill using a phased approach so that the disturbed and potentially exposed areas will be minimized.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC MECCS, BC EAO
1.7 Fish	Fish and Fish Habitat	• The Project expansion is not expected to result in a change in habitat or mortality risk and no potential impacts to the Fish and Fish Habitat VC are predicted. Consequently, no mitigation measures are required.	N/A	N/A	N/A

Table 15.2-1. Summary of Proposed Mitigation Measures

No.	VC Potential Effects	Proposed Mitigation Measures	Timing	Legal Requirement?	Responsible Agency
1.8 Wildlife	Wildlife and Wildlife Habitat – Loss or alteration of wildlife habitat	• Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • Use a cover crop to assist in weed and erosion control, where warranted. • If previously unidentified wildlife species with special conservation status or their site-specific habitat (for example, dens and nests) are identified during construction, suspend activities and notify the Environment & Regulatory Advisor, who will determine the appropriate mitigation measure to be implemented in consultation with a Wildlife Resource Specialist and the appropriate government authority, if applicable. • Existing mitigation measures such as dust suppression at the landfill will be implemented for the proposed Project expansion, including: – Current mitigation measures will continue, such as occasional watering of roadways, and curtailment of activity during high wind events. – Contractor will confirm that equipment is well-maintained – Reduce idling of equipment, where possible. – Construct the landfill using a phased approach so that the disturbed soil available for wind erosion will be minimized. – Equipment to use low-sulphur diesel, as appropriate. – Implement additional measures provided in the Dust and Odour Control Plan and the Air Quality Monitoring Plan. • Implement measures in the Erosion and Sediment Control Plan, the Leachate Management Plan, and the Stormwater Management Plan to prevent sediment, contaminants, waste materials, or leachate from being released to surface or subsurface water outside the Project footprint.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC MECCS, BC EAO
	Wildlife and Wildlife Habitat – Changes to wildlife movement	• The active landfill area will be surrounded by a fence as required by Section 8(a)(i) of the HWR, limiting wildlife interactions. • All food and wastes will be stored and secured in vehicles or appropriate facilities. • Limit light and noise effects on wildlife by actively accepting waste on a prebooked basis from 7 a.m. to 7 p.m.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC MECCS, BC EAO
	Wildlife and Wildlife Movement – Increase wildlife mortality risk	• The feeding or harassment of livestock or wildlife will be prohibited. Construction and operations personnel will not be permitted to have firearms or pets on the Project site. • Schedule construction activities outside the migratory bird nesting period of May 1 to July 31. Conduct a nonintrusive preconstruction nest survey in the event any clearing activities are scheduled within the migratory bird nesting period. • If amphibians are found, Tervita will seek an amphibian salvage permit from BC MFLNRORD to salvage any amphibians from the Project footprint prior to construction activities. • Tervita personnel and contractors will be required to abide by all speed limits on the Project site and on transit to the site. • All collisions (including wildlife) along the Project access road or within the Project site must be immediately reported to the Facility Manager. The root causes of the collision will be recorded and reasonable corrective measures put in place to try and prevent future collisions. • Tervita will ensure compliance with safe operating practices so that wildlife will not come in contact with any spills, leaks or other releases from Project facilities and equipment. • Any wildlife mortalities or injuries at the Project site will be documented.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA,* HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO

Table 15.2-1. Summary of Proposed Mitigation Measures

No.	VC Potential Effects	Proposed Mitigation Measures	Timing	Legal Requirement?	Responsible Agency
Social					
2.1	Economy – Increased contract procurement and employment opportunities	• Inform appropriate municipalities, Aboriginal groups and economic development agencies of the Project developments and workforce details, as warranted. • Engage with the local and regional business community to notify businesses of Project contracting, subcontracting and employment opportunities and requirements.	Construction, Operations, and Closure/Reclamation	*EMA*	BC EAO
	Economy – Increased local, provincial and federal revenue	• Increase government revenue by promoting local labour income and expenditure.	Construction, Operations, and Closure/Reclamation	*EMA*	BC EAO
	Land and Resource Use – Potential disruption of resource use activities including agriculture, timber harvesting, industrial use and trapping activities	• The proposed Project expansion footprint is currently fenced and not being used by agricultural or recreational users. • Provide forest tenure holders and trappers with information and protocols regarding the timeframe for construction. • Consult with forest tenure holders and trappers and consider specific requests for mitigation. • Inform and consult with interested federal and provincial agencies with the potential to be impacted by the Project, as warranted.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC EAO
	Land and Resource Use – Potential disruption of First Nation land and resource use including access to lands	• The proposed Project expansion footprint is currently fenced and not being used by First Nations. • Provide First Nations with information and protocols regarding the timeframe for construction. • Consult with First Nations and consider specific requests for mitigation. • Refer to Section 4.8 for mitigation measures relating to Wildlife and Wildlife Habitat. • Refer to Section 4.8 for mitigation measures relating to Wildlife and Wildlife Habitat. • Refer to Section 4.6 for mitigation measures relating to Terrestrial Vegetation. • Refer to Section 4.5 and Section 4.4 for mitigation measures relating to Groundwater and Surface Water. • As no effects have been identified for fish and fish habitat (Section 4.7), no mitigation measures are required.	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC EAO
	Community Services – Disruption of community life by temporary workers	• Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • Adhere to Tervita's Alcohol and Drug Policy. • Adhere to Tervita's HSE Program. • See mitigation to address potential effects related to Land and Resource Use in Section 6.1. • See mitigation to address the potential effects on Community Infrastructure in Section 6.3. • See mitigation to address potential effects related to Human Health in Section 8.1. • See enhancement measures relate to Economy in Section 5.1	Construction, Operations, Closure/Reclamation, and Postclosure	*EMA*	BC EAO
	Community Infrastructure – Increased traffic volumes as a result of transporting workers, supplies, equipment and incoming waste for disposal	• Restrict all construction and operations activities to the approved designated survey area. All Project-related traffic will adhere to safety and traffic regulations. • Inform all responsible federal and provincial resource agencies and interested municipal officials of the Project developments, as warranted. • Provide potentially affected Aboriginal groups with the proposed Project expansion construction schedule and maps. • All incoming waste will be prebooked before arrival at the landfill site and will be received between 7 a.m. to 7 p.m. unless it's an emergency situation. • Implement traffic management measures outlined in the Operations Plan. • Adhere to Tervita's Alcohol and Drug Policy. • Adhere to Tervita's HSE Program. • See mitigation to address potential effects related to Land and Resource Use in Section 6.1. • See mitigation to address potential effects related to Human Health in Section 8.1.	Construction, Operations, and Closure/Reclamation	*EMA*	BC EAO

Table 15.2-1. Summary of Proposed Mitigation Measures

No.	VC Potential Effects	Proposed Mitigation Measures	Timing	Legal Requirement?	Responsible Agency
2.1 (cont'd)	Culture and Heritage – Disturbance of previously unidentified cultural or heritage resources during construction or operations	• If historical features (for example, arrow heads, modified bone, pottery fragments, and fossils) not previously identified are found on the construction footprint, implement the following: – Immediately notify the BC Archaeology Branch – Immediately stop work within the site – Implement any other measures identified by the BC Archaeology Branch – Implement measures in the BC Archaeological Chance Find Procedure (GBC 2014) • Prohibit the collection of historical resources by Project personnel.	Construction and Operations	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Change in drinking water quality	• Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria. • Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing quarterly groundwater monitoring program will be applied to the proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable).	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Potential adverse human health effects due to the disturbance of contaminated soil	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing mitigation measures such as dust suppression at the landfill will be implemented for the proposed Project expansion. • Workers must comply with occupational health and safety requirements (for example, use of PPE).	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Leachate effects on surface water, groundwater or soil quality	• Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Workers must comply with occupational health and safety requirements (for example, use of PPE).	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Decreased quality of country foods in plant gathering areas, hunting sites and fishing areas	Existing mitigation measures such as dust suppression at the existing landfill will be implemented for the proposed Project expansion. • Existing mitigation measures to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). • Existing quarterly groundwater monitoring program will be applied to the proposed Project expansion to detect any potential impacts to groundwater (and potential migration, if applicable). • Proposed Project expansion will be tied into the existing stormwater management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria.	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Air quality effects on respiratory health	• All construction equipment will adhere to low-emission Tier 4 engine specifications.	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO
	Human Health – Noise disturbance to nearby Land Users/ First Nations	• Construction work will be done in daylight hours only and operational work will be done in between 7 a.m. to 7 p.m. • Equipment will be well maintained with properly functioning mufflers. Operators will take reasonable measures to control construction-related noise.	Construction, Operations, and Closure/Reclamation	*EMA*	BC EAO
	Human Health – Potential adverse human health effects due to the disturbance of contaminated soil associated with NORMs	• Dust suppression measures to minimize dust generated from vehicular traffic. • Air filter monitoring at the property boundary. • Workers must comply with occupational health and safety requirements (for example, use of PPE).	Construction, Operations, and Closure/Reclamation	*EMA*, HWR, *and Waste Discharge Regulation*	BC MECCS, BC EAO

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Appendix 1
Soil Sampling Report

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March 6, 2017

Subject: Results of Soil Sampling Activities
August 23 and 24, 2016
Tervita Silverberry Landfill

Dear Mr. Nelson,

1. Introduction

Based on comments from the Working Group to Tervita Corporation (Tervita) for the Silverberry Landfill Capacity Replacement Project, Tervita has retained CH2M HILL Energy Canada, Ltd. (CH2M) to conduct a soil study for the Silverberry landfill site (the Facility).

The Facility is located approximately 50 kilometers northwest of Fort St. John in northeastern British Columbia (BC). The landfill is used primarily for the disposal of waste associated with oil and gas exploration.

2. Objectives

The objective of the Surface Water Drainage Area (SWDA) soil sampling investigation is to assess concentration and distribution of potential impact in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the ephemeral stream, as show in Figure 2 of the SWDA area.

The objective of the Potential Dust Migration Area (PDMA) soil sampling investigation is to assess concentration and distribution of potential impact in surficial soils resulting from airborne particulate matter originating from site-related activities.

Details of the study and the results are provided in the following sections.

3. Scope of Work

The scope of work for the surficial soil quality assessment program included collection of soil samples from the proposed SWDA and PDMA as shown in Figure 1 of Attachment A. The scope of work is broken down as follows:

3.1 Surficial Soil Quality Assessment in the Surface Water Drainage Area (SWDA)

- Performed a review of the work area to determine borehole locations.
- Obtained safe work permit and adhered to all applicable health and safety plans and requirements of CH2M and Tervita.
- Located proposed boring locations in field using GPS coordinates. Boring locations may be slightly altered based on topography or accessibility.
- Hand augured ten boreholes and collected soil samples to delineate contaminants of potential concern (COPCs).
- Collected and submitted soil samples to an accredited laboratory for the analyses of:
  - **Benzene, toluene, ethylbenzene, and xylenes (BTEX)**
  - **Volatile petroleum hydrocarbons (VPHs)** – C6-C10
  - **Light extractable petroleum hydrocarbons (LEPHs)** – C10-C19
  - **Heavy extractable petroleum hydrocarbons (HEPHs)** – C19-C32
  - **Petroleum aromatic hydrocarbons (PAHs)** – naphthalene, anthracene, pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, fluoranthene, fluorene, acenaphthene, phenanthrene, benzo(a)anthracene, acenaphthylene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene, benzo(g,h,i)perylene, 2-methylnaphthalene (soil), 1-methylnaphthalene (soil).
  - **Volatile organic compounds (VOCs)** – chloromethane, vinyl chloride, bromomethane, chloroethane, trichlorofluoromethane, acetone, 1,1-dichloroethene, dichloromethane, methyl tert-butyl ether, 2-butanone, trans-1,2-dichloroethylene, 1,1-dichloroethane, cis-1,2-dichloroethylene, chloroform, 1,2-dichloroethane, 1,1,1-trichloroethane, carbon tetrachloride, benzene, 1,2-dichloropropane, trichloroethene, bromodichloromethane, trans-1,3-dichloropropene, 4-methyl-2-pentanone, cis-1,3-dichloropropene, 1,1,2-trichloroethane, toluene, dibromochloromethane, ethylene dibromide, tetrachloroethene, 1,1,1,2-tetrachloroethane, chlorobenzene, ethylbenzene, m&p-xylenes, bromoform, styrene, 1,1,2,2-tetrachloroethane, o-xylene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trichlorobenzene.
  - **Polychlorinated biphenyls (PCBs)** – by Alocor
  - **Metals** – Sb, As, Ba, Be, B, Cd, Cr, Co, Cu, Pb, Hg, Mo, Ni, Se, Ag, Ti, Sn, V, and Zn
  - **Total phenols –** non-chlorinated phenols screening tool
  - **Extractable organic halides (EOXs)**
  - **Duplicate samples** for quality assurance and quality control (QA/QC) purposes
  - **General parameters** – pH, EC, and particle size analyses for selected samples
- Backfilled boreholes with cuttings.

3.2 Surficial Soil Quality Assessment in the PDMA

- Performed a review of the work area to determine borehole locations.
- Obtained safe work permit and adhered to all applicable health and safety plans and requirements of CH2M and Tervita.
- Located proposed boring locations in field using GPS coordinates. Boring locations may be slightly altered based on topography or accessibility.
- Hand augured six boreholes and collected soil samples to delineate COPCs.
- Collected and submitted soil samples to an accredited laboratory for the analyses of same parameters as outlined in Section 3.1.
- Backfilled boreholes with cuttings.

3.3 Deliverables

Prepare a letter report summarizing the scope of work, regulatory framework, field activities, analytical results, and conclusions of the soil assessment program.

4. Regulatory Framework

The Environmental Management Act, which includes the Contaminated Sites Regulation (CSR), including nine stages of amendments up to BC Reg. 184/2016, July 19, 2016, is the primary law governing contaminated sites in BC. The BC Ministry of Environment (BC MoE) provides two numerical standards for soil in CSR, namely, the generic standards (Schedule 4 and 10) and matrix standards (Schedule 5). Soil standards values are calculated for five generically defined land uses: agricultural (AL), wildland (WL), urban park (PL), residential (RL), commercial (CL), and industrial (IL). The applicable standards depend on the primary land use onsite. The Facility has an IL use and is surrounded by areas of undeveloped forest supporting natural ecosystems. Based on an iMapBC land search, the Facility and surrounding area are located within the Agricultural Land Reserve (ALR). Per the Facility permit, the end land use for the Facility would be AL.

To determine which Schedule 5 site specific factors applied at the Facility, an iMapBC water well search was completed. No water wells were found within 500 m of the Facility. Based on the CSR and the characteristics at the Facility and surrounding lands, the applicable site specific water factors for Schedule 5 matrix standards are human intake of contaminated soil and toxicity to soil invertebrates and plants (mandatory at all sites), the protection of Aquatic Life water use for freshwater (AWF) and Drinking Water use (DW). Although no water wells were identified within 500 m of the Facility, DW site-specific factors for consideration of future water use is mandatory at all sites.

As outlined in Protocol 4 for contaminated sites (BC MoE, 2010) BC MoE has background concentrations for inorganic substances for regions across the province. Data can also be compared to these background soil concentrations in Protocol 4 and can supersede the CSR standards, and therefore could be the applicable standard for the Silverberry Facility. Within Protocol 4, the Facility is located within the Omineca Peace Region. Protocol 4 metals background concentrations have been presented on Tables 3a and 3b, for on and off site, respectively, in Attachment B.

Based on the above, the applicable standards are as follows:

- **During operation at the Facility:** CSR IL use standards and Protocol 4 background concentrations;
- **Facility's end land use (post-operation):** CSR AL use standards and Protocol 4 background concentrations; and
- **Adjacent lands:** CSR AL use standards and Protocol 4 background concentrations.

Analytical data for the Facility has been compared to both AL and IL standards, in consideration of both current and end land use standards.

5. Methodology

5.1 Sample Locations for the SWDA

The SWDA, located in the northwest corner of the landfill site, drains northwest towards an ephemeral stream located approximately 100 m north of the storm water retention pond, as shown on Figure 1. The objective of the SWDA soil sampling investigation was to assess concentration and distribution of potential impact in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the ephemeral stream. Ten soil sampling locations were selected in the field based on professional judgement within a 100 m by 100 m area along an elevation gradient between discharge point of the storm water retention pond and the ephemeral stream. Particular consideration was given to areas that appeared to have a high probability of soil impact from surface water such as the surface water flow outlet, depressional areas where water appeared to pond, and areas of vegetation change (tree line). Any areas that had noticeable staining were to be sampled, although none were observed. Eight sampling locations (BH-1 to BH-8) were located within the Facility fenceline, and two (BH-9 and BH-10) were located within undisturbed native areas off-Site. Sampling locations are shown in Figure 2 of Attachment A and the GPS coordinates and sample depths are provided on the Borehole Logs in Attachment C.

5.2 Sample Locations for the PDMA

Initial estimates of the number and layout of PDMA sampling locations were determined from wind rose analysis of prevailing winds and estimates of area of potential distribution. Analysis of average monthly wind speed and primary wind direction at Fort St John, BC suggests a predictable monthly pattern of wind speed and direction (Exhibit 1).

Exhibit 1. Average Monthly Wind Speed and Wind Direction at Fort St. John A Weather Station (Government of-Canada 2016)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Speed (km/h)	13.3	13.5	14.1	14.4	14.1	13.1	12.2	11.8	13.2	14.8	13.9	13.2	13.5
Most Frequent Direction	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW	SW

Samples were taken at locations upwind and downwind from the Facility. Distribution distances are influenced by particle size distributions, landforms, and lateral and horizontal wind characteristics (Countess, 2001). Although initial estimates suggested downwind samples would be taken at a distance up to 1 km from the site with the majority of samples taken within 200 m of the Facility, road, and access conditions (dense forested areas) limited access to sampling locations within 200 m of the Facility boundary. Six sampling locations were selected, of which four were within the Facility fenceline (BH-12, BH-13, BH-16 and BH-17) and two were located off-site in undisturbed native areas (BH-14 and BH-15). Their locations are shown in Figure 3 of Attachment A and the GPS coordinates and sample depths are provided on the Borehole Logs in Attachment C.

5.3 Soil Field Screening

All boreholes were visually inspected for any signs of impact. The soil sampled from each interval were field screened for headspace vapour concentrations using an RKI Eagle 2 combustible vapour analyzer with photoionization detector (PID) with methane elimination enabled.

5.4 Soil Sampling

Soils samples were collected from each of the borehole locations at intervals of approximately 15 cm depth. Lithology was logged continuously according to a modified Unified Soil Classification System, and were visually inspected for any signs of impact. Detailed stratigraphy is presented on the Borehole Logs in Attachment C.

All soil samples were collected using a hand held soil auger. Nitrile gloves were worn by CH2M field personnel, and replaced after each sampling interval, in order to mitigate the potential for cross contamination. All non-disposable equipment used in the collection of a soil sample was cleaned before use at each sample location and between sample collection at each location to avoid cross-contamination of samples. All soil samples were collected in appropriate laboratory supplied sampling containers for subsequent regular turn-around analysis to be completed by ALS Laboratories (ALS) in Calgary, Alberta.

5.5 Soil Laboratory Analytical Program

Based on soil field screening results and visual observations, the following soil samples were submitted to ALS for analyses:

- **From SWDA:** Ten soil samples and one duplicate sample for analyses of BTEX, VPH, LEPHs, HEPHs, PAHs, VOCs, PCBs, metals, total phenols, extractable organic halides; and two of the 11 samples were additionally analyzed for pH, EC, and particle size.
- **From PDMA:** Six soil samples and one duplicate sample for analyses of BTEX, VPH, LEPHs, HEPHs, PAHs, VOCs, PCBs, metals, total phenols, extractable organic halides; and four of the six samples were additionally analyzed for pH, EC, and particle size.

6. Results

6.1 Soil Lithology

The observed surface and subsurface stratigraphy encountered in 16 borehole locations varied across SWDA and PDMA vary consisting of top soil underlain by clay and silty clay layer with trace fine sand and gravel.

6.2 Soil Field Screening

Headspace vapour concentrations measured in soil samples collected from the boreholes ranged from 0 ppm to 2 ppm. The headspace vapour concentrations are presented in Table 1 of Attachment B and on the borehole logs in Attachment C**.**

6.3 Laboratory Analytical Results

6.3.1 SWDA

Ten boreholes (BH-1 to BH-10) were drilled within the SWDA. No visual evidence of petroleum hydrocarbon (PHC) contamination or elevated VOC headspace concentrations were observed in the field.

6.3.1.1 General Parameters

A total of eleven soil samples, consisting of ten samples and one duplicate sample, were submitted to the laboratory from ten borehole locations for analyses of EOX and PCB parameters. Concentrations of EOX and PCB parameters of all submitted samples were less than the method detection limits (MDLs).

Two samples from two borehole locations were submitted for pH, conductivity and particle size analysis. The pH values ranged on-site from 5.63 (BH-7A) to 6.94 (BH-3A), while for off-site borehole samples, it was 4.75 (BH10-A) and 5.14 (BH-9A). The on-site borehole soil conductivity values ranged from

0.272 dS/m (BH-5A) to 0.510 dS/m (BH-4A). The on-site borehole percentage of clay ranged from 50% (BH-5A) to 62.5% (BH-4A). Detailed results are presented in Tables 2a and 2b of Attachment B.

6.3.1.2 Metals Parameters

A total of eleven soil samples, consisting of ten samples and one duplicate sample, were submitted to the laboratory from ten borehole locations for analyses of metals parameters.

As shown in Tables 3a and 3b – Attachment B, concentrations of all metals parameters in all submitted samples were found to be less than applicable CSR AL or IL standards, or Protocol 4 background concentration at all locations with the exception of

- **Boron:** BH-1A to BH-8A (9.6 to 14.3 mg/kg), which were greater than the applicable future end land use at the Facility, the AL standard of 2 mg/kg, and in BH-9A and BH-10A (7.2 and 6.7 mg/kg) which were greater than the applicable AL standard for the off-site lands.

There is no boron standard for IL land use, nor is there a BC MoE Protocol 4 background soil concentration for boron. Further discussion on boron is provided in Section 8.1.

6.3.1.3 VOCs Parameters

A total of eleven soil samples, consisting of ten samples and one duplicate sample were submitted to the laboratory from ten borehole locations for analyses of VOCs parameters. Concentrations of all VOCs parameters in all submitted samples were less than applicable CSR AL and IL land use standards and were also less than the MDLs. Detailed results are presented in Tables 4a and 4b of Attachment B**.**

6.3.1.4 Hydrocarbon and Total Phenols

A total of eleven soil samples, consisting of ten samples and one duplicate sample were submitted to the laboratory from ten borehole locations for analyses of the following hydrocarbon parameters, BTEX, VPH, LEPH, HEPH and PAH parameters. Concentrations of all hydrocarbon parameters in all submitted samples were less than applicable CSR AL and IL land use standards and were also less than the MDLs. Detailed results are presented in Tables 5a to 6b of Attachment B**.**

Total phenols (non-chlorinated) were also tested as a screening tool for presence/absence in all ten sample and were found to be less than the MDL of 0.1 µg/g, with exception of sample BH-9A which had a concentration of 0.11 µg/g. There is no Total Phenol parameter standard in the CSR, however there are individual phenolic compound standards for the various land uses. Further discussion is provided in Section 8.1.

6.3.2 PDMA

Six boreholes (BH-12 to BH-17) were advanced within the PDMA. No visual evidence of PHC contamination or elevated headspace vapour concentrations were observed in the field.

6.3.2.1 General Parameters

A total of six soil samples, and one duplicate sample, were submitted to the laboratory from six borehole locations for analyses of EOX and PCB parameters. Concentrations of EOX and PCB parameters of all submitted samples were less than the MDLs.

Four samples from four borehole locations were submitted for pH, conductivity, and particle size analysis. The on-site borehole soil pH values ranged from 5.74 (BH-16A) to 7.18 (BH-13A) and for off-site boreholes in the PDMA it was 5.21 (BH15-A) and 5.73 (BH14-A). The on-site soil conductivity values ranged from 0.15 dS/m (BH-16A) to 0.85 dS/m (BH-13A) and off-site a value of 0.17 (BH14-A) was measured. The percentage of clay ranged from 31.8% (BH-14A off-site) to 53.5% (BH-16A – on-site). Detailed results are presented in Tables 2a and 2b of Attachment B.

6.3.2.2 Metals Parameters

A total of six soil samples, and one duplicate sample, were submitted to the laboratory from six borehole locations for analyses of metals parameters.

As shown in Tables 3a and 3b, Attachment B, concentrations of all metals parameters in all submitted samples were less than applicable CSR AL and IL land use standards, and Protocol 4 background concentrations in metals with following exceptions:

- **Barium:** On-Site BH-16A (830 mg/kg); BH-17A (664 mg/kg) which were greater than the applicable CSR AL/IL standard for drinking water use of 400 mg/kg and the BC MoE Protocol 4 background barium concentration for the Omineca Peace Region of 600 mg/kg; and
- **Boron:** BH-12A, BH-13A, BH-16A and BH-17A (6.8 to 13.4 µg/g), which were greater than the applicable future end land use at the Facility, CSR AL standard of 2 mg/kg and in BH-15A (9.7/10.2 mg/kg), which was greater than the applicable AL standard for the off-site lands. There is no boron standard for IL land use, nor is there a BC MoE Protocol 4 background soil concentration for boron.

Further discussion on barium is provided in Section 8.2.

6.3.2.3 VOCs Parameters

A total of six soil samples, and one duplicate sample, were submitted to the laboratory from six borehole locations for analyses of VOCs parameters. Concentrations of all VOCs parameters outlined in Schedules 4 and 5 in all submitted samples were less than the applicable CSR AL and IL standards and were also less than the MDLs. Detail results are presented in Tables 4a and 4b of Attachment B**.**

6.3.2.4 Hydrocarbon, PAHs and Total Phenols

A total of six soil samples, and one duplicate sample, were submitted to the laboratory from six borehole locations for analyses of the following hydrocarbon parameters, BTEX, VPH, LEPH, HEPH, PAH. Concentrations of all hydrocarbon parameters in all submitted samples were less than applicable CSR AL and IL land use standards and all were also less than MDLs, with the exception of PAHs concentrations in BH-12A and BH-13A samples, which were all detectable, but less than applicable standards. Detail results are presented in Tables 5a to 6b, Attachment B**.**

Total phenols screening was also completed in all six sample and the concentrations were less than or equal to the MDL of 0.10 µg/g.

7. Quality Assurance and Quality Control

CH2M prepared and implemented QA/QC procedures throughout this investigation. This included field measures and a data quality review of the analytical results.

7.1 Field Measures

QA/QC field measures conducted by CH2M included the following:

- Donning a clean pair of nitrile gloves to collect each sample.
- Decontamination of field tools and sampling equipment, as required.
- Following appropriate CH2M standard operating procedures (SOPs) for sampling and decontamination activities.
- Collecting and analyzing appropriate field QA/QC samples as proposed in the work plan.
- Using proper sampling containers, storage methods, and shipping container.
- Maintaining and documenting chain-of-custody of all samples throughout collection, storage, and shipment to the receiving laboratory.

Measures were also taken in the field to avoid cross contamination between samples, field tools, external contamination, and contamination from the samples to external sources.

7.2 Data Quality Review

The data quality review conducted by CH2M included the following:

- Verifying the chain-of-custody forms had been properly completed and signed.
- Verifying all of the requested analyses were performed and reported for the correct samples.
- Reviewing the results for all field QC samples.
- Verifying the applicable holding times and extraction times have been met by the laboratory.

7.3 Analytical Reports

The review included the following samples and analytical reports.

Soil samples collected August 23-24, 2016 were analyzed BTEX, VPHs, LEPHs, HEPHs, PAHs, VOCs, PCBs, metals, Total Phenols, Extractable Organic Halides, pH, EC, and particle size analyses. The final results were reported by ALS Calgary on August 25, 2016 as work order L1819102. (Attachment D).

7.4 Field Duplicate

Field duplicates were collected and analyzed in all sets of soil samples at a frequency of 10% (one duplicate for every ten field samples).

The field duplicate sample results are evaluated by calculating a relative percent difference (RPD), a measure of the reproducibility and variability of the data. CH2M assessed the analytical data precision in the soil field duplicate samples by calculating an RPD using the following formula:

$$\text{RPD\%} = \frac{|S - D|}{\frac{1}{2}(S + D)} \times 100\%$$

Where:

RPD = relative percent difference
S = parent sample result
D = duplicate sample result

The closer the calculated RPD result is to 0%, the better the precision and the smaller the variability of the represented data set. Depending on the parameter analyzed, RPD values below 50% are typically considered acceptable for most parameters in soil, while 30% is typical for most parameters in water. If the calculated RPD is above the applicable control limit, further assessment may be required to establish the cause and determine whether the elevated variability has an effect on the reported results investigation (that is, change the classification of a sample from “uncontaminated” to “contaminated” based on the applicable standards, guidelines or criteria). However, all RPD values found above the applicable control limit are evaluated in relation to other factors. These factors include the sample matrix, the specific analytical parameter, and the relative concentration. Since analytical accuracy decreases near the detection limit, results reported within five times the laboratory reportable detection limit (RDL) are not typically used for RPD calculations. For the purpose of this report, when one of the reported results was not greater than five times the RDL, the RPD was not calculated.

The RPDs calculated for each parameter in each set of samples during this investigation were below the appropriate control limits.

7.5 Laboratory Quality Control Results

Laboratory QC sample results consisted of laboratory duplicates, method blanks, matrix spikes, laboratory control samples, and reference materials. All results fell within the laboratory's QC limits, or met the laboratory's QC acceptance criteria. It is noticed that some Laboratory Control Sample recovery and Reference Material recovery were below ALS DQO (Data Quality Objectives). In accordance with ALS, Reference Material (or Laboratory Control Samples) and/or Matrix Spike were acceptable under that situation.

These results indicate acceptable precision and accuracy with minimal variability. The laboratory analytical systems appear to be producing reliable results.

7.6 Holding Times

The holding times experienced by all samples met the recommended limits for all parameters except phenols.

Due to laboratory error in sample tracking, the sample holding times for the phenol parameter were exceeded before analyses. The holding times for phenols ranged from 15 to 17 days which were longer than the recommended holding time of 14 days. The ALS Technical Director of Canada indicated that as the samples were stored appropriately, a very marginal hold time exceedance of 1 or 2 days on a 14-day hold time would have a very marginal impact on the results. Even a hold time exceedance of more than 50% of the recommended hold time would be considered a "marginal" impact exceedance. Based on this statement, it is not expected the holding times have a significant impact on the results. A copy of the correspondence with ALS is provided in Attachment D.

7.7 Chain of Custody

The chain-of-custody submitted for each work order appeared to be properly completed.

Sample temperatures upon receipt at the laboratory, all of the appropriate signatures, and all other necessary information were included on each chain-of-custody provided in the completed work orders.

The sample temperatures upon receipt at the laboratory were below the QC limit (10°C) when applicable, for all sets of samples. It is noticed the ALS subcontracted out EOX tests to SRC. However, the sample temperatures upon receipt at SRC were at 16.2°C which is above QC limit (10°C). ALS confirmed that the temperature does not affect the EOX measurement.

8. Summary

8.1 SWDA

Ten boreholes (BH-1 to BH-10) were advanced at the SWDA between August 23 and 24, 2016 using a hand auger. The objective of the SWDA soil sampling investigation was to assess concentration and distribution of potential contamination in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the ephemeral stream.

Field observations and field screening as well as the subsequent laboratory analysis indicated shallow soil concentrations were less than applicable BC CSR AL and IL standards and the BC MoE Protocol 4 background concentrations (available for metals only) for all hydrocarbon parameters, VOCs, PAHs, and metals, with following exceptions for boron:

- **On-site:** BH-1A to BH-8A (greater than the future end land use standard)
- **Off-Site:** BH-9A to BH-10A (greater than AL standard).

As there is no BC MoE background concentration for boron, it is unknown if the boron concentrations observed are from anthropogenic sources or not. However, based on the following lines of evidence, it is determined that the measured boron concentrations are resulting from naturally occurring sources:

- Given the observation of elevated boron greater than applicable standards across the Facility in both the PDMA and SWDA areas, as well as in undisturbed areas at BH-9A, BH-10A, BH-14A and BH-15A locations.
- The absence of other primary contaminants of concern for the facility (hydrocarbons) within the samples.

EOX, PCB, and total Phenols are all less than the detection limits except at off-site BH-9A sample location where the total phenol concentration of 0.11 mg/kg was marginally greater than the MDL of 0.1 mg/kg. Given total phenols were not detected in samples collected within the Facility and only in one sample in a non-disturbed area and was marginally greater than the MDL, the environmental risk is low for this parameter and is not a concern. This is supported in the 2014 surface water monitoring report, where all chlorinated and non-chlorinated phenolic compound concentrations were less than the detection limits, with the exception of phenol which was detectable but less than the applicable standard (Attachment E).

8.2 PDMA

Six boreholes (BH-12 to BH-17) were advanced at the PDMA between August 23 and 24, 2016, using a hand auger. The objective of the PDMA soil sampling investigation is to assess concentration and distribution of potential contamination in surficial soils resulting from airborne particulate matter originating from site-related activities. Field observations and field screening, as well as the subsequent laboratory analysis, detected less than applicable BC CSR AL and IL land use standards for hydrocarbon parameters, VOCs, PAHs, and metals, and the BC MoE Protocol 4 background metals concentrations, with following exception:

- **Barium:** BH-16A; BH-17A (830 and 664 mg/kg, greater than MoE Protocol 4 background concentrations); and
- **Boron:** BH-12A to BH-17A (greater than the CSR AL standard).

BHs 16A and 17A are located adjacent to Cell 7 and the “common stockpile’, as shown on Figure 3. Based on the barium results at the Facility exceeding the MoE Protocol 4 background concentrations at two locations, additional investigation may be warranted to confirm the source of the barium, whether it is from naturally occurring barium concentrations or the materials stored at the Facility. It is recommended that Tervita review the applicability of the BC MoE Protocol 14 *Determining a Barite Site* given the main source of the materials accepted at the Facility come from the oil and gas industry activities, where barite is a common mud additive.

As noted in Section 8.1, the boron concentrations measured were due to natural background soil quality for the area.

EOX, total phenols and PCB concentrations were all less than or equal to detection limits.

9. Conclusions

9.1 SDWA

Based on the surficial soil investigation and sampling that was completed in the SDWA, there was no EOX, hydrocarbon, phenols or metals contamination in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the adjacent ephemeral stream.

9.2 PDMA

Based on the soil investigation and sampling that was completed in the PDMA, there was no evidence of EOX, hydrocarbon, phenols or metals contamination in surficial soils resulting from assess from airborne particulate matter originating from site-related activities, with the exception of barium.

Barium concentrations at two borehole sample locations along the southern Facility limit (BH-16A and BH-17A) were greater than BC MoE Protocol 4 background concentrations for the area. To confirm whether these barium concentrations are a result of potential barite presence within the soils handled at the Facility or due to natural elevated background concentrations in the native soils, additional surficial soil samples should be collected and analyzed using the methodology prescribed in BC MoE Protocol 14, *Requirements for Determining a Barite Site*, to demonstrate that the Facility can be considered a barite site and that the elevated barium concentrations are a result of the presence of barite in the soil.

The results presented in this report are reflective of the conditions at the time of the sample collection, and at the locations where the samples were collected. CH2M does not attest to the conditions at the Facility or emissions therefrom at any other time or location.

Use of this Report or any information contained herein, if by any party other than Tervita, shall be at the sole risk of such party and shall constitute a release and agreement by such party to defend and indemnify CH2M and its affiliates, officers, employees and subcontractors from and against any liability for direct, indirect, incidental, consequential or special loss or damage or other liability of any nature arising from its use of the Report or reliance upon any of its content. To the maximum extent permitted by law, such release from and indemnification against liability shall apply in contract, tort (including negligence), strict liability, or any other theory of liability.

10. References

BC Ministry of the Environment (BC MoE). 2010. Protocol 4 for Contaminated Sites – Determining Background Soil Quality.

BC Ministry of the Environment (BC MoE). 2008. Protocol 14 - Requirements for Determining a Barite Site.

BC Ministry of the Environment (BC MoE). 2016. Contaminated Sites Regulation (includes amendments up to B.C. Reg. 184/2016, July 19, 2016). http://www.bclaws.ca/Recon/document/ID/freeside/375_96_00

Government of Canada. 2016. 1981-2010 Canadian Climate Normals. Accessed September, 2016. http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?searchType=stnName&txtStationName=fort+st+john&searchMethod=contains&txtCentralLatMin=0&txtCentralLatSec=0&txtCentralLongMin=0&txtCentralLongSec=0&stnID=1413&dispBack=1

Greystone Environmental Consultants. 2002. Phase 1 and Phase 2 Environmental Site Assessment. Silverberry Land Treatment Facility. Fort Saint John, BC.

11. Closure

We trust that the information provided meets your current needs. If you have any questions regarding this summary letter, please contact Suzanne Byrne at 403.407.6519 or suzanne.byrne@ch2m.com.

Attachments: A – Figures
B – Tables
C – Borehole logs
D – Certificates of Analyses and Correspondence with ALS
E – 2014 Surface Water Monitoring Report

Copy: Nelson Liu, Tervita
Heather Conquergood, CH2M
Michelle Uyeda, CH2M
Raymond Li, CH2M

Attachment A
Figures

TERVITA
EARTH MATTERS

September2016

FIGURE 1

PROPOSED SURFACE WATER DRAINAGE AREA AND POTENTIAL DUST MIGRATION AREA

TERVITA SILVERBERRY LANDFILL SOIL STUDY

661198

- Resource Road
- Road
- Railway
- Watercourse
- Project Area
- Surface Water Drainage Area
- Potential Dust Migration Area

SCALE: 1:18,000

0 150 300 450
Metres

(All Locations Approximate)

ch2m

UTM Zone 10N
Roads: NRCan 2014; Railways: NRCan 2012; Hydrography: IHS Inc. 2004; Regional Districts: BC MFLNRO 2007; Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

Mapped By: CL | Checked By: MW

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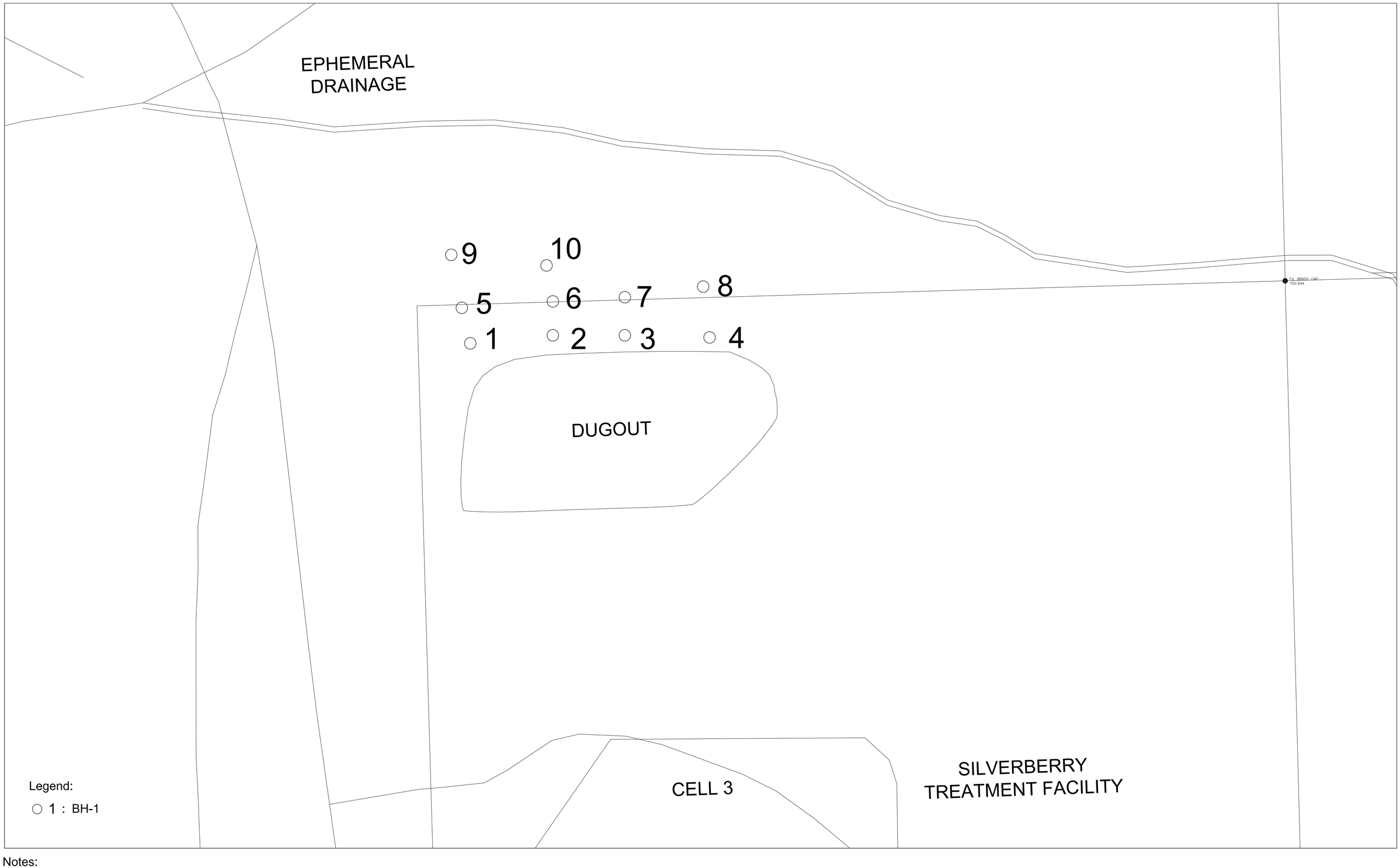

Notes:
CAD File Source: Tervita Corporation

Figure 2 Sampling Locations in Surface Water Draingae Area

SILVERBERRY
TREATMENT FACILITY

SUBSOIL
STOCKPILE

TOPSOIL
STOCKPILE

COMMON
STOCKPILE

12

13

14

ACCESS ROAD

TRD

STORMWATER
DETENTION POND

CELL 1

CELL 2

CELL 5

ACCESS ROAD

CELL 3

CELL 4

LEACHATE
POND

FRAC WATER
POND

BARBED WIRE
FENCE

CELL 6

TOPSOIL
STOCKPILE

SUBSOIL
STOCKPILE

CELL 7

COMMON
STOCKPILE

15

16

17

Legend:

○ 12 : BH-12

Notes:

CAD File Source: Tervita Corporation

Figure 3 Sampling Locations in Potential Dust Migration Area

ch2m

Attachment B
Tables

TABLE 1

Soil Sample Field Screen Results

Silverberry Landfill, Fort St. John, BC

Sample ID	Date	Sample Depth	Headspace Vapour Measurements[a]	
			Isobutylene	LEL
		(m)	(ppm)	(%)
BH-1-A	23-Aug-16	0.10-0.20	0	0
BH-1-B	23-Aug-16	0.20-0.33	1	0
BH-2-A	23-Aug-16	0.08-0.15	1	0
BH-2-B	23-Aug-16	0.15-0.31	1	0
BH-3-A	23-Aug-16	0.05-0.15	0	0
BH-3-B	23-Aug-16	0.15-0.30	0	0
BH-4-A	23-Aug-16	0.10-0.15	0	0
BH-4-B	23-Aug-16	0.15-0.30	0	0
BH-5-A	24-Aug-16	0.00-0.20	0	0
DUP-1	24-Aug-16	0.00-0.20	0	0
BH-5-B	24-Aug-16	0.20-0.37	1	0
BH-6-A	24-Aug-16	0.03-0.17	1	0
BH-6-B	24-Aug-16	0.17-0.33	2	0
BH-7-A	24-Aug-16	0.03-0.17	1	0
BH-7-B	24-Aug-16	0.17-0.30	2	0
BH-8-A	24-Aug-16	0.03-0.17	1	0
BH-8-B	24-Aug-16	0.17-0.31	1	0
BH-9-A	23-Aug-16	0.14-0.25	0	0
BH-9-B	23-Aug-16	0.25-0.40	0	0
BH-10-A	23-Aug-16	0.13-0.25	1	0
BH-10-B	23-Aug-16	0.25-0.40	0	0
BH-12-A	24-Aug-16	0.07-0.20	0	0
BH-13-A	24-Aug-16	0.08-0.20	0	0
BH-14-A	24-Aug-16	0.08-0.20	1	0
BH-15-A	24-Aug-16	0.05-0.20	1	0
DUP-2	24-Aug-16	0.05-0.20	1	0
BH-16-A	24-Aug-16	0.09-0.21	0	0
BH-17-A	24-Aug-16	0.07-0.22	1	0

Table 2a - On-Site Soil Samples Collected Between 0 mbgs to < .30 mbgs - General Parameters and PCBs

Sample ID	Sample Date	Sample Depth	pH	Conductivity (1:2)	Moisture	EOX (as Cl)	% Sand	% Silt	% Clay	Texture	Aroclor 1016	Aroclor 1221	Aroclor 1232	Aroclor 1242	Aroclor 1248	Aroclor 1254	Aroclor 1260	Aroclor 1262	Aroclor 1268	Decachlorobiphenyl	Total PCBs
		(m)	(pH Unit)	dS m^{-1}	%	(mg/L)	%	%	%		(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations																					
BH-1-A	23-Aug-16	0.10-0.20	6.92		23.7	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	78.3	<0.050
BH-2-A	23-Aug-16	0.08-0.15	6.42		19.8	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	84.3	<0.050
BH-3-A	23-Aug-16	0.05-0.15	6.94		17.1	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	83.5	<0.050
BH-4-A	23-Aug-16	0.10-0.15	6.50	0.51	16.8	<1	8.3	29.2	62.5	Clay	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	83.4	<0.050
BH-5-A	24-Aug-16	0.00-0.20	6.58	0.27	24.9	<1	9.7	40.3	50.0	Silty clay / Clay	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	94.7	<0.050
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	6.00		24.0	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	101.9	<0.050
RPD			9%		4%	nc					nc	nc	nc	nc	nc	nc	nc	nc	nc	7%	nc
BH-6-A	24-Aug-16	0.03-0.17	5.65		25.5	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	108.0	<0.050
BH-7-A	24-Aug-16	0.03-0.17	5.63		32.3	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	88.9	<0.050
BH-8-A	24-Aug-16	0.14-0.25	5.97		29.3	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	92.7	<0.050
PDMA Sampling Locations																					
BH-12-A	24-Aug-16	0.08-0.20	6.69		17.5	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	100.6	<0.050
BH-13-A	24-Aug-16	0.08-0.20	7.18	0.85	18.7	<1	24.7	31.2	44.1	Clay	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	98.9	<0.050
BH-16-A	24-Aug-16	0.09-0.21	5.74	0.15	22.5	<1	15.2	31.3	53.5	Clay	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	98.5	<0.050
BH-17-A	24-Aug-16	0.07-0.22	6.00	0.20	19.7	<1	20.2	38.0	41.8	Clay	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	102.8	<0.050
CSR AL Standard[1] - Future land use			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.5
CSR IL Standard[1] - Current land use			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	50

Table 2b - Off-Site Soil Samples Collected Between 0 mbgs to < .30 mbgs - General Parameters and PCBs

SWDA Sampling Locations																					
BH-9-A	23-Aug-16	0.13-0.25	5.14		24.5	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	99.5	<0.050
BH-10-A	23-Aug-16	0.07-0.20	4.75		28.8	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	94.9	<0.050
PDMA Sampling Locations																					
BH-14-A	24-Aug-16	0.05-0.20	5.73	0.17	14.6	<1	30.8	37.4	31.8	Clay loam	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	70.3	<0.050
BH-15-A	24-Aug-16	0.05-0.20	5.21		21.6	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	97.9	<0.050
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	5.50		23.2	<1					<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	103.5	<0.050
RPD			5%		7%	nc					nc	nc	nc	nc	nc	nc	nc	nc	nc	6%	nc
CSR AL Standard[1]			ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.5

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

* = laboratory analytical detection limit exceeds CSR standard

[a] = Laboratory analysis method consisted of Strong Acid Leachable Metals (SALM)

[b] = Laboratory analysis method consisted of Multiple Acid Digestion (MAD)

[c] = Laboratory duplicate relative percent difference above control limit (increased variability of results)

AL = Agricultural Land

CSR = Contaminated Sites Regulation

ID = identification

mg/kg = milligram per kilogram

nc = not calculated

ns = no standard specified

RPD = Relative Percent Difference

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 3a -Surficial Soil Samples Collected Between 0 mbgs to < .30 mbgs - Total Metals

On-Site

Sample ID	Sample Date	Sample Depth	pH	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Boron (B)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Tin (Sn)	Uranium (U)	Tungsten	Vanadium (V)	Zinc (Zn)
		(m)	(pH Unit)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)		(mg/kg)	(mg/kg)
SWDA Sampling Locations																							
BH-1-A	23-Aug-16	0.10-0.20	6.92	0.77	14.0	**444**	1.17	**11.7**	0.200	37.9	12.6	32	17.3	0.0523	2.21	40.5	1.64	0.23	<2.0	1.73		74.3	100
BH-2-A	23-Aug-16	0.08-0.15	6.42	0.70	11.8	397	1.03	**10.9**	0.150	37.7	10.2	28	15.5	0.0481	1.77	27.5	1.60	0.17	<2.0	1.53		76.5	83.0
BH-3-A	23-Aug-16	0.05-0.15	6.94	0.72	12.6	**455**	0.84	**14.3**	0.397	31.2	11.9	29.7	14.5	0.0570	2.18	38.0	1.05	0.24	<2.0	1.71		61.3	104
BH-4-A	23-Aug-16	0.10-0.15	6.50	0.78	13.6	**469**	1.09	**11.6**	0.183	38.1	12.0	32.3	16.9	0.0456	2.08	38.1	1.16	0.22	<2.0	1.85		75.6	96.9
BH-5-A	24-Aug-16	0.00-0.20	6.58	0.55	10.3	159	0.86	**9.6**	0.128	29.2	7.8	13.2	17.4	0.0241	1.77	17.4	0.58	0.12	<2.0	0.984		65.9	63.8
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	6.00	0.40	10.6	196	0.73	**9.8**	0.140	35.7	7.4	14.6	13.3	0.0299	1.39	19.8	0.58	0.11	<2.0	0.801		77.7	71.8
RPD			9%	32%	3%	21%	16%	2%	9%	20%	5%	10%	27%	21%	24%	13%	0%	9%	NC	21%		16%	12%
BH-6-A	24-Aug-16	0.03-0.17	5.65	0.55	12.6	227	1.03	**12.4**	0.123	43.2	7.7	25.9	16.4	0.0402	1.73	22.2	0.81	0.17	<2.0	1.24		89.6	77.1
BH-7-A	24-Aug-16	0.03-0.17	5.63	0.46	10.2	286	1.01	**11.3**	0.274	39.0	7.6	23.9	15.1	0.0372	1.43	27.6	0.84	0.22	<2.0	1.28		81.5	81.3
BH-8-A	24-Aug-16	0.14-0.25	5.97	0.62	11.7	351	1.04	**11.6**	0.212	36.2	10.9	27.0	16.2	0.0450	1.73	34.4	0.99	0.22	<2.0	1.55		73.8	86.9
PDMA Sampling Locations																							
BH-12-A	24-Aug-16	0.08-0.20	6.69	0.74	10.4	**472**	0.68	**12.8**	0.707	25.1	11.4	26.9	12.8	0.0595	1.70	35.7	1.02	0.25	<2.0	1.50		48.1	111
BH-13-A	24-Aug-16	0.08-0.20	7.18	0.78	11.1	**439**	0.72	**13.4**	0.444	25.7	10.4	26.3	13.1	0.0506	1.87	35.8	0.87	0.22	<2.0	1.29		47.6	107
BH-16-A	24-Aug-16	0.09-0.21	5.74	0.64	11.1	**830**	0.62	**6.8**	0.132	31.7	6.3	22.8	13.7	0.0489	1.69	20.2	0.82	0.10	<2.0	1.09		60.8	73.0
BH-17-A	24-Aug-16	0.07-0.22	6.00	0.80	10.2	**664**	0.60	**7.0**	0.295	28.4	6.8	23.4	13.1	0.0544	1.68	20.8	1.37	0.14	<2.0	1.18		61.4	92.1
Protocol 4 Regional Background Soil Quality			ns	4.0	15	600	2.0	ns	0.90	85	35	75	35	0.025	1.0	60	4.0	1.0	4.0	ns		200	150
CSR AL Standard[1] - Future land use			ns	20	15	400	4	2	pH<6.5 = 1.5 6.5≤pH<7.0 = 2 7.0≤pH<7.5 = 2.5 7.5≤pH<8.0 = 25 pH≥8.0 = 35	60	40	pH<5.0 = 90 5.0≤pH<5.5 = 100 pH≥5.5 = 150	pH<6.0 = 100 6.0≤pH<6.5 = 250 pH≥6.5 = 400	15	5	150	2	20	5	16		200	pH<6.0 = 150 6.0≤pH<6.5 = 300 pH≥6.5 = 450
CSR IL Standard[1] - Current land use			ns	40	15	400	8	ns	pH<6.5 = 1.5 6.5≤pH<7.0 = 2 7.0≤pH<7.5 = 2.5 7.5≤pH<8.0 = 25 pH≥8.0 = 150	60	300	pH<5.0 = 90 5.0≤pH<5.5 = 100 5.5≤pH<6.0 = 200 pH≥6.0 = 250	pH<6.0 = 100 6.0≤pH<6.5 = 250 pH≥6.5 = 2000	150	40	500	10	40	300	200		ns	pH<6.0 = 150 6.0≤pH<6.5 = 300 pH≥6.5 = 600

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

\- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

* = laboratory analytical detection limit exceeds CSR standard

[a] = Laboratory analysis method consisted of Strong Acid Leachable Metals (SALM)

[b] = Laboratory analysis method consisted of Multiple Acid Digestion (MAD)

[c] = Laboratory duplicate relative percent difference above control limit (increased variability of results)

AL = Agricultural Land

CSR = Contaminated Sites Regulation

ID = identification

m = metre

mg/kg = milligram per kilogram

nc = not calculated

ns = no standard specified

RPD = Relative Percent Difference

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 3b -Site Surficial Soil Samples Collected Between 0 to < .30 mbgs - Total Metals
Off-Site

Sample ID	Sample Date	Sample Depth	pH	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Boron (B)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Lead (Pb)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Vanadium (V)	Zinc (Zn)
		(m)	(pH Unit)	(mg/kg)	(mg/kg)	(mg/kg)	mg/kg	mg/kg	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations - Off-site																				
BH-9-A	23-Aug-16	0.13-0.25	5.14	0.33	11.1	246	1.32	**7.2**	0.563	35.7	12.5	25.8	17.3	0.0238	1.51	33.9	0.56	0.31	87.7	85.1
BH-10-A	23-Aug-16	0.07-0.20	4.75	0.31	9.5	210	0.86	**6.7**	0.431	32.9	9.6	22.0	16.5	0.0239	1.36	25.7	0.39	0.35	79.1	79.9
PDMA Sampling Locations - Off Site																				
BH-14-A	24-Aug-16	0.05-0.20	5.73	0.70	9.9	230	0.48	**<5.0**	0.327	18.1	8.1	15.7	11.2	0.0336	1.42	18.6	0.71	0.29	41.1	86.0
BH-15-A	24-Aug-16	0.05-0.20	5.21	0.71	12.7	347	0.91	**9.7**	0.108	37.5	8.6	27.0	15.8	0.0696	1.89	25.2	0.88	0.16	77.3	86.2
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	5.50	0.73	12.3	253	0.88	**10.2**	0.105	37.5	9.6	26.7	16.6	0.0601	1.90	24.7	0.82	0.14	77.4	85.1
RPD			5%	3%	3%	31%	3%	5%	3%	0%	11%	1%	5%	15%	1%	2%	7%	13%	0%	1%
Protocol 4 Regional Background Soil Quality			ns	4.0	15	600	2.0	ns	0.90	85	35	75	35	0.025	1.0	60	4.0	1.0	200	150
CSR AL Standard[1]			ns	20	15	400	4	2	pH<6.5 = 1.5 6.5≤pH<7.0 = 2 7.0≤pH<7.5 = 2.5 7.5≤pH<8.0 = 25 pH≥8.0 = 35	60	40	pH<5.0 = 90 5.0≤pH<5.5 = 100 pH≥5.5 = 150	pH<6.0 = 100 6.0≤pH<6.5 = 250 pH≥6.5 = 400	15	5	150	2	20	200	pH<6.0 = 150 6.0≤pH<6.5 = 300 pH≥6.5 = 450

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

\- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

* = laboratory analytical detection limit exceeds CSR standard

[a] = Laboratory analysis method consisted of Strong Acid Leachable Metals (SALM)

[b] = Laboratory analysis method consisted of Multiple Acid Digestion (MAD)

[c] = Laboratory duplicate relative percent difference above control limit (increased variability of results)

AL = Agricultural Land

CSR = Contaminated Sites Regulation

ID = identification

m = metre

mg/kg = milligram per kilogram

nc = not calculated

ns = no standard specified

RPD = Relative Percent Difference

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Table 4a -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
On-Site

Sample ID	Sample Date	Sample Depth	Acetone	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	n-Butylbenzene	sec-Butylbenzene	tert-Butylbenzene	Carbon tetrachloride	Chlorobenzene	Dibromochloromethane	Chloroethane	Chloroform	Chloromethane	2-Chlorotoluene	4-Chlorotoluene	1,2-Dibromo-3-chloropropane	1,2-Dibromoethane	Dibromomethane	1,2-Dichlorobenzene	1,3-Dichlorobenzene	1,4-Dichlorobenzene
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations																									
BH-1-A	23-Aug-16	0.10-0.20	1.4	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-2-A	23-Aug-16	0.08-0.15	1.8	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-3-A	23-Aug-16	0.05-0.15	1.3	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-4-A	23-Aug-16	0.10-0.15	1.5	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-5-A	24-Aug-16	0.00-0.20	<1.0	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	1.9	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
BH-6-A	24-Aug-16	0.03-0.17	1.4	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-7-A	24-Aug-16	0.03-0.17	1.3	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-8-A	24-Aug-16	0.14-0.25	1.8	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PDMA Sampling Locations																									
BH-12-A	24-Aug-16	0.08-0.20	1.5	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-13-A	24-Aug-16	0.08-0.20	1	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-16-A	24-Aug-16	0.09-0.21	<1.0	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-17-A	24-Aug-16	0.07-0.22	1.9	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
CSR AL Standard[1] - Future land use			14000	28	ns	8.2	620	3.9	ns	ns	ns	0.1	0.05	11	30	0.1	47	160	ns	4.6	0.32	67	0.1	0.1	0.1
CSR IL Standard1 - Current land use			54000	92	ns	18	2200	13.0	ns	ns	ns	50	10	26	65	50	160	560	ns	20	0.73	230	10	10	10

Table 4b -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
Off-Site

SWDA Sampling Locations																									
BH-9-A	23-Aug-16	0.13-0.25	<1.0	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	0.011	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-10-A	23-Aug-16	0.07-0.20	<1.0	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
PDMA Sampling Locations																									
BH-14-A	24-Aug-16	0.05-0.20	1.8	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
BH-15-A	24-Aug-16	0.05-0.20	1.9	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	1.9	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10	<0.010	<0.10	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
RPD			0	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
CSR AL Standard[1]			14000	28	ns	8.2	620	1.9	ns	ns	ns	ns	0.05	11	30	ns	47	160	ns	4.6	0.32	67	0.1	0.1	0.1

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

\- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

CSR = Contaminated Sites Regulation

ID = identification

m = metre

mg/kg = milligram per kilogram

NC = not calculated

ns = no standard specified

PAH = polycyclic aromatic hydrocarbons

PL = Urban Park Land

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 4a -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
On-Site

Sample ID	Sample Date	Sample Depth	Dichlorodifluoromethane	1,1-Dichloroethane	1,2-Dichloroethane	1,1-Dichloroethene	cis-1,2-Dichloroethene	trans-1,2-Dichloroethene	Methylene chloride	1,2-Dichloropropane	1,3-Dichloropropane	2,2-Dichloropropane	1,1-Dichloropropene	cis-1,3-Dichloropropene	trans-1,3-Dichloropropene	Hexachlorobutadiene	Isopropylbenzene	p-Isopropyltoluene	Methyl ethyl ketone	4-Methyl-2-pentanone (MIBK)	n-Propylbenzene	1,1,1,2-Tetrachloroethane	1,1,2,2-Tetrachloroethane	Tetrachloroethene	1,2,3-Trichlorobenzene
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations																									
BH-1-A	23-Aug-16	0.10-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-2-A	23-Aug-16	0.08-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-3-A	23-Aug-16	0.05-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-4-A	23-Aug-16	0.10-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-5-A	24-Aug-16	0.00-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
BH-6-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-7-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-8-A	24-Aug-16	0.14-0.25	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
PDMA Sampling Locations																									
BH-12-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-13-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-16-A	24-Aug-16	0.09-0.21	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-17-A	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
CSR AL Standard[1] - Future land use			94	0.1	0.1	0.1	0.1	0.1	0.1	0.1	100	ns	ns	0.1	0.1	ns	ns	ns	22000	5300	ns	32	4.1	ns	ns
CSR IL Standard1 - Current land use			310	50	50	50	50	50	50	50	360	ns	ns	50	50	ns	ns	ns	110000	47000	ns	73	9.3	ns	ns

Table 4b -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
Off-Site

SWDA Sampling Locations																									
BH-9-A	23-Aug-16	0.13-0.25	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-10-A	23-Aug-16	0.07-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
PDMA Sampling Locations																									
BH-14-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
BH-15-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<1.0	<0.10	<0.010	<0.010	<0.050	<0.010	<0.010
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
CSR AL Standard[1]			94	0.1	ns	ns	0.1	0.1	ns	0.1	100	ns	ns	0.1	0.1	ns	ns	ns	22000	5300	ns	32	4.1	ns	ns

Notes:

Results are expressed in mg/kg, unless otherwise ir

[1] Summary CSR Standard for most stringent site spec

\- = parameter not analyzed

< = parameter less than the laboratory analytical det

CSR = Contaminated Sites Regulation

ID = identification

m = metre

mg/kg = milligram per kilogram

NC = not calculated

ns = no standard specified

PAH = polycyclic aromatic hydrocarbons

PL = Urban Park Land

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 4a -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
On-Site

Sample ID	Sample Date	Sample Depth	1,2,4-Trichlorobenzene	1,1,1-Trichloroethane	1,1,2-Trichloroethane	Trichloroethene	Trichlorofluoromethane	1,2,3-Trichloropropane	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations										
BH-1-A	23-Aug-16	0.10-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-2-A	23-Aug-16	0.08-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-3-A	23-Aug-16	0.05-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-4-A	23-Aug-16	0.10-0.15	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-5-A	24-Aug-16	0.00-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
RPD			NC	NC	NC	NC	NC	NC	NC	NC
BH-6-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-7-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-8-A	24-Aug-16	0.14-0.25	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
PDMA Sampling Locations										
BH-12-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-13-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-16-A	24-Aug-16	0.09-0.21	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-17-A	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
CSR AL Standard[1] - Future land use			ns	0.1	0.1	ns	390	0.34	ns	ns
CSR IL Standard1 - Current land use			ns	50	50	ns	2000	0.76	ns	ns

Table 4b -Soil Samples Collected Between 0 to < .30 mbgs -VOCs
Off-Site

SWDA Sampling Locations										
BH-9-A	23-Aug-16	0.13-0.25	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-10-A	23-Aug-16	0.07-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
PDMA Sampling Locations										
BH-14-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
BH-15-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.010	<0.010	<0.020	<0.010	<0.010
RPD			NC	NC	NC	NC	NC	NC	NC	NC
CSR AL Standard[1]			ns	0.1	0.1	ns	390	0.34	ns	ns

Notes:

Results are expressed in mg/kg, unless otherwise ir

[1] Summary CSR Standard for most stringent site spec

\- = parameter not analyzed

< = parameter less than the laboratory analytical det

CSR = Contaminated Sites Regulation

ID = identification

m = metre

mg/kg = milligram per kilogram

NC = not calculated

ns = no standard specified

PAH = polycyclic aromatic hydrocarbons

PL = Urban Park Land

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 5a - On-SiteSoil Samples Collected Between 0 to < .30 mbgs -PHCs

Sample ID	Sample Date	Sample Depth	Benzene	Toluene	Ethylbenzene	Xylenes (Total)	Styrene	Methyl-tert-butylether (MTBE)	VPH (VH6 to 10 - BTEX)	LEPH (C10-C19 less PAH)	HEPH (C19-C32 less PAH)
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations											
BH-1-A	23-Aug-16	0.10-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-2-A	23-Aug-16	0.08-0.15	<0.010	0.012	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-3-A	23-Aug-16	0.05-0.15	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-4-A	23-Aug-16	0.10-0.15	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-5-A	24-Aug-16	0.00-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC
BH-6-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-7-A	24-Aug-16	0.03-0.17	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-8-A	24-Aug-16	0.14-0.25	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
PDMA Sampling Locations											
BH-12-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-13-A	24-Aug-16	0.08-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	450
BH-16-A	24-Aug-16	0.09-0.21	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-17-A	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
CSR AL Standard[1] - Future land use			0.04	1.5	1	0.1	ns	320	200	1000	1000
CSR IL Standard[1] - Current land use			0.04	2.5	7	20	ns	700	200	2000	5000

Table 5b - Off-Soil Samples Collected Between 0 to < .30 mbgs -PHCs

SWDA Sampling Locations											
BH-9-A	23-Aug-16	0.13-0.25	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
BH-10-A	23-Aug-16	0.07-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
PDMA Sampling Locations											
BH-14-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	200
BH-15-A	24-Aug-16	0.05-0.20	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	<0.010	<0.010	<0.010	<0.071	<0.010	<0.020	<10	<200	<200
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC
CSR AL Standard[1]			0.04	1.5	1	0.1	ns	320	200	1000	1000

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

\- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

ID = identification

m = metre

mg/kg = milligram per kilogram

NC = not calculated

ns = no standard specified

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Table 6a - On-Site Soil Samples Collected Between 0 mbgs to < .30 mbgs -PAHs and Phenols

Sample ID	Sample Date	Sample Depth	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b&j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	2-Methylnaphthalene	Naphthalene	Phenanthrene	Pyrene	Total Phenols
		(m)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
SWDA Sampling Locations																				
BH-1-A	23-Aug-16	0.10-0.20	<0.0050	<0.0050	<0.0040	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
BH-2-A	23-Aug-16	0.08-0.15	<0.0050	<0.0050	<0.0040	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
BH-3-A	23-Aug-16	0.05-0.15	<0.0050	<0.0050	<0.0040	<0.010	<0.010	0.026	0.028	<0.010	0.013	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
BH-4-A	23-Aug-16	0.10-0.15	<0.0050	<0.0050	<0.0040	<0.010	<0.010	0.028	0.035	<0.010	0.015	0.0055	<0.010	<0.010	0.011	<0.010	<0.010	<0.010	<0.010	<0.10
BH-5-A	24-Aug-16	0.00-0.20	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
DUP-5-A (duplicate of BH-5-A)	24-Aug-16	0.03-0.17	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
BH-6-A	24-Aug-16	0.03-0.17	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
BH-7-A	24-Aug-16	0.03-0.17	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.10
BH-8-A	24-Aug-16	0.14-0.25	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PDMA Sampling Locations																				
BH-12-A	24-Aug-16	0.08-0.20	<0.0050	<0.0050	<0.0040	<0.010	0.011	0.046	0.036	<0.010	0.032	0.0061	0.011	<0.010	0.012	<0.010	<0.010	0.011	0.014	<0.10
BH-13-A	24-Aug-16	0.08-0.20	<0.0050	<0.0050	<0.0040	<0.010	0.012	0.029	0.03	<0.010	0.039	0.0077	<0.010	<0.010	<0.010	0.051	0.015	0.029	0.02	<0.10
BH-16-A	24-Aug-16	0.09-0.21	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
BH-17-A	24-Aug-16	0.07-0.22	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
CSR AL Standard[1] - Future land use			ns	ns	ns	0.1	0.1	ns	ns	ns	ns	0.1	ns	ns	0.1	ns	0.1	0.1	0.1	ns
CSR IL Standard[1] - Current land use			ns	ns	ns	10	10	ns	ns	ns	ns	10	ns	ns	10	ns	50	50	100	ns

Table 6b - Off-Site Soil Samples Collected Between 0 mbgs to < .30 mbgs -PAHs and Phenols

SWDA Sampling Locations																				
BH-9-A	23-Aug-16	0.13-0.25	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.11
BH-10-A	23-Aug-16	0.07-0.20	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
PDMA Sampling Locations																				
BH-14-A	24-Aug-16	0.05-0.20	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.10
BH-15-A	24-Aug-16	0.05-0.20	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
DUP-15-A (duplicate of BH-15-A)	24-Aug-16	0.07-0.22	<0.0050	<0.0050	<0.0040	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.10
RPD			NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC
CSR AL Standard[1]			ns	ns	ns	0.1	0.1	ns	ns	ns	ns	0.1	ns	ns	0.1	ns	0.1	0.1	0.1	ns

Notes:

Results are expressed in mg/kg, unless otherwise indicated.

[1] Summary CSR Standard for most stringent site specific factor for which data has been compared to for the noted land use

\- = parameter not analyzed

< = parameter less than the laboratory analytical detection limit indicated

ID = identification

m = metre

mg/kg = milligram per kilogram

NC = not calculated

ns = no standard specified

Shaded = Exceeds Protocol 4 and CSR standards

BOLD = Exceeds CSR AL standard

Underline = Exceeds CSR IL standard

Attachment C
Borehole Logs

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-1
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 2:30PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278144
	Backfilled:	Total Depth of Boring: 0.33m	Easting: 612094

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	1A	☒		Clay: silty, firm, high plastic, blown, trace sand and gravel moist, no odor, no stain,	0.10-0.20	0	0
0.2	1B	☒		gravel size up to 25mm at 0.1m	0.20-0.33	1	0
0.3							
0.4							
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-2
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 2:00PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278147
	Backfilled:	Total Depth of Boring: 0.31m	Easting: 612133

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	2A	☒		Clay: silty, stiff, medium plastic, dark blown, trace fine to medium gravel, dry, no odor, no stain, rootlets	0.08-0.15	1	0
0.2	2B	☒			0.15-0.31	1	0
0.3							
0.4							
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-3
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 12:35PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278147
	Backfilled:	Total Depth of Boring: 0.30m	Easting: 612167

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	3A	☒		Clay: silty, very stiff, medium plastic, dark grey, trace fine to medium gravel, dry, no odor, fine rust stained sand partings, rootlets	0.05-0.15	0	0
0.2	3B	☒			0.15-0.30	0	0
0.3							
0.4							
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-4
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 09:50AM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278146
	Backfilled:	Total Depth of Boring: 0.30m	Easting: 612207

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	4A	☒		Clay: silty, very stiff, medium plastic, grey, dry, no odor, no stain, rootlets	0.10-0.15	0	0
0.2	4B	☒			0.15-0.30	0	0
0.3							
0.4							
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-5
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 10:20AM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278160
	Backfilled:	Total Depth of Boring: 0.37m	Easting: 612090

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	5A & Dup-1			Clay:			
				silty, firm, medium plastic, grey-brown,	0.00-0.20	0	0
				trace fine sand, moist, no odor, no stain, rootlets	0.00-0.20	0	0
0.2							
0.3	5B				0.20-0.37	1	0
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-6
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 11:30AM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278163
	Backfilled:	Total Depth of Boring: 0.33m	Easting: 612133

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.01				Top soil: silt and clay, dark brown, dry, loose			
0.1	6A			Clay:	0.03-0.17	1	0
				silty, firm, high plastic, grey-brown,			
0.2				moist, no odor, no stain, rootlets			
	6B				0.17-0.33	2	0
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-7
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 12:15PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278165
	Backfilled:	Total Depth of Boring: 0.33m	Easting: 612167

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.01				Top soil: silt and clay, dark brown, dry, loose			
0.1	7A			Clay: silty, stiff, low plastic, grey, some black organic matter, moist, no odor, no stain, rootlets	0.03-0.17	1	0
0.2	7B			very stiff	0.17-0.30	2	0
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-8
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 1:15PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278170
	Backfilled:	Total Depth of Boring: 0.30m	Easting: 612204

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.01				Top soil: silt and clay, dark brown, dry, loose			
0.1	8A			Clay: silty, stiff, medium plastic, dark grey, some black organic matter, moist, no odor, rootlets	0.01-0.17	1	0
0.2	8B			red stain at 0.3m	0.17-0.30	1	0
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-9
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 6:00PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278170
	Backfilled:	Total Depth of Boring: 0.40m	Easting: 612204

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1				Top soil: silt and clay, dark brown, dry, loose			
0.14				Silt:			
0.2	9A			clayey, firm, low plastic, brown, with some top soil, moist, no odor, no stain, rootlets	0.14-0.25	0	0
0.3	9B			Clay: silty, soft, high plastic, grey, moist, no stain, no odor, rootlets	0.25-0.40	0	0
0.4							
0.5							
1.0							

Note:

Grap Sample

Shelby Tube

Stabllized Ground water

Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-10
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 6:45PM	Drilling Method: Hand auger	Elevation:
Date: 23-Aug-16	Completed:	Groundwater Depth:	Northing: 6278180
	Backfilled:	Total Depth of Boring: 0.40m	Easting: 612130

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1				Top soil: silt and clay, brown, dry, loose			
0.13				Silt:			
0.2	10A			clayey, firm, low plastic, brown, with some top soil, dry, no odor, no stain, rootlets	0.13-0.25	1	0
0.3	10B			Clay: silty, soft, high plastic, moist, no stain, no odor, rootlets	0.25-0.40	0	0
0.4							
0.5							
1.0							

Note:

Grap Sample

Shelby Tube

Stabllized Ground water

Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-12
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 3:15PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6277166
	Backfilled:	Total Depth of Boring: 0.20m	Easting: 612549

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	12A			Clay: silty, soft, high plastic, grey, trace fine gravel, moist, no odor, no stain	0.07-0.20	0	0
0.2							
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-13
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 2:45PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6277183
	Backfilled:	Total Depth of Boring: 0.20m	Easting: 613310

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.01				Top soil: silt and clay, dark brown, dry, loose			
0.1	13A			Clay: silty, stiff, low plastic,dark brown, trace fine gravel, moist, no odor, no stain, rootlets,	0.08-0.20	0	0
0.2				black organic spots at 0.2m			
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-14
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 6:45PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6277184
	Backfilled:	Total Depth of Boring: 0.20m	Easting: 614218

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.1	14A			Silt: with clay and fine sand, stiff, low plastic, brown, trace fine gravel, dry, no odor, no stain, rootlets	0.08-0.20	1	0
0.2							
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-15
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 4:30PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6276599
	Backfilled:	Total Depth of Boring: 0.20m	Easting: 611590

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.02	15A & Dup 2			Top soil: silt and clay, brown, dry, loose Clay: silty, firm, medium plastic, grey, trace gravel, moist, no odor, no stain, rootlets, gravel size up to 12mm	0.05-0.20	0	0
0.1							
0.2							
0.3							
0.4							
0.5							
1.0							

Note:

- Grap Sample
- Shelby Tube
- Stabllized Ground water
- Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-16
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 5:30PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6276559
	Backfilled:	Total Depth of Boring: 0.21m	Easting: 612578

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.01	16A	☒	▨	Top soil: silt & clay, brown, moist, loose, some gravel	0.09-0.21	0	0
0.1				Clay:			
0.2				silty, stiff, medium plastic, brown, trace gravel,			
0.3				moist, no odor, no stain, rootlets			
0.4				gravel size up to 10mm			
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Project: Silverberry landfill soil study	Project Number: 661198	Client: Tervita	Boring No. BH-17
Project location Silverberry landfill FSJ		Drilling Contractor: CH2M	Drill Rig Type: Dutch auger
Logged By: Raymond Li	Time: Started: 5:30PM	Drilling Method: Hand auger	Elevation:
Date: 24-Aug-16	Completed:	Groundwater Depth:	Northing: 6276578
	Backfilled:	Total Depth of Boring: 0.22m	Easting: 612331

Depth (m)	Sample Number	Sample Type	Graphic Log	Soil Description Soil Group Name: modifier, consistency, plasticity, color, moisture, odor, stain, other descriptors	Sample Depth (mbgl)	Isobutylene (ppm)	LEL (%)
0.02	17A	☒	▨	Top soil: silt & clay, brown, moist, loose, some gravel	0.07-0.22	1	0
0.1				Clay:			
0.2				silty, stiff, medium plastic, grey, trace fine gravel,			
0.3				moist, no odor, fine rust stained sand partings,			
0.4				rootlets			
0.5							
1.0							

Note:

☒ Grap Sample

▥ Shelby Tube

▼ Stabllized Ground water

▽ Groundwater At time of Drilling

Attachment D
Certificates of Analyses

ALS ENVIRONMENTAL ANALYTICAL REPORT

CH2M HILL Canada Ltd.
ATTN: Raymond Li / Suzanne Byrne
540 - 12 Avenue SW
Calgary AB T2R 0H4

Date Received: 25- AUG- 16
Report Date: 21- SEP- 16 16:13 (MT)
Version: FINAL

Client Phone: 403- 407- 6199

Certificate of Analysis

Lab Work Order #: L1819102
Project P.O. #: PO# 10201- 7- 101217
Job Reference: 661198 TASK: 661198.A1.15
C of C Numbers:
Legal Site Desc:

Other Information: INV COMMENTS: Task Order # 10201- 7- 101217, MSA # 10201- 7- 100309

Nelson Kwan, B.Sc.
Account Manager

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-1 BH-1-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:30							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0523	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.77		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	14.0		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	444		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.17		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	11.7		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.200		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	37.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	12.6		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	32.4		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	17.3		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	2.21		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	40.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.64		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.23		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.285		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	25.5		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.73		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	74.3		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	100		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.92		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-1 BH-1-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:30							
Matrix: SOIL							
PAHs - BC CSR Regs							
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.011		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	85.7		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	89.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	90.8		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	23.7		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

661198 TASK: 661198.A1.15

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-1 BH-1-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	78.5		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	82.4		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	95.9		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.4		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	80.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	78.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	74.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-1 BH-1-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:30							
Matrix: SOIL							
PCBs							
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	78.3		65-130	%		07-SEP-16	R3543923
L1819102-3 BH-2-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:00							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0481	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.70		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	11.8		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	397		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.03		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	10.9		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.150		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	37.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	10.2		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	27.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	15.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.77		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	27.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.60		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.17		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.267		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	23.4		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.53		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	76.5		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	83.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.42		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-3 BH-2-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:00							
Matrix: SOIL							
LEPHs and HEPHs							
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.012		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	81.7		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	81.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.3		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	19.8		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-3 BH-2-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:00							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	0.012		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	85.2		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	83.5		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	90.8		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.8		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	78.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	73.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	74.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-3 BH-2-A							
Sampled By: RL/ZP on 23-AUG-16 @ 14:00							
Matrix: SOIL							
PCBs							
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	84.3		65-130	%		07-SEP-16	R3543923
L1819102-5 BH-3-A							
Sampled By: RL/ZP on 23-AUG-16 @ 12:35							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0570	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.72		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	12.6		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	455		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.84		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	14.3		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.397		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	31.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	11.9		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	29.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	14.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	2.18		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	38.0		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.05		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.24		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.289		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	31.3		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.71		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	61.3		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	104		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.94		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-5 BH-3-A							
Sampled By: RL/ZP on 23-AUG-16 @ 12:35							
Matrix: SOIL							
EPH (C10-C19) & EPH (C19-C32)							
Surrogate: 2-Bromobenzotrifluoride	96.9		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	96.9		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.026		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	0.028		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	0.013		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	79.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	83.8		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	82.3		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	17.1		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-5 BH-3-A							
Sampled By: RL/ZP on 23-AUG-16 @ 12:35							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	79.6		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	81.1		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	82.5		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.3		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	75.0		50-150	%		16-SEP-16	R3552101

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-5 BH-3-A							
Sampled By: RL/ZP on 23-AUG-16 @ 12:35							
Matrix: SOIL							
EPA Volatile Organics							
Surrogate: 4-Bromofluorobenzene (SS)	74.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	73.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	83.5		65-130	%		07-SEP-16	R3543923
L1819102-7 BH-4-A							
Sampled By: RL/ZP on 23-AUG-16 @ 09:50							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0456	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.78		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	13.6		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Barium (Ba)	469		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.09		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	11.6		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.183		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	38.1		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	12.0		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	32.3		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	16.9		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	2.08		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	38.1		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.16		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.22		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.282		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	25.8		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.85		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	75.6		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	96.9		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.50		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-7 BH-4-A							
Sampled By: RL/ZP on 23-AUG-16 @ 09:50							
Matrix: SOIL							
BTEX and VPHs							
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	99.6		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	99.6		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.028		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	0.035		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	0.015		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	0.0055		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	0.011		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	83.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	85.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.9		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	16.8		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	8.3		1.0	%		18-SEP-16	R3550858
% Silt	29.2		1.0	%		18-SEP-16	R3550858
% Clay	62.5		1.0	%		18-SEP-16	R3550858
Texture	Clay					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-7 BH-4-A							
Sampled By: RL/ZP on 23-AUG-16 @ 09:50							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-7 BH-4-A							
Sampled By: RL/ZP on 23-AUG-16 @ 09:50							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	79.7		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	82.3		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	107.2		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.5		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	83.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	76.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	79.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	83.4		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							
Conductivity (1:2)	0.510		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	6.58		0.10	pH		17-SEP-16	R3550550
L1819102-9 BH-5-A							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0241	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.55		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	10.3		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Barium (Ba)	159		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.86		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	9.6		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.128		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	29.2		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	7.77		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	13.2		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	17.4		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.77		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	17.4		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-9 BH-5-A							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
Metals in Soil by CRC ICPMS							
Selenium (Se)	0.58		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.12		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.263		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	28.3		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Uranium (U)	0.984		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	65.9		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	63.8		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.83		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.7		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.7		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	76.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	83.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	82.9		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	24.9		0.25	%		03-SEP-16	R3540868

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-9 BH-5-A							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	9.7		1.0	%		18-SEP-16	R3550858
% Silt	40.3		1.0	%		18-SEP-16	R3550858
% Clay	50.0		1.0	%		18-SEP-16	R3550858
Texture	Silty clay / Clay					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-9 BH-5-A							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	81.7		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	74.2		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	109.9		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	77.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	70.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	73.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	94.7		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							
Conductivity (1:2)	0.272		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	6.00		0.10	pH		17-SEP-16	R3550550
L1819102-11 BH-6-A							
Sampled By: RL/ZP on 24-AUG-16 @ 11:30							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0402	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-11 BH-6-A							
Sampled By: RL/ZP on 24-AUG-16 @ 11:30							
Matrix: SOIL							
below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.55		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	12.6		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	227		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.03		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	12.4		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.123		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	43.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	7.68		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	25.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	16.4		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.73		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	22.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.81		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.17		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.303		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	26.5		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.24		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	89.6		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	77.1		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.65		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	102.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	102.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-11 BH-6-A							
Sampled By: RL/ZP on 24-AUG-16 @ 11:30							
Matrix: SOIL							
PAHs - BC CSR Regs							
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	86.3		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	78.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.6		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	25.5		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-11 BH-6-A							
Sampled By: RL/ZP on 24-AUG-16 @ 11:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	88.6		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	85.1		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	102.3		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.4		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	81.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	74.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	77.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	108.0		65-130	%		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-13 BH-7-A							
Sampled By: RL/ZP on 24-AUG-16 @ 12:15							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0372	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.46		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	10.2		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	286		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.01		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	11.3		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.274		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	39.0		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	7.58		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	23.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	15.1		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.43		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	27.6		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.84		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.22		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.283		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	21.9		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.28		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	81.5		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	81.3		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.63		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-13 BH-7-A							
Sampled By: RL/ZP on 24-AUG-16 @ 12:15							
Matrix: SOIL							
PAHs - BC CSR Regs							
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	83.5		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	78.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	82.1		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	32.3		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	0.10	PEHT	0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-13 BH-7-A							
Sampled By: RL/ZP on 24-AUG-16 @ 12:15							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	85.6		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	82.9		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	109.5		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.3		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	75.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	77.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	70.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-13 BH-7-A							
Sampled By: RL/ZP on 24-AUG-16 @ 12:15							
Matrix: SOIL							
PCBs							
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	88.9		65-130	%		07-SEP-16	R3543923
L1819102-15 BH-8-A							
Sampled By: RL/ZP on 24-AUG-16 @ 13:15							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0450	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.62		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	11.7		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	351		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.04		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	11.6		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.212		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	36.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	10.9		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	27.0		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	16.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.73		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	34.4		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.99		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.22		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.278		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	23.6		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.55		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	73.8		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	86.9		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.97		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	97.8		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	97.8		70-130	%	03-SEP-16	07-SEP-16	R3543925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-15 BH-8-A							
Sampled By: RL/ZP on 24-AUG-16 @ 13:15							
Matrix: SOIL							
LEPHs and HEPHs							
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	77.2		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	71.3		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	75.3		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	29.3		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-15 BH-8-A							
Sampled By: RL/ZP on 24-AUG-16 @ 13:15							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	85.9		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	84.4		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	97.4		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.8		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	80.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	72.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	74.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-15 BH-8-A							
Sampled By: RL/ZP on 24-AUG-16 @ 13:15							
Matrix: SOIL							
PCBs							
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	92.7		65-130	%		07-SEP-16	R3543923
L1819102-17 BH-9-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:00							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0238	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.33		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	11.1		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	246		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	1.32		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	7.2		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.563		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	35.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	12.5		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	25.8		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	17.3		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.51		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	33.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.56		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.31		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.233		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	19.1		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.20		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	87.7		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	85.1		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.14		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-17 BH-9-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:00							
Matrix: SOIL							
EPH (C10-C19) & EPH (C19-C32)							
Surrogate: 2-Bromobenzotrifluoride	99.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	99.5		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	88.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	87.8		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	90.2		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	24.5		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	0.11	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	0.011		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-17 BH-9-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:00							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	85.8		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	83.4		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	100.7		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	75.0		50-150	%		16-SEP-16	R3552101

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-17 BH-9-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:00							
Matrix: SOIL							
EPA Volatile Organics							
Surrogate: 4-Bromofluorobenzene (SS)	71.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	71.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	99.5		65-130	%		07-SEP-16	R3543923
L1819102-19 BH-10-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:45							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0239	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.31		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	9.45		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	210		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.86		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	6.7		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.431		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	32.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	9.61		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	22.0		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	16.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.36		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	25.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.39		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.35		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.233		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	15.3		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	0.996		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	79.1		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	79.9		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	4.75		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-19 BH-10-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:45							
Matrix: SOIL							
BTEX and VPHs							
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.0		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.0		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	80.7		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	81.7		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.3		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	28.8		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	23-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-19 BH-10-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:45							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,1-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	23-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	77.9		70-130	%	23-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	73.5		70-130	%	23-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-19 BH-10-A							
Sampled By: RL/ZP on 23-AUG-16 @ 18:45							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Surrogate: 3,4-Dichlorotoluene	94.2		70-130	%	23-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	82.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	74.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	75.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	94.9		65-130	%		07-SEP-16	R3543923
L1819102-21 BH-12-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:15							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0595	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.74		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	10.4		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	472		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.68		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	12.8		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.707		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	25.1		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	11.4		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	26.9		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	12.8		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.70		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	35.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.02		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.25		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.271		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	39.5		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.50		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	48.1		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	111		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.69		0.10	pH		16-SEP-16	R3549856

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-21 BH-12-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:15							
Matrix: SOIL							
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.8		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.8		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	0.011		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.046		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	0.036		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	0.032		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	0.0061		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	0.011		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	0.012		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	0.011		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	0.014		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	81.4		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	85.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.4		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	17.5		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-21 BH-12-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:15							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-21 BH-12-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:15							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	86.6		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	83.7		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	101.8		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.5		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	82.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	73.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	78.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	100.6		65-130	%		07-SEP-16	R3543923
L1819102-22 BH-13-A							
Sampled By: RL/ZP on 24-AUG-16 @ 14:45							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0506	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.78		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	11.1		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Barium (Ba)	439		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.72		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	13.4		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.444		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	25.7		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	10.4		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	26.3		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	13.1		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.87		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	35.8		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.87		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.22		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.223		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	30.3		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-22 BH-13-A							
Sampled By: RL/ZP on 24-AUG-16 @ 14:45							
Matrix: SOIL							
Metals in Soil by CRC ICPMS							
Uranium (U)	1.29		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	47.6		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	107		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	6.77		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	450		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	97.4		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	97.4		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	450		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	0.012		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	0.029		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	0.030		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	0.039		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	0.0077		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	0.051		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	0.015		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	0.029		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	0.020		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	77.8		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	97.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	94.8		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	18.7		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-22 BH-13-A							
Sampled By: RL/ZP on 24-AUG-16 @ 14:45							
Matrix: SOIL							
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	24.7		1.0	%		18-SEP-16	R3550858
% Silt	31.2		1.0	%		18-SEP-16	R3550858
% Clay	44.1		1.0	%		18-SEP-16	R3550858
Texture	Clay					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-22 BH-13-A							
Sampled By: RL/ZP on 24-AUG-16 @ 14:45							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	76.9		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	76.9		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	78.8		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.0		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	80.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	71.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	75.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	98.9		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							
Conductivity (1:2)	0.852		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	7.18		0.10	pH		17-SEP-16	R3550550
L1819102-23 BH-14-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:45							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0336	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.70		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	9.94		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-23 BH-14-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:45							
Matrix: SOIL							
Metals in Soil by CRC ICPMS							
Barium (Ba)	230		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.48		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	<5.0		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.327		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	18.1		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	8.10		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	15.7		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	11.2		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.42		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	18.6		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.71		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.29		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.153		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	23.4		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Uranium (U)	0.723		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	41.1		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	86.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.21		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	97.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	97.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-23 BH-14-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:45							
Matrix: SOIL							
PAHs - BC CSR Regs							
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	85.0		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	94.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	94.7		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	14.6		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	30.8		1.0	%		18-SEP-16	R3550858
% Silt	37.4		1.0	%		18-SEP-16	R3550858
% Clay	31.8		1.0	%		18-SEP-16	R3550858
Texture	Clay loam					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-23 BH-14-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:45							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	84.4		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	81.0		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	102.2		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.8		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	83.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	73.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	76.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	70.3		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-23 BH-14-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:45							
Matrix: SOIL							
Conductivity (1:2)							
Conductivity (1:2)	0.167		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	5.73		0.10	pH		17-SEP-16	R3550550
L1819102-24 BH-15-A							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0696	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.71		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	12.7		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	347		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.91		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	9.7		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.108		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	37.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	8.56		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	27.0		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	15.8		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.89		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	25.2		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.88		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.16		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.284		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	22.3		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.04		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	77.3		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	86.2		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.72		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	97.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	97.3		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-24 BH-15-A							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	78.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	90.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.7		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	21.6		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-24 BH-15-A							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	76.6		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	78.0		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	86.8		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.9		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	81.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	73.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	79.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-24 BH-15-A							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
PCBs							
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	97.9		65-130	%		07-SEP-16	R3543923
L1819102-25 BH-16-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:30							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0489	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.64		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	11.1		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Barium (Ba)	830		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.62		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	6.8		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.132		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	31.7		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	6.34		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	22.8		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	13.7		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.69		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	20.2		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.82		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.10		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.256		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	22.1		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.09		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	60.8		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	73.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.28		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-25 BH-16-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:30							
Matrix: SOIL							
EPH (C10-C19) & EPH (C19-C32)							
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	96.8		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	96.8		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	98.4		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	78.6		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	79.5		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	22.5		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	03-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	15.2		1.0	%		18-SEP-16	R3550858
% Silt	31.3		1.0	%		18-SEP-16	R3550858
% Clay	53.5		1.0	%		18-SEP-16	R3550858
Texture	Clay					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-25 BH-16-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	09-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	77.8		70-130	%	24-AUG-16	09-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	79.6		70-130	%	24-AUG-16	09-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-25 BH-16-A							
Sampled By: RL/ZP on 24-AUG-16 @ 15:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
Surrogate: 3,4-Dichlorotoluene	95.5		70-130	%	24-AUG-16	09-SEP-16	R3549742
EPA Volatile Organics							
Acetone	<1.0		1.0	mg/kg		19-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		19-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		19-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	79.0		50-150	%		19-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	74.0		70-130	%		19-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	80.0		50-150	%		19-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	98.5		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							
Conductivity (1:2)	0.153		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	5.74		0.10	pH		17-SEP-16	R3550550
L1819102-26 BH-17-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:15							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0544	RRR	0.0050	mg/kg	14-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.80		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Arsenic (As)	10.2		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Barium (Ba)	664		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.60		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Boron (B)	7.0		5.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.295		0.020	mg/kg	14-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	28.4		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	6.78		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Copper (Cu)	23.4		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Lead (Pb)	13.1		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.68		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	20.8		0.50	mg/kg	14-SEP-16	15-SEP-16	R3548992
Selenium (Se)	1.37		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.14		0.10	mg/kg	14-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.226		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	19.1		1.0	mg/kg	14-SEP-16	15-SEP-16	R3548992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-26 BH-17-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:15							
Matrix: SOIL							
Metals in Soil by CRC ICPMS							
Uranium (U)	1.18		0.050	mg/kg	14-SEP-16	15-SEP-16	R3548992
Vanadium (V)	61.4		0.20	mg/kg	14-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	92.1		2.0	mg/kg	14-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.38		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	95.9		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	95.9		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	84.1		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	77.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	80.8		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	19.7		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	04-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-26 BH-17-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:15							
Matrix: SOIL							
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
Particle Size							
% Sand	20.2		1.0	%		18-SEP-16	R3550858
% Silt	38.0		1.0	%		18-SEP-16	R3550858
% Clay	41.8		1.0	%		18-SEP-16	R3550858
Texture	Clay					18-SEP-16	R3550858
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-26 BH-17-A							
Sampled By: RL/ZP on 24-AUG-16 @ 18:15							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	87.2		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	75.5		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	107.7		70-130	%	24-AUG-16	10-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.9		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	77.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	72.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	75.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	102.8		65-130	%		07-SEP-16	R3543923
pH and EC (1:2 soil:water)							
Conductivity (1:2)							
Conductivity (1:2)	0.204		0.010	dS m-1		17-SEP-16	R3550550
pH in soil (1:2 Soil:Water Extraction)							
pH (1:2 soil:water)	6.00		0.10	pH		17-SEP-16	R3550550
L1819102-27 DUP-1							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0299	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.40		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	10.6		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-27 DUP-1							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
Metals in Soil by CRC ICPMS							
Barium (Ba)	196		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.73		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	9.8		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.140		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	35.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	7.40		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	14.6		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	13.3		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.39		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	19.8		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.58		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.11		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.259		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	28.6		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	0.801		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	77.7		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	71.8		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.60		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	98.0		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	98.0		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-27 DUP-1							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
PAHs - BC CSR Regs							
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	84.9		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	78.4		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	83.5		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	24.0		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	04-SEP-16	R3540945
Phenols (4AAP)	<0.10	PEHT	0.10	mg/kg	13-SEP-16	14-SEP-16	R3548399
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-27 DUP-1							
Sampled By: RL/ZP on 24-AUG-16 @ 10:20							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	78.8		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	75.8		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	100.3		70-130	%	24-AUG-16	10-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.9		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	83.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	72.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	76.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	101.9		65-130	%		07-SEP-16	R3543923
L1819102-28 DUP-2							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
BC Contaminated Sites Regulations Metals							
Mercury in Soil by CVAAS							
Mercury (Hg)	0.0601	RRR	0.0050	mg/kg	13-SEP-16	14-SEP-16	R3548859

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-28 DUP-2							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
Note: Reference material recovered slightly below ALS DQO, see QC report. Sample results may be biased low.							
Metals in Soil by CRC ICPMS							
Antimony (Sb)	0.73		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Arsenic (As)	12.3		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Barium (Ba)	253		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Beryllium (Be)	0.88		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Boron (B)	10.2		5.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cadmium (Cd)	0.105		0.020	mg/kg	13-SEP-16	15-SEP-16	R3548992
Chromium (Cr)	37.5		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Cobalt (Co)	9.55		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Copper (Cu)	26.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Lead (Pb)	16.6		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Molybdenum (Mo)	1.90		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Nickel (Ni)	24.7		0.50	mg/kg	13-SEP-16	15-SEP-16	R3548992
Selenium (Se)	0.82		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Silver (Ag)	0.14		0.10	mg/kg	13-SEP-16	15-SEP-16	R3548992
Thallium (Tl)	0.289		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Tin (Sn)	<2.0		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Titanium (Ti)	22.9		1.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
Uranium (U)	1.02		0.050	mg/kg	13-SEP-16	15-SEP-16	R3548992
Vanadium (V)	77.4		0.20	mg/kg	13-SEP-16	15-SEP-16	R3548992
Zinc (Zn)	85.1		2.0	mg/kg	13-SEP-16	15-SEP-16	R3548992
pH (1:2 Soil:Water Extraction)							
pH	5.55		0.10	pH		16-SEP-16	R3549856
BTEX, VPH, LEPH & HEPH; PAH corrected							
BTEX and VPHs							
Benzene	<0.040		0.040	mg/kg	03-SEP-16	04-SEP-16	R3540945
Toluene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Ethylbenzene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
o-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
m+p-Xylene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Styrene	<0.050		0.050	mg/kg	03-SEP-16	04-SEP-16	R3540945
Volatile Hydrocarbons (VH6-10)	<10		10	mg/kg	03-SEP-16	04-SEP-16	R3540945
EPH (C10-C19) & EPH (C19-C32)							
EPH10-19	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
EPH19-32	<200		200	mg/kg	03-SEP-16	07-SEP-16	R3543925
Surrogate: 2-Bromobenzotrifluoride	99.6		70-130	%	03-SEP-16	07-SEP-16	R3543925
LEPHs and HEPHs							
LEPH	<200		200	mg/kg		09-SEP-16	
HEPH	<200		200	mg/kg		09-SEP-16	
LEPHs and HEPHs							
Surrogate: 2-Bromobenzotrifluoride	99.6		70-130	%	03-SEP-16	07-SEP-16	R3543925
Prep/Analysis Dates					03-SEP-16	07-SEP-16	R3543925
PAHs - BC CSR Regs							
Acenaphthene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Acenaphthylene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Anthracene	<0.0040		0.0040	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benz(a)anthracene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(a)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(b&j)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Benzo(g,h,i)perylene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-28 DUP-2							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
PAHs - BC CSR Regs							
Benzo(k)fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Chrysene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Dibenz(a,h)anthracene	<0.0050		0.0050	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluoranthene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Fluorene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Indeno(1,2,3-c,d)pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
2-Methylnaphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Naphthalene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Phenanthrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Pyrene	<0.010		0.010	mg/kg	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Acenaphthene	99.2		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d12-Chrysene	70.3		60-140	%	03-SEP-16	06-SEP-16	R3544283
Surrogate: d10-Phenanthrene	77.1		60-130	%	03-SEP-16	06-SEP-16	R3544283
Miscellaneous Parameters							
Moisture	23.2		0.25	%		03-SEP-16	R3540868
EOX (as Cl)	See Attached		0.030	mg/L		21-SEP-16	R3553442
Methyl tert-butyl ether	<0.020		0.020	mg/kg	24-AUG-16	04-SEP-16	R3540945
Phenols (4AAP)	<0.10		0.10	mg/kg	15-SEP-16	16-SEP-16	R3550163
Xylenes (Total)	<0.071		0.071	mg/kg		06-SEP-16	
VPH (C6-C10)	<10		10	mg/kg		06-SEP-16	
EPA 8260 Volatile Organics - single parm							
Dichlorodifluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloromethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Vinyl chloride	<0.20		0.20	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromomethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroethane	<0.10		0.10	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichlorofluoromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Methylene chloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,2-Dichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chloroform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Carbon tetrachloride	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Benzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Trichloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromodichloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromomethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
cis-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
trans-1,3-Dichloropropene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Toluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2-Trichloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Tetrachloroethene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Dibromochloromethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819102-28 DUP-2							
Sampled By: RL/ZP on 24-AUG-16 @ 16:30							
Matrix: SOIL							
EPA 8260 Volatile Organics - single parm							
1,2-Dibromoethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Chlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Ethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,1,2-Tetrachloroethane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
m+p-Xylenes	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
o-Xylene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Styrene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromoform	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Isopropylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,1,2,2-Tetrachloroethane	<0.050		0.050	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichloropropane	<0.020		0.020	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Propylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Bromobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3,5-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
2-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
4-Chlorotoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
tert-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trimethylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
sec-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
p-Isopropyltoluene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,3-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,4-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
n-Butylbenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2-Dibromo-3-chloropropane	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,4-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Hexachlorobutadiene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
1,2,3-Trichlorobenzene	<0.010		0.010	mg/kg	24-AUG-16	10-SEP-16	R3549742
Surrogate: 1,4-Difluorobenzene	84.9		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 4-Bromofluorobenzene	81.9		70-130	%	24-AUG-16	10-SEP-16	R3549742
Surrogate: 3,4-Dichlorotoluene	104.2		70-130	%	24-AUG-16	10-SEP-16	R3549742
EPA Volatile Organics							
Acetone	1.9		1.0	mg/kg		16-SEP-16	R3552101
Methyl ethyl ketone	<1.0		1.0	mg/kg		16-SEP-16	R3552101
4-Methyl-2-pentanone (MIBK)	<0.10		0.10	mg/kg		16-SEP-16	R3552101
Surrogate: 1,4-Difluorobenzene (SS)	82.0		50-150	%		16-SEP-16	R3552101
Surrogate: 4-Bromofluorobenzene (SS)	73.0		70-130	%		16-SEP-16	R3552101
Surrogate: 3,4-Dichlorotoluene (SS)	76.0		50-150	%		16-SEP-16	R3552101
PCBs							
Aroclor 1016	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1221	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1232	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1242	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1248	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1254	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1260	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1262	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Aroclor 1268	<0.010		0.010	mg/kg		07-SEP-16	R3543923
Total PCBs	<0.050		0.050	mg/kg		07-SEP-16	R3543923
Surrogate: Decachlorobiphenyl	103.5		65-130	%		07-SEP-16	R3543923

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
LCS-L	Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
PEHT	Parameter Exceeded Recommended Holding Time Prior to Analysis
RM-L	Reference Material recovery was below ALS DQO. Lab Control Sample and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RRR	Refer to Report Remarks for issues regarding this analysis

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
BTX,VPH-MEOH-CL	Soil	BTEX and VPHs	EPA 8260C/5021A and BCMELP

This analysis involves the extraction of a subsample of the sediment/soil with methanol added in the field at the time of subsampling. The soil methanol extract is added to water and reagents, then heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. BTX Target compound concentrations are measured using mass spectrometry detection. Volatile Hydrocarbons (VH) are analyzed by capillary column gas chromatography with flame-ionization detection (GC/FID) in accordance with the British Columbia Ministry of Environment.

EC-1:2-CL	Soil	Conductivity (1:2)	CSSS ch.15

Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the conductivity of the liquid portion of the extract is measured by a conductivity meter

EOX-SR	Misc.	Ext. Org. Halogen (EOX)	EPA 9022 and EPA 9023
HG-200.2-CVAA-CL	Soil	Mercury in Soil by CVAAS	EPA 200.2/1631E (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CVAAS.

LEPH/HEPH-CALC-CL	Soil	LEPHs and HEPHs	BC MELP; CSR-Analytical Method 3

: Light and Heavy Extractable Petroleum Hydrocarbons in Solids. These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Light and Heavy Extractable Petroleum Hydrocarbons in Solids or Water". According to this method, LEPH and HEPH are calculated by subtracting selected Polycyclic Aromatic Hydrocarbon results from Extractable Petroleum Hydrocarbon results. To calculate LEPH, the individual results for Naphthalene and Phenanthrene are subtracted from EPH(C10-19). To calculate HEPH, the individual results for Benz(a)anthracene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Dibenz(a,h)anthracene, Indeno(1,2,3-c,d)pyrene, and Pyrene are subtracted from EPH(C19-32). Analysis of Extractable Petroleum Hydrocarbons adheres to all prescribed elements of the BCMELP method "Extractable Petroleum Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

LEPH/HEPH-CL	Soil	LEPHs and HEPHs	BC MELP; CSR-Analytical Method 3
MET-200.2-CCMS-CL	Soil	Metals in Soil by CRC ICPMS	EPA 200.2/6020A (mod)

Soil samples are digested with nitric and hydrochloric acids, followed by analysis by CRC ICPMS.

Method Limitation: This method is not a total digestion technique. It is a very strong acid digestion that is intended to dissolve those metals that may be environmentally available. This method does not dissolve all silicate materials and may result in a partial extraction. depending on the sample matrix, for some metals, including, but not limited to Al, Ba, Be, Cr, Sr, Ti, Tl, and V.

MOISTURE-CL	Soil	% Moisture	CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C

MTBE-ADD-CL	Soil	MTBE - additional to BTEX	EPA 5030/8260B-P&T GC-MSD
PAH-BCCSR-CL	Soil	PAHs - BC CSR Regs	EPA 3570/8270-GC/MS

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3570 & 8270, published by the United States Environmental Protection Agency (EPA). The procedure uses a mechanical shaking technique to extract a subsample of the sediment/soil with a 1:1 mixture of Hexane and acetone. The extract is then solvent exchanged to toluene. The final extract is analyzed by capillary column gas chromatography with mass spectrometric detection (GC/MS). Surrogate recoveries may not be reported in cases where interferences from the sample matrix prevent accurate quantitation.

PCB-ED	Soil	PCBs	EPA 3570/8082-GC-ECD
PH-1:2-CL	Soil	pH in soil (1:2 Soil:Water Extraction)	CSSS Ch. 16

Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.

PH-1:2-CL	Waste	pH (1:2 Soil:Water Extraction)	CSSS Ch. 16

Soil and de-ionized water (by volume) are mixed in a defined ratio. The slurry is allowed to stand, shaken, and then allowed to stand again prior to taking measurements. After equilibration, the pH of the liquid portion of the extract is measured by a pH meter. Field Measurement is recommended where accurate pH measurements are required, due to the 15 minute recommended hold time.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
PHENOLS-4AAP-WT	Soil	Phenol (4AAP)	EPA 9066

A manual method is used to distill the sample. The distillate is then buffered to pH 9.4 and reacts with 4AAP and alkaline ferricyanide to form a red complex which is measured colorimetrically.

PSA-1-CL	Soil	Particle Size	CSSS 55.3 - Hydrometer

Particle Size analysis in soil using a hydrometer

TEH-BC-CL	Soil	EPH (C10-C19) & EPH (C19-C32)	BC MOE EPH GCFID

Analysis is in accordance with BC MOE Lab Manual method "Extractable Petroleum Hydrocarbons in Solids by GC/FID", v2.1, July 1999. Soil samples are extracted with a 1:1 mixture of hexane and acetone using a rotary extraction technique modified from EPA 3570 prior to gas chromatography with flame ionization detection (GC-FID). EPH results include Polycyclic Aromatic Hydrocarbons (PAH) and are therefore not equivalent to Light and Heavy Extractable Petroleum Hydrocarbons (LEPH/HEPH).

VOC-EPA-ED	Soil	EPA Volatile Organics	SW 846 8260-GC-MS
VOC-MISC-CL	Soil	EPA 8260 Volatile Organics - single parm	SW 846 8260-GC-MS
VPH-CALC-CL	Soil	VPH Calculation	BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

XYLENES-SUM-CALC-CL	Soil	Sum of Xylene Isomer Concentrations	CALCULATED RESULT

Total xylenes represents the sum of o-xylene and m&p-xylene.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SR	Saskatchewan Research Council - Saskatoon, Saskatchewan, Can
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

Additional Information:

INV COMMENTS	Task Order # 10201-7-101217, MSA # 10201-7-100309

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: CH2M HILL Canada Ltd.
540 - 12 Avenue SW
Calgary AB T2R 0H4
Contact: Raymond Li / Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX,VPH-MEOH-CL	**Soil**							
Batch R3540945								
WG2381722-4 DUP		**L1819102-1**						
Benzene		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	04-SEP-16
Toluene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Ethylbenzene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
o-Xylene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
m+p-Xylene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Styrene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Volatile Hydrocarbons (VH6-10)		<10	<10	RPD-NA	mg/kg	N/A	40	04-SEP-16
WG2381722-7 DUP		**L1819102-27**						
Benzene		<0.040	<0.040	RPD-NA	mg/kg	N/A	40	04-SEP-16
Toluene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Ethylbenzene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
o-Xylene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
m+p-Xylene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Styrene		<0.050	<0.050	RPD-NA	mg/kg	N/A	40	04-SEP-16
Volatile Hydrocarbons (VH6-10)		<10	<10	RPD-NA	mg/kg	N/A	40	04-SEP-16
WG2381722-2 LCS								
Benzene			98.2		%		70-130	04-SEP-16
Toluene			94.9		%		70-130	04-SEP-16
Ethylbenzene			96.9		%		70-130	04-SEP-16
o-Xylene			96.4		%		70-130	04-SEP-16
m+p-Xylene			98.9		%		70-130	04-SEP-16
Styrene			94.4		%		70-130	04-SEP-16
Volatile Hydrocarbons (VH6-10)			97.0		%		70-130	04-SEP-16
WG2381722-6 LCS								
Benzene			99.2		%		70-130	04-SEP-16
Toluene			95.0		%		70-130	04-SEP-16
Ethylbenzene			97.6		%		70-130	04-SEP-16
o-Xylene			96.5		%		70-130	04-SEP-16
m+p-Xylene			98.4		%		70-130	04-SEP-16
Styrene			94.7		%		70-130	04-SEP-16
Volatile Hydrocarbons (VH6-10)			84.2		%		70-130	04-SEP-16
WG2381722-1 MB								
Benzene			<0.040		mg/kg		0.04	04-SEP-16
Toluene			<0.050		mg/kg		0.05	04-SEP-16
Ethylbenzene			<0.050		mg/kg		0.05	04-SEP-16

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTX,VPH-MEOH-CL	**Soil**							
Batch R3540945								
WG2381722-1 MB								
o-Xylene			<0.050		mg/kg		0.05	04-SEP-16
m+p-Xylene			<0.050		mg/kg		0.05	04-SEP-16
Styrene			<0.050		mg/kg		0.05	04-SEP-16
Volatile Hydrocarbons (VH6-10)			<10		mg/kg		10	04-SEP-16
WG2381722-5 MB								
Benzene			<0.040		mg/kg		0.04	04-SEP-16
Toluene			<0.050		mg/kg		0.05	04-SEP-16
Ethylbenzene			<0.050		mg/kg		0.05	04-SEP-16
o-Xylene			<0.050		mg/kg		0.05	04-SEP-16
m+p-Xylene			<0.050		mg/kg		0.05	04-SEP-16
Styrene			<0.050		mg/kg		0.05	04-SEP-16
Volatile Hydrocarbons (VH6-10)			<10		mg/kg		10	04-SEP-16
EC-1:2-CL	**Soil**							
Batch R3550550								
WG2391049-2 DUP		**L1819102-26**						
Conductivity (1:2)		0.204	0.211		dS m-1	3.4	20	17-SEP-16
WG2391049-1 IRM		**SAL-STD8**						
Conductivity (1:2)			90.4		%		80-120	17-SEP-16
HG-200.2-CVAA-CL	**Soil**							
Batch R3548859								
WG2387199-2 CRM		**TILL-1**						
Mercury (Hg)			75.2		%		70-130	14-SEP-16
WG2388172-2 CRM		**TILL-1**						
Mercury (Hg)			64.0	RM-L	%		70-130	14-SEP-16
WG2388172-4 DUP		**L1819102-7**						
Mercury (Hg)		0.0456	0.0445		mg/kg	2.5	40	14-SEP-16
WG2387199-3 LCS								
Mercury (Hg)			69.3	LCS-L	%		70-130	14-SEP-16
WG2388172-3 LCS								
Mercury (Hg)			65.8	LCS-L	%		70-130	14-SEP-16
WG2387199-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	14-SEP-16
WG2388172-1 MB								
Mercury (Hg)			<0.0050		mg/kg		0.005	14-SEP-16
MET-200.2-CCMS-CL	**Soil**							

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R3548582								
WG2387199-2 CRM		**TILL-1**						
Antimony (Sb)			91.5		%		70-130	14-SEP-16
Arsenic (As)			104.9		%		70-130	14-SEP-16
Barium (Ba)			101.6		%		70-130	14-SEP-16
Beryllium (Be)			90.9		%		70-130	14-SEP-16
Boron (B)			98.0		%		70-130	14-SEP-16
Cadmium (Cd)			90.7		%		70-130	14-SEP-16
Chromium (Cr)			100.0		%		70-130	14-SEP-16
Cobalt (Co)			96.9		%		70-130	14-SEP-16
Copper (Cu)			95.9		%		70-130	14-SEP-16
Lead (Pb)			87.7		%		70-130	14-SEP-16
Molybdenum (Mo)			91.1		%		70-130	14-SEP-16
Nickel (Ni)			96.3		%		70-130	14-SEP-16
Selenium (Se)			0.31		mg/kg		0.12-0.52	14-SEP-16
Silver (Ag)			103.9		%		70-130	14-SEP-16
Thallium (Tl)			90.8		%		70-130	14-SEP-16
Tin (Sn)			91.2		%		70-130	14-SEP-16
Titanium (Ti)			104.5		%		70-130	14-SEP-16
Uranium (U)			101.5		%		70-130	14-SEP-16
Vanadium (V)			101.3		%		70-130	14-SEP-16
Zinc (Zn)			97.6		%		70-130	14-SEP-16
WG2387199-3 LCS								
Antimony (Sb)			107.8		%		80-120	14-SEP-16
Arsenic (As)			95.8		%		80-120	14-SEP-16
Barium (Ba)			91.2		%		80-120	14-SEP-16
Beryllium (Be)			95.5		%		80-120	14-SEP-16
Boron (B)			100.6		%		80-120	14-SEP-16
Cadmium (Cd)			89.2		%		80-120	14-SEP-16
Chromium (Cr)			87.8		%		80-120	14-SEP-16
Cobalt (Co)			89.8		%		80-120	14-SEP-16
Copper (Cu)			87.3		%		80-120	14-SEP-16
Lead (Pb)			100.5		%		80-120	14-SEP-16
Molybdenum (Mo)			108.3		%		80-120	14-SEP-16
Nickel (Ni)			87.6		%		80-120	14-SEP-16
Selenium (Se)			93.2		%		80-120	14-SEP-16

ALS Environmental

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R3548582								
WG2387199-3 LCS								
Silver (Ag)			88.9		%		80-120	14-SEP-16
Thallium (Tl)			99.5		%		80-120	14-SEP-16
Tin (Sn)			94.5		%		80-120	14-SEP-16
Titanium (Ti)			95.2		%		80-120	14-SEP-16
Uranium (U)			98.9		%		80-120	14-SEP-16
Vanadium (V)			90.1		%		80-120	14-SEP-16
Zinc (Zn)			86.5		%		80-120	14-SEP-16
WG2387199-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	14-SEP-16
Arsenic (As)			<0.10		mg/kg		0.1	14-SEP-16
Barium (Ba)			2.48	MB-LOR	mg/kg		0.5	14-SEP-16
Beryllium (Be)			<0.10		mg/kg		0.1	14-SEP-16
Boron (B)			<5.0		mg/kg		5	14-SEP-16
Cadmium (Cd)			<0.020		mg/kg		0.02	14-SEP-16
Chromium (Cr)			<0.50		mg/kg		0.5	14-SEP-16
Cobalt (Co)			<0.10		mg/kg		0.1	14-SEP-16
Copper (Cu)			<0.50		mg/kg		0.5	14-SEP-16
Lead (Pb)			<0.50		mg/kg		0.5	14-SEP-16
Molybdenum (Mo)			<0.10		mg/kg		0.1	14-SEP-16
Nickel (Ni)			<0.50		mg/kg		0.5	14-SEP-16
Selenium (Se)			<0.20		mg/kg		0.2	14-SEP-16
Silver (Ag)			<0.10		mg/kg		0.1	14-SEP-16
Thallium (Tl)			<0.050		mg/kg		0.05	14-SEP-16
Tin (Sn)			<2.0		mg/kg		2	14-SEP-16
Titanium (Ti)			<1.0		mg/kg		1	14-SEP-16
Uranium (U)			<0.050		mg/kg		0.05	14-SEP-16
Vanadium (V)			<0.20		mg/kg		0.2	14-SEP-16
Zinc (Zn)			<2.0		mg/kg		2	14-SEP-16
Batch R3548992								
WG2388172-2 CRM		**TILL-1**						
Antimony (Sb)			106.2		%		70-130	15-SEP-16
Arsenic (As)			113.0		%		70-130	15-SEP-16
Barium (Ba)			107.5		%		70-130	15-SEP-16
Beryllium (Be)			101.8		%		70-130	15-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R3548992								
WG2388172-2 CRM		**TILL-1**						
Boron (B)			113.0		%		70-130	15-SEP-16
Cadmium (Cd)			109.9		%		70-130	15-SEP-16
Chromium (Cr)			108.8		%		70-130	15-SEP-16
Cobalt (Co)			103.5		%		70-130	15-SEP-16
Copper (Cu)			101.1		%		70-130	15-SEP-16
Lead (Pb)			94.5		%		70-130	15-SEP-16
Molybdenum (Mo)			93.0		%		70-130	15-SEP-16
Nickel (Ni)			105.9		%		70-130	15-SEP-16
Selenium (Se)			0.35		mg/kg		0.12-0.52	15-SEP-16
Silver (Ag)			111.5		%		70-130	15-SEP-16
Thallium (Tl)			128.5		%		70-130	15-SEP-16
Tin (Sn)			99.2		%		70-130	15-SEP-16
Titanium (Ti)			112.8		%		70-130	15-SEP-16
Uranium (U)			106.8		%		70-130	15-SEP-16
Vanadium (V)			110.8		%		70-130	15-SEP-16
Zinc (Zn)			103.2		%		70-130	15-SEP-16
WG2388172-4 DUP		**L1819102-7**						
Antimony (Sb)		0.78	0.79		mg/kg	0.5	30	15-SEP-16
Arsenic (As)		13.6	13.7		mg/kg	0.6	30	15-SEP-16
Barium (Ba)		469	458		mg/kg	2.4	40	15-SEP-16
Beryllium (Be)		1.09	1.09		mg/kg	0.6	30	15-SEP-16
Boron (B)		11.6	12.6		mg/kg	8.4	30	15-SEP-16
Cadmium (Cd)		0.183	0.181		mg/kg	0.7	30	15-SEP-16
Chromium (Cr)		38.1	38.7		mg/kg	1.5	30	15-SEP-16
Cobalt (Co)		12.0	11.7		mg/kg	2.4	30	15-SEP-16
Copper (Cu)		32.3	32.9		mg/kg	1.8	30	15-SEP-16
Lead (Pb)		16.9	17.0		mg/kg	0.1	40	15-SEP-16
Molybdenum (Mo)		2.08	2.04		mg/kg	1.8	40	15-SEP-16
Nickel (Ni)		38.1	38.7		mg/kg	1.4	30	15-SEP-16
Selenium (Se)		1.16	1.21		mg/kg	4.5	30	15-SEP-16
Silver (Ag)		0.22	0.22		mg/kg	0.3	40	15-SEP-16
Thallium (Tl)		0.282	0.283		mg/kg	0.4	30	15-SEP-16
Tin (Sn)		<2.0	<2.0	RPD-NA	mg/kg	N/A	40	15-SEP-16
Titanium (Ti)		25.8	27.6		mg/kg	6.7	40	15-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R3548992								
WG2388172-4 DUP		**L1819102-7**						
Uranium (U)		1.85	1.88		mg/kg	1.4	30	15-SEP-16
Vanadium (V)		75.6	78.8		mg/kg	4.1	30	15-SEP-16
Zinc (Zn)		96.9	98.3		mg/kg	1.5	30	15-SEP-16
WG2388172-3 LCS								
Antimony (Sb)			105.6		%		80-120	15-SEP-16
Arsenic (As)			103.3		%		80-120	15-SEP-16
Barium (Ba)			99.9		%		80-120	15-SEP-16
Beryllium (Be)			108.3		%		80-120	15-SEP-16
Cadmium (Cd)			98.9		%		80-120	15-SEP-16
Chromium (Cr)			97.2		%		80-120	15-SEP-16
Cobalt (Co)			97.3		%		80-120	15-SEP-16
Copper (Cu)			94.7		%		80-120	15-SEP-16
Lead (Pb)			95.5		%		80-120	15-SEP-16
Molybdenum (Mo)			103.4		%		80-120	15-SEP-16
Nickel (Ni)			96.4		%		80-120	15-SEP-16
Selenium (Se)			99.0		%		80-120	15-SEP-16
Silver (Ag)			84.6		%		80-120	15-SEP-16
Thallium (Tl)			96.2		%		80-120	15-SEP-16
Tin (Sn)			103.8		%		80-120	15-SEP-16
Titanium (Ti)			104.5		%		80-120	15-SEP-16
Uranium (U)			96.5		%		80-120	15-SEP-16
Vanadium (V)			98.4		%		80-120	15-SEP-16
Zinc (Zn)			94.5		%		80-120	15-SEP-16
WG2388172-1 MB								
Antimony (Sb)			<0.10		mg/kg		0.1	15-SEP-16
Arsenic (As)			<0.10		mg/kg		0.1	15-SEP-16
Barium (Ba)			<0.50		mg/kg		0.5	15-SEP-16
Beryllium (Be)			<0.10		mg/kg		0.1	15-SEP-16
Boron (B)			<5.0		mg/kg		5	15-SEP-16
Cadmium (Cd)			<0.020		mg/kg		0.02	15-SEP-16
Chromium (Cr)			<0.50		mg/kg		0.5	15-SEP-16
Cobalt (Co)			<0.10		mg/kg		0.1	15-SEP-16
Copper (Cu)			<0.50		mg/kg		0.5	15-SEP-16
Lead (Pb)			<0.50		mg/kg		0.5	15-SEP-16
Molybdenum (Mo)			<0.10		mg/kg		0.1	15-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-200.2-CCMS-CL	**Soil**							
Batch R3548992								
WG2388172-1 MB								
Nickel (Ni)			<0.50		mg/kg		0.5	15-SEP-16
Selenium (Se)			<0.20		mg/kg		0.2	15-SEP-16
Silver (Ag)			<0.10		mg/kg		0.1	15-SEP-16
Thallium (Tl)			<0.050		mg/kg		0.05	15-SEP-16
Tin (Sn)			<2.0		mg/kg		2	15-SEP-16
Titanium (Ti)			<1.0		mg/kg		1	15-SEP-16
Uranium (U)			<0.050		mg/kg		0.05	15-SEP-16
Vanadium (V)			<0.20		mg/kg		0.2	15-SEP-16
Zinc (Zn)			<2.0		mg/kg		2	15-SEP-16
MOISTURE-CL	**Soil**							
Batch R3540868								
WG2381717-3 DUP		**L1819102-1**						
Moisture		23.7	24.8		%	4.5	20	03-SEP-16
WG2381717-2 LCS								
Moisture			105.6		%		90-110	03-SEP-16
WG2381717-1 MB								
Moisture			<0.25		%		0.25	03-SEP-16
MTBE-ADD-CL	**Soil**							
Batch R3540945								
WG2381722-4 DUP		**L1819102-1**						
Methyl tert-butyl ether		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	03-SEP-16
WG2381722-7 DUP		**L1819102-27**						
Methyl tert-butyl ether		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	04-SEP-16
WG2381722-2 LCS								
Methyl tert-butyl ether			106.0		%		50-150	03-SEP-16
WG2381722-6 LCS								
Methyl tert-butyl ether			107.6		%		50-150	04-SEP-16
WG2381722-1 MB								
Methyl tert-butyl ether			<0.020		mg/kg		0.02	03-SEP-16
WG2381722-5 MB								
Methyl tert-butyl ether			<0.020		mg/kg		0.02	04-SEP-16
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-2 DUP		**L1819102-1**						
Acenaphthene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16
Acenaphthylene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-2 DUP		**L1819102-1**						
Anthracene		<0.0040	<0.0040	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benz(a)anthracene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(a)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(b&j)fluoranthene		0.011	0.015		mg/kg	29	50	06-SEP-16
Benzo(g,h,i)perylene		<0.010	0.016	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(k)fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Chrysene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Dibenz(a,h)anthracene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16
Fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Fluorene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Indeno(1,2,3-c,d)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
2-Methylnaphthalene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Naphthalene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Phenanthrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
WG2383169-6 DUP		**L1819102-27**						
Acenaphthene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16
Acenaphthylene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16
Anthracene		<0.0040	<0.0040	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benz(a)anthracene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(a)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(b&j)fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(g,h,i)perylene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Benzo(k)fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Chrysene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Dibenz(a,h)anthracene		<0.0050	<0.0050	RPD-NA	mg/kg	N/A	50	06-SEP-16
Fluoranthene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Fluorene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Indeno(1,2,3-c,d)pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
2-Methylnaphthalene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Naphthalene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Phenanthrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
Pyrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	06-SEP-16
WG2383169-4 IRM		**ALS PHC1 RM HA**						
Acenaphthene			86.1		%		65-130	06-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-4 IRM		**ALS PHC1 RM HA**						
Acenaphthylene			111.3		%		65-130	06-SEP-16
Anthracene			116.2		%		65-130	06-SEP-16
Benz(a)anthracene			97.4		%		65-130	06-SEP-16
Benzo(a)pyrene			94.6		%		65-130	06-SEP-16
Benzo(b&j)fluoranthene			99.6		%		65-130	06-SEP-16
Benzo(g,h,i)perylene			100.2		%		65-130	06-SEP-16
Benzo(k)fluoranthene			113.7		%		65-130	06-SEP-16
Chrysene			106.6		%		65-130	06-SEP-16
Dibenz(a,h)anthracene			109.7		%		65-130	06-SEP-16
Fluoranthene			98.9		%		65-130	06-SEP-16
Fluorene			100.0		%		65-130	06-SEP-16
Indeno(1,2,3-c,d)pyrene			100.2		%		65-130	06-SEP-16
2-Methylnaphthalene			87.0		%		65-130	06-SEP-16
Naphthalene			87.8		%		65-130	06-SEP-16
Phenanthrene			101.7		%		65-130	06-SEP-16
Pyrene			99.4		%		65-130	06-SEP-16
WG2383169-8 IRM		**ALS PHC1 RM HA**						
Acenaphthene			89.9		%		65-130	06-SEP-16
Acenaphthylene			100.7		%		65-130	06-SEP-16
Anthracene			115.9		%		65-130	06-SEP-16
Benz(a)anthracene			90.0		%		65-130	06-SEP-16
Benzo(a)pyrene			86.9		%		65-130	06-SEP-16
Benzo(b&j)fluoranthene			92.8		%		65-130	06-SEP-16
Benzo(g,h,i)perylene			89.9		%		65-130	06-SEP-16
Benzo(k)fluoranthene			102.8		%		65-130	06-SEP-16
Chrysene			98.9		%		65-130	06-SEP-16
Dibenz(a,h)anthracene			98.7		%		65-130	06-SEP-16
Fluoranthene			95.1		%		65-130	06-SEP-16
Fluorene			95.2		%		65-130	06-SEP-16
Indeno(1,2,3-c,d)pyrene			92.1		%		65-130	06-SEP-16
2-Methylnaphthalene			90.8		%		65-130	06-SEP-16
Naphthalene			86.5		%		65-130	06-SEP-16
Phenanthrene			94.8		%		65-130	06-SEP-16
Pyrene			95.0		%		65-130	06-SEP-16
WG2383169-3 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-3 LCS								
Acenaphthene			87.9		mg/kg		60-130	06-SEP-16
Acenaphthylene			88.3		mg/kg		60-130	06-SEP-16
Anthracene			86.3		mg/kg		60-130	06-SEP-16
Benz(a)anthracene			90.2		mg/kg		60-130	06-SEP-16
Benzo(a)pyrene			91.4		mg/kg		60-130	06-SEP-16
Benzo(b&j)fluoranthene			90.8		mg/kg		60-130	06-SEP-16
Benzo(g,h,i)perylene			88.4		mg/kg		60-130	06-SEP-16
Benzo(k)fluoranthene			95.0		mg/kg		60-130	06-SEP-16
Chrysene			93.9		mg/kg		60-130	06-SEP-16
Dibenz(a,h)anthracene			89.5		mg/kg		60-130	06-SEP-16
Fluoranthene			89.9		mg/kg		60-130	06-SEP-16
Fluorene			91.2		mg/kg		60-130	06-SEP-16
Indeno(1,2,3-c,d)pyrene			85.6		mg/kg		60-130	06-SEP-16
2-Methylnaphthalene			90.6		mg/kg		60-130	06-SEP-16
Naphthalene			91.0		mg/kg		50-130	06-SEP-16
Phenanthrene			88.1		mg/kg		60-130	06-SEP-16
Pyrene			91.3		mg/kg		60-130	06-SEP-16
WG2383169-7 LCS								
Acenaphthene			73.9		mg/kg		60-130	06-SEP-16
Acenaphthylene			73.9		mg/kg		60-130	06-SEP-16
Anthracene			72.3		mg/kg		60-130	06-SEP-16
Benz(a)anthracene			83.5		mg/kg		60-130	06-SEP-16
Benzo(a)pyrene			84.7		mg/kg		60-130	06-SEP-16
Benzo(b&j)fluoranthene			83.8		mg/kg		60-130	06-SEP-16
Benzo(g,h,i)perylene			82.2		mg/kg		60-130	06-SEP-16
Benzo(k)fluoranthene			87.8		mg/kg		60-130	06-SEP-16
Chrysene			87.3		mg/kg		60-130	06-SEP-16
Dibenz(a,h)anthracene			83.1		mg/kg		60-130	06-SEP-16
Fluoranthene			80.0		mg/kg		60-130	06-SEP-16
Fluorene			75.2		mg/kg		60-130	06-SEP-16
Indeno(1,2,3-c,d)pyrene			79.0		mg/kg		60-130	06-SEP-16
2-Methylnaphthalene			75.8		mg/kg		60-130	06-SEP-16
Naphthalene			77.1		mg/kg		50-130	06-SEP-16
Phenanthrene			73.0		mg/kg		60-130	06-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-7 LCS								
Pyrene			81.6		mg/kg		60-130	06-SEP-16
WG2383169-1 MB								
Acenaphthene			<0.0050		mg/kg		0.005	06-SEP-16
Acenaphthylene			<0.0050		mg/kg		0.005	06-SEP-16
Anthracene			<0.0040		mg/kg		0.004	06-SEP-16
Benz(a)anthracene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(a)pyrene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Chrysene			<0.010		mg/kg		0.01	06-SEP-16
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	06-SEP-16
Fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Fluorene			<0.010		mg/kg		0.01	06-SEP-16
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	06-SEP-16
2-Methylnaphthalene			<0.010		mg/kg		0.01	06-SEP-16
Naphthalene			<0.010		mg/kg		0.01	06-SEP-16
Phenanthrene			<0.010		mg/kg		0.01	06-SEP-16
Pyrene			<0.010		mg/kg		0.01	06-SEP-16
Surrogate: d10-Acenaphthene			93.0		%		60-140	06-SEP-16
Surrogate: d12-Chrysene			86.2		%		60-140	06-SEP-16
Surrogate: d10-Phenanthrene			90.6		%		60-130	06-SEP-16
WG2383169-5 MB								
Acenaphthene			<0.0050		mg/kg		0.005	06-SEP-16
Acenaphthylene			<0.0050		mg/kg		0.005	06-SEP-16
Anthracene			<0.0040		mg/kg		0.004	06-SEP-16
Benz(a)anthracene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(a)pyrene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(b&j)fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(g,h,i)perylene			<0.010		mg/kg		0.01	06-SEP-16
Benzo(k)fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Chrysene			<0.010		mg/kg		0.01	06-SEP-16
Dibenz(a,h)anthracene			<0.0050		mg/kg		0.005	06-SEP-16
Fluoranthene			<0.010		mg/kg		0.01	06-SEP-16
Fluorene			<0.010		mg/kg		0.01	06-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Soil**							
Batch R3544283								
WG2383169-5 MB								
Indeno(1,2,3-c,d)pyrene			<0.010		mg/kg		0.01	06-SEP-16
2-Methylnaphthalene			<0.010		mg/kg		0.01	06-SEP-16
Naphthalene			<0.010		mg/kg		0.01	06-SEP-16
Phenanthrene			<0.010		mg/kg		0.01	06-SEP-16
Pyrene			<0.010		mg/kg		0.01	06-SEP-16
Surrogate: d10-Acenaphthene			87.0		%		60-140	06-SEP-16
Surrogate: d12-Chrysene			88.1		%		60-140	06-SEP-16
Surrogate: d10-Phenanthrene			85.6		%		60-130	06-SEP-16
PCB-ED	**Soil**							
Batch R3543923								
WG2382773-3 CRM		**PCB SOIL CRM915-050**						
Aroclor 1260			87.0		%		65-130	07-SEP-16
WG2382773-4 DUP		**L1819102-28**						
Aroclor 1016		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1221		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1232		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1242		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1248		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1254		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1260		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1262		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
Aroclor 1268		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	07-SEP-16
WG2382773-2 LCS		**LCS A1254**						
Aroclor 1254			90.2		%		65-130	07-SEP-16
WG2382773-1 MB								
Aroclor 1016			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1221			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1232			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1242			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1248			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1254			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1260			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1262			<0.010		mg/kg		0.01	07-SEP-16
Aroclor 1268			<0.010		mg/kg		0.01	07-SEP-16
Surrogate: Decachlorobiphenyl			71.5		%		65-130	07-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-1:2-CL	**Soil**							
Batch R3550550								
WG2391049-2 DUP		**L1819102-26**						
pH (1:2 soil:water)		6.00	5.97	J	pH	0.03	0.2	17-SEP-16
PHENOLS-4AAP-WT	**Soil**							
Batch R3548399								
WG2387243-3 DUP		**L1819102-7**						
Phenols (4AAP)		<0.10	<0.10	RPD-NA	mg/kg	N/A	30	14-SEP-16
WG2387243-2 LCS								
Phenols (4AAP)			92.2		%		80-120	14-SEP-16
WG2387243-1 MB								
Phenols (4AAP)			<0.10		mg/kg		0.1	14-SEP-16
WG2387243-4 MS		**L1819102-7**						
Phenols (4AAP)			84.8		%		70-130	14-SEP-16
Batch R3550163								
WG2389101-3 DUP		**L1819102-13**						
Phenols (4AAP)		0.10	<0.10	RPD-NA	mg/kg	N/A	30	16-SEP-16
WG2389101-2 LCS								
Phenols (4AAP)			95.3		%		80-120	16-SEP-16
WG2389101-1 MB								
Phenols (4AAP)			<0.10		mg/kg		0.1	16-SEP-16
WG2389101-4 MS		**L1819102-13**						
Phenols (4AAP)			82.5		%		70-130	16-SEP-16
PSA-1-CL	**Soil**							
Batch R3550858								
WG2391080-2 IRM		**SAL-STD8**						
% Sand			37.9		%		30.8-40.8	18-SEP-16
% Silt			31.5		%		27.6-37.6	18-SEP-16
% Clay			30.6		%		26.7-36.7	18-SEP-16
WG2391080-1 MB								
% Sand			<1.0		%		1	18-SEP-16
% Silt			<1.0		%		1	18-SEP-16
% Clay			<1.0		%		1	18-SEP-16
TEH-BC-CL	**Soil**							
Batch R3543925								
WG2384408-2 DUP		**L1819102-1**						
EPH10-19		<200	<200	RPD-NA	mg/kg	N/A	50	07-SEP-16
EPH19-32		<200	<200	RPD-NA	mg/kg	N/A	50	07-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-BC-CL	**Soil**							
Batch R3543925								
WG2384408-5 DUP		**L1819102-27**						
EPH10-19		<200	<200	RPD-NA	mg/kg	N/A	50	07-SEP-16
EPH19-32		<200	<200	RPD-NA	mg/kg	N/A	50	07-SEP-16
WG2384408-4 IRM		**ALS PHC2 RM**						
EPH10-19			86.9		%		70-130	07-SEP-16
EPH19-32			93.3		%		70-130	07-SEP-16
WG2384408-6 IRM		**ALS PHC2 RM**						
EPH10-19			85.0		%		70-130	07-SEP-16
EPH19-32			89.8		%		70-130	07-SEP-16
WG2384408-1 MB								
EPH10-19			<200		mg/kg		200	07-SEP-16
EPH19-32			<200		mg/kg		200	07-SEP-16
Surrogate: 2-Bromobenzotrifluoride			100.0		%		70-130	07-SEP-16
VOC-EPA-ED	**Soil**							
Batch R3552101								
WG2389779-2 LCS								
Acetone			117.0		%		70-130	16-SEP-16
Methyl ethyl ketone			111.0		%		70-130	16-SEP-16
4-Methyl-2-pentanone (MIBK)			86.0		%		70-130	16-SEP-16
WG2389779-1 MB								
Acetone			<1.0		mg/kg		1	16-SEP-16
Methyl ethyl ketone			<1.0		mg/kg		1	16-SEP-16
4-Methyl-2-pentanone (MIBK)			<0.10		mg/kg		0.1	16-SEP-16
Surrogate: 1,4-Difluorobenzene (SS)			74.0		%		50-150	16-SEP-16
Surrogate: 4-Bromofluorobenzene (SS)			75.0		%		70-130	16-SEP-16
Surrogate: 3,4-Dichlorotoluene (SS)			72.0		%		50-150	16-SEP-16
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-2 DUP		**L1819102-1**						
Dichlorodifluoromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Chloromethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	09-SEP-16
Vinyl chloride		<0.20	<0.20	RPD-NA	mg/kg	N/A	50	09-SEP-16
Bromomethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	09-SEP-16
Chloroethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	09-SEP-16
Trichlorofluoromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-2 DUP		**L1819102-1**						
Methylene chloride		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
trans-1,2-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1-Dichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
2,2-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
cis-1,2-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Chloroform		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Bromochloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2-Dichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1,1-Trichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Carbon tetrachloride		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Benzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Trichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Bromodichloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Dibromomethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
cis-1,3-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
trans-1,3-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Toluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1,2-Trichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,3-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Tetrachloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Dibromochloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2-Dibromoethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Chlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Ethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1,1,2-Tetrachloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
m+p-Xylenes		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
o-Xylene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Styrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Bromoform		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Isopropylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2,3-Trichloropropane		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-2 DUP		**L1819102-1**						
n-Propylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Bromobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,3,5-Trimethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
2-Chlorotoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
4-Chlorotoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
tert-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2,4-Trimethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
sec-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
p-Isopropyltoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,3-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,4-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
n-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2-Dibromo-3-chloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2,4-Trichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
Hexachlorobutadiene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
1,2,3-Trichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	09-SEP-16
WG2390375-4 DUP		**L1819102-27**						
Dichlorodifluoromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Chloromethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	10-SEP-16
Vinyl chloride		<0.20	<0.20	RPD-NA	mg/kg	N/A	50	10-SEP-16
Bromomethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	10-SEP-16
Chloroethane		<0.10	<0.10	RPD-NA	mg/kg	N/A	50	10-SEP-16
Trichlorofluoromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Methylene chloride		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
trans-1,2-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1-Dichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
2,2-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
cis-1,2-Dichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Chloroform		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Bromochloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2-Dichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1,1-Trichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-4 DUP		**L1819102-27**						
1,1-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Carbon tetrachloride		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Benzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Trichloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Bromodichloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Dibromomethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
cis-1,3-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
trans-1,3-Dichloropropene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Toluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1,2-Trichloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,3-Dichloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Tetrachloroethene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Dibromochloromethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2-Dibromoethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Chlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Ethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1,1,2-Tetrachloroethane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
m+p-Xylenes		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
o-Xylene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Styrene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Bromoform		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Isopropylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,1,2,2-Tetrachloroethane		<0.050	<0.050	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2,3-Trichloropropane		<0.020	<0.020	RPD-NA	mg/kg	N/A	50	10-SEP-16
n-Propylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Bromobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,3,5-Trimethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
2-Chlorotoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
4-Chlorotoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
tert-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2,4-Trimethylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
sec-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
p-Isopropyltoluene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-4 DUP		**L1819102-27**						
1,3-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,4-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
n-Butylbenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2-Dichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2-Dibromo-3-chloropropane		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2,4-Trichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
Hexachlorobutadiene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
1,2,3-Trichlorobenzene		<0.010	<0.010	RPD-NA	mg/kg	N/A	50	10-SEP-16
WG2390375-5 LCS								
Dichlorodifluoromethane			120.9		%		50-150	09-SEP-16
Chloromethane			92.9		%		50-150	09-SEP-16
Vinyl chloride			99.2		%		50-150	09-SEP-16
Bromomethane			102.0		%		50-150	09-SEP-16
Chloroethane			101.8		%		50-150	09-SEP-16
Trichlorofluoromethane			109.3		%		50-150	09-SEP-16
1,1-Dichloroethene			122.4		%		50-150	09-SEP-16
Methylene chloride			93.0		%		50-150	09-SEP-16
trans-1,2-Dichloroethene			92.0		%		50-150	09-SEP-16
1,1-Dichloroethane			92.4		%		50-150	09-SEP-16
2,2-Dichloropropane			98.1		%		50-150	09-SEP-16
cis-1,2-Dichloroethene			93.3		%		50-150	09-SEP-16
Chloroform			99.6		%		50-150	09-SEP-16
Bromochloromethane			96.7		%		50-150	09-SEP-16
1,2-Dichloroethane			85.2		%		50-150	09-SEP-16
1,1,1-Trichloroethane			103.7		%		50-150	09-SEP-16
1,1-Dichloropropene			95.7		%		50-150	09-SEP-16
Carbon tetrachloride			104.8		%		50-150	09-SEP-16
Benzene			92.3		%		50-150	09-SEP-16
Trichloroethene			103.4		%		50-150	09-SEP-16
1,2-Dichloropropane			85.6		%		50-150	09-SEP-16
Bromodichloromethane			89.2		%		50-150	09-SEP-16
Dibromomethane			92.8		%		50-150	09-SEP-16
cis-1,3-Dichloropropene			76.5		%		50-150	09-SEP-16
trans-1,3-Dichloropropene			72.4		%		50-150	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-5 LCS								
Toluene			89.4		%		50-150	09-SEP-16
1,1,2-Trichloroethane			87.0		%		50-150	09-SEP-16
1,3-Dichloropropane			81.4		%		50-150	09-SEP-16
Tetrachloroethene			109.4		%		50-150	09-SEP-16
Dibromochloromethane			91.0		%		50-150	09-SEP-16
1,2-Dibromoethane			84.0		%		50-150	09-SEP-16
Chlorobenzene			90.6		%		50-150	09-SEP-16
Ethylbenzene			88.1		%		50-150	09-SEP-16
1,1,1,2-Tetrachloroethane			93.2		%		50-150	09-SEP-16
m+p-Xylenes			91.0		%		50-150	09-SEP-16
o-Xylene			82.0		%		50-150	09-SEP-16
Styrene			74.4		%		50-150	09-SEP-16
Bromoform			83.2		%		50-150	09-SEP-16
Isopropylbenzene			76.4		%		50-150	09-SEP-16
1,1,2,2-Tetrachloroethane			77.9		%		50-150	09-SEP-16
1,2,3-Trichloropropane			70.5		%		50-150	09-SEP-16
n-Propylbenzene			88.2		%		50-150	09-SEP-16
Bromobenzene			92.9		%		50-150	09-SEP-16
1,3,5-Trimethylbenzene			83.6		%		50-150	09-SEP-16
2-Chlorotoluene			87.3		%		50-150	09-SEP-16
4-Chlorotoluene			89.4		%		50-150	09-SEP-16
tert-Butylbenzene			86.9		%		50-150	09-SEP-16
1,2,4-Trimethylbenzene			87.1		%		50-150	09-SEP-16
sec-Butylbenzene			94.3		%		50-150	09-SEP-16
p-Isopropyltoluene			86.9		%		50-150	09-SEP-16
1,3-Dichlorobenzene			88.2		%		50-150	09-SEP-16
1,4-Dichlorobenzene			90.1		%		50-150	09-SEP-16
n-Butylbenzene			89.9		%		50-150	09-SEP-16
1,2-Dichlorobenzene			94.7		%		50-150	09-SEP-16
1,2-Dibromo-3-chloropropane			85.9		%		50-150	09-SEP-16
1,2,4-Trichlorobenzene			101.7		%		50-150	09-SEP-16
Hexachlorobutadiene			116.5		%		50-150	09-SEP-16
1,2,3-Trichlorobenzene			100.6		%		50-150	09-SEP-16
WG2390375-6 LCS								

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-6 LCS								
Dichlorodifluoromethane			125.8		%		50-150	10-SEP-16
Chloromethane			97.6		%		50-150	10-SEP-16
Vinyl chloride			102.1		%		50-150	10-SEP-16
Bromomethane			104.3		%		50-150	10-SEP-16
Chloroethane			108.1		%		50-150	10-SEP-16
Trichlorofluoromethane			112.8		%		50-150	10-SEP-16
1,1-Dichloroethene			127.1		%		50-150	10-SEP-16
Methylene chloride			101.5		%		50-150	10-SEP-16
trans-1,2-Dichloroethene			92.5		%		50-150	10-SEP-16
1,1-Dichloroethane			99.9		%		50-150	10-SEP-16
2,2-Dichloropropane			88.2		%		50-150	10-SEP-16
cis-1,2-Dichloroethene			98.8		%		50-150	10-SEP-16
Chloroform			107.5		%		50-150	10-SEP-16
Bromochloromethane			106.8		%		50-150	10-SEP-16
1,2-Dichloroethane			94.3		%		50-150	10-SEP-16
1,1,1-Trichloroethane			108.6		%		50-150	10-SEP-16
1,1-Dichloropropene			97.3		%		50-150	10-SEP-16
Carbon tetrachloride			109.1		%		50-150	10-SEP-16
Benzene			98.3		%		50-150	10-SEP-16
Trichloroethene			104.7		%		50-150	10-SEP-16
1,2-Dichloropropane			93.4		%		50-150	10-SEP-16
Bromodichloromethane			97.2		%		50-150	10-SEP-16
Dibromomethane			102.8		%		50-150	10-SEP-16
cis-1,3-Dichloropropene			74.8		%		50-150	10-SEP-16
trans-1,3-Dichloropropene			70.6		%		50-150	10-SEP-16
Toluene			92.8		%		50-150	10-SEP-16
1,1,2-Trichloroethane			97.2		%		50-150	10-SEP-16
1,3-Dichloropropane			90.4		%		50-150	10-SEP-16
Tetrachloroethene			108.2		%		50-150	10-SEP-16
Dibromochloromethane			100.4		%		50-150	10-SEP-16
1,2-Dibromoethane			94.6		%		50-150	10-SEP-16
Chlorobenzene			88.6		%		50-150	10-SEP-16
Ethylbenzene			88.4		%		50-150	10-SEP-16
1,1,1,2-Tetrachloroethane			101.0		%		50-150	10-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-6 LCS								
m+p-Xylenes			90.2		%		50-150	10-SEP-16
o-Xylene			83.2		%		50-150	10-SEP-16
Styrene			78.0		%		50-150	10-SEP-16
Bromoform			89.3		%		50-150	10-SEP-16
Isopropylbenzene			82.7		%		50-150	10-SEP-16
1,1,2,2-Tetrachloroethane			85.9		%		50-150	10-SEP-16
1,2,3-Trichloropropane			73.8		%		50-150	10-SEP-16
n-Propylbenzene			85.7		%		50-150	10-SEP-16
Bromobenzene			96.3		%		50-150	10-SEP-16
1,3,5-Trimethylbenzene			81.6		%		50-150	10-SEP-16
2-Chlorotoluene			87.8		%		50-150	10-SEP-16
4-Chlorotoluene			89.0		%		50-150	10-SEP-16
tert-Butylbenzene			83.6		%		50-150	10-SEP-16
1,2,4-Trimethylbenzene			84.6		%		50-150	10-SEP-16
sec-Butylbenzene			95.0		%		50-150	10-SEP-16
p-Isopropyltoluene			83.5		%		50-150	10-SEP-16
1,3-Dichlorobenzene			86.9		%		50-150	10-SEP-16
1,4-Dichlorobenzene			88.0		%		50-150	10-SEP-16
n-Butylbenzene			83.1		%		50-150	10-SEP-16
1,2-Dichlorobenzene			98.7		%		50-150	10-SEP-16
1,2-Dibromo-3-chloropropane			85.6		%		50-150	10-SEP-16
1,2,4-Trichlorobenzene			87.5		%		50-150	10-SEP-16
Hexachlorobutadiene			104.1		%		50-150	10-SEP-16
1,2,3-Trichlorobenzene			90.2		%		50-150	10-SEP-16
WG2390375-1 MB								
Dichlorodifluoromethane			<0.010		mg/kg		0.01	09-SEP-16
Chloromethane			<0.10		mg/kg		0.1	09-SEP-16
Vinyl chloride			<0.20		mg/kg		0.2	09-SEP-16
Bromomethane			<0.10		mg/kg		0.1	09-SEP-16
Chloroethane			<0.10		mg/kg		0.1	09-SEP-16
Trichlorofluoromethane			<0.010		mg/kg		0.01	09-SEP-16
1,1-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16
Methylene chloride			<0.010		mg/kg		0.01	09-SEP-16
trans-1,2-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-1 MB								
1,1-Dichloroethane			<0.010		mg/kg		0.01	09-SEP-16
2,2-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
cis-1,2-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16
Chloroform			<0.010		mg/kg		0.01	09-SEP-16
Bromochloromethane			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichloroethane			<0.010		mg/kg		0.01	09-SEP-16
1,1,1-Trichloroethane			<0.010		mg/kg		0.01	09-SEP-16
1,1-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
Carbon tetrachloride			<0.010		mg/kg		0.01	09-SEP-16
Benzene			<0.010		mg/kg		0.01	09-SEP-16
Trichloroethene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
Bromodichloromethane			<0.010		mg/kg		0.01	09-SEP-16
Dibromomethane			<0.010		mg/kg		0.01	09-SEP-16
cis-1,3-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
trans-1,3-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
Toluene			<0.010		mg/kg		0.01	09-SEP-16
1,1,2-Trichloroethane			<0.010		mg/kg		0.01	09-SEP-16
1,3-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
Tetrachloroethene			<0.010		mg/kg		0.01	09-SEP-16
Dibromochloromethane			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dibromoethane			<0.010		mg/kg		0.01	09-SEP-16
Chlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Ethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,1,1,2-Tetrachloroethane			<0.010		mg/kg		0.01	09-SEP-16
m+p-Xylenes			<0.010		mg/kg		0.01	09-SEP-16
o-Xylene			<0.010		mg/kg		0.01	09-SEP-16
Styrene			<0.010		mg/kg		0.01	09-SEP-16
Bromoform			<0.010		mg/kg		0.01	09-SEP-16
Isopropylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,1,2,2-Tetrachloroethane			<0.050		mg/kg		0.05	09-SEP-16
1,2,3-Trichloropropane			<0.020		mg/kg		0.02	09-SEP-16
n-Propylbenzene			<0.010		mg/kg		0.01	09-SEP-16
Bromobenzene			<0.010		mg/kg		0.01	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-1 MB								
1,3,5-Trimethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
2-Chlorotoluene			<0.010		mg/kg		0.01	09-SEP-16
4-Chlorotoluene			<0.010		mg/kg		0.01	09-SEP-16
tert-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2,4-Trimethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
sec-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16
p-Isopropyltoluene			<0.010		mg/kg		0.01	09-SEP-16
1,3-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
1,4-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
n-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dibromo-3-chloropropane			<0.010		mg/kg		0.01	09-SEP-16
1,2,4-Trichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Hexachlorobutadiene			<0.010		mg/kg		0.01	09-SEP-16
1,2,3-Trichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Surrogate: 1,4-Difluorobenzene			87.2		%		70-130	09-SEP-16
Surrogate: 4-Bromofluorobenzene			83.2		%		70-130	09-SEP-16
Surrogate: 3,4-Dichlorotoluene			111.7		%		70-130	09-SEP-16
WG2390375-3 MB								
Dichlorodifluoromethane			<0.010		mg/kg		0.01	09-SEP-16
Chloromethane			<0.10		mg/kg		0.1	09-SEP-16
Vinyl chloride			<0.20		mg/kg		0.2	09-SEP-16
Bromomethane			<0.10		mg/kg		0.1	09-SEP-16
Chloroethane			<0.10		mg/kg		0.1	09-SEP-16
Trichlorofluoromethane			<0.010		mg/kg		0.01	09-SEP-16
1,1-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16
Methylene chloride			<0.010		mg/kg		0.01	09-SEP-16
trans-1,2-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16
1,1-Dichloroethane			<0.010		mg/kg		0.01	09-SEP-16
2,2-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
cis-1,2-Dichloroethene			<0.010		mg/kg		0.01	09-SEP-16
Chloroform			<0.010		mg/kg		0.01	09-SEP-16
Bromochloromethane			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichloroethane			<0.010		mg/kg		0.01	09-SEP-16

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-3 MB								
1,1,1-Trichloroethane			<0.010		mg/kg		0.01	09-SEP-16
1,1-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
Carbon tetrachloride			<0.010		mg/kg		0.01	09-SEP-16
Benzene			<0.010		mg/kg		0.01	09-SEP-16
Trichloroethene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
Bromodichloromethane			<0.010		mg/kg		0.01	09-SEP-16
Dibromomethane			<0.010		mg/kg		0.01	09-SEP-16
cis-1,3-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
trans-1,3-Dichloropropene			<0.010		mg/kg		0.01	09-SEP-16
Toluene			<0.010		mg/kg		0.01	09-SEP-16
1,1,2-Trichloroethane			<0.010		mg/kg		0.01	09-SEP-16
1,3-Dichloropropane			<0.010		mg/kg		0.01	09-SEP-16
Tetrachloroethene			<0.010		mg/kg		0.01	09-SEP-16
Dibromochloromethane			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dibromoethane			<0.010		mg/kg		0.01	09-SEP-16
Chlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Ethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,1,1,2-Tetrachloroethane			<0.010		mg/kg		0.01	09-SEP-16
m+p-Xylenes			<0.010		mg/kg		0.01	09-SEP-16
o-Xylene			<0.010		mg/kg		0.01	09-SEP-16
Styrene			<0.010		mg/kg		0.01	09-SEP-16
Bromoform			<0.010		mg/kg		0.01	09-SEP-16
Isopropylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,1,2,2-Tetrachloroethane			<0.050		mg/kg		0.05	09-SEP-16
1,2,3-Trichloropropane			<0.020		mg/kg		0.02	09-SEP-16
n-Propylbenzene			<0.010		mg/kg		0.01	09-SEP-16
Bromobenzene			<0.010		mg/kg		0.01	09-SEP-16
1,3,5-Trimethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
2-Chlorotoluene			<0.010		mg/kg		0.01	09-SEP-16
4-Chlorotoluene			<0.010		mg/kg		0.01	09-SEP-16
tert-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2,4-Trimethylbenzene			<0.010		mg/kg		0.01	09-SEP-16
sec-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-MISC-CL	**Soil**							
Batch R3549742								
WG2390375-3 MB								
p-Isopropyltoluene			<0.010		mg/kg		0.01	09-SEP-16
1,3-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
1,4-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
n-Butylbenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
1,2-Dibromo-3-chloropropane			<0.010		mg/kg		0.01	09-SEP-16
1,2,4-Trichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Hexachlorobutadiene			<0.010		mg/kg		0.01	09-SEP-16
1,2,3-Trichlorobenzene			<0.010		mg/kg		0.01	09-SEP-16
Surrogate: 1,4-Difluorobenzene			82.5		%		70-130	09-SEP-16
Surrogate: 4-Bromofluorobenzene			72.5		%		70-130	09-SEP-16
Surrogate: 3,4-Dichlorotoluene			104.8		%		70-130	09-SEP-16
PH-1:2-CL	**Waste**							
Batch R3549856								
WG2390491-1 IRM		**SAL-STD8**						
pH			7.59		pH		7.4-8	16-SEP-16

Quality Control Report

Workorder: L1819102 Report Date: 21-SEP-16 Page 26 of 27

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
LCS-L	Lab Control Sample recovery was below ALS DQO. Reference Material and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
MB-LOR	Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.
RM-L	Reference Material recovery was below ALS DQO. Lab Control Sample and/or Matrix Spike results were acceptable. Non-detected sample results are considered reliable. Other results, if reported, have been qualified.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Aggregate Organics							
Phenol (4AAP)							
	1	23-AUG-16 14:30	08-SEP-16 00:00	14	15	days	EHT
	3	23-AUG-16 14:00	08-SEP-16 00:00	14	15	days	EHT
	5	23-AUG-16 12:35	08-SEP-16 00:00	14	15	days	EHT
	7	23-AUG-16 09:50	08-SEP-16 00:00	14	16	days	EHT
	9	24-AUG-16 10:20	08-SEP-16 12:00	14	15	days	EHT
	11	24-AUG-16 11:30	08-SEP-16 12:00	14	15	days	EHT
	13	24-AUG-16 12:15	08-SEP-16 12:00	14	15	days	EHT
	15	24-AUG-16 13:15	08-SEP-16 12:00	14	15	days	EHT
	17	23-AUG-16 18:00	08-SEP-16 12:00	14	16	days	EHT
	19	23-AUG-16 18:45	09-SEP-16 07:00	14	17	days	EHT
	21	24-AUG-16 15:15	08-SEP-16 12:00	14	15	days	EHT
	22	24-AUG-16 14:45	08-SEP-16 12:00	14	15	days	EHT
	23	24-AUG-16 18:45	09-SEP-16 07:00	14	16	days	EHT
	24	24-AUG-16 16:30	08-SEP-16 12:00	14	15	days	EHT
	25	24-AUG-16 15:30	08-SEP-16 12:00	14	15	days	EHT
	26	24-AUG-16 18:15	08-SEP-16 12:00	14	15	days	EHT
	27	24-AUG-16 10:20	08-SEP-16 12:00	14	15	days	EHT
	28	24-AUG-16 16:30	08-SEP-16 12:00	14	15	days	EHT

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1819102 were received on 25-AUG-16 11:25.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

SRC SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
102 - 422 Downey Road, Saskatoon, SK Canada S7N 4N1
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E: analytical@src.sk.ca
www.src.sk.ca/analytical

SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group
2559 29th St NE
Calgary, AB T1Y 7B5
Attn: Nelson Kwan

Date Samples Received: Sep-09-2016 Client P.O.: L1819102

This is a final report.

Lab Section 1 results have been authorized by Keith Gipman, Supervisor

Lab Section 2 results have been authorized by Melissa Tackaberry-Syed, Supervisor

Lab Section 3 results have been authorized by Pat Moser, Supervisor

Lab Sections 4 and 5 results have been authorized by Vicky Snook, Supervisor

Lab Section 6 results have been authorized by Marion McConnell, Supervisor

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as

  * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
  * Environment Canada
  * US EPA
  * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group
2559 29th St NE
Calgary, AB T1Y 7B5
Attn: Nelson Kwan

Sample #: **2016028390**
Date Sampled: **Aug 23, 2016**
Sample Matrix: **SOIL**
Description: **08/23/2016 L1819102-1 BH-1-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028391**
Date Sampled: **Aug 23, 2016**
Sample Matrix: **SOIL**
Description: **08/23/2016 L1819102-3 BH-2-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028392**
Date Sampled: **Aug 23, 2016**
Sample Matrix: **SOIL**
Description: **08/23/2016 L1819102-5 BH-3-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028393**
Date Sampled: **Aug 23, 2016**
Sample Matrix: **SOIL**
Description: **08/23/2016 L1819102-7 BH-4-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028394**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-9 BH-5-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028395**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-11 BH-6-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028396**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-13 BH-7-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028397**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-15 BH-8-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028398**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-17 BH-9-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028399**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-19 BH-10-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028400**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-21 BH-12-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028401**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-22 BH-13-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028402**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-23 BH-14-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028403**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-24 BH-15-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028404**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-25 BH-16-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028405**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-26 BH-17-A**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028406**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-27 DUP-1**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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SRC Group # 2016-10791

Sep 21, 2016

ALS Laboratory Group

Sample #: **2016028407**
Date Sampled: **Aug 24, 2016**
Sample Matrix: **SOIL**
Description: **08/24/2016 L1819102-28 DUP-2**

Client PO #: **L1819102**
Date Received: **Sep 09, 2016**

Analyte	Units	Result
Lab Section 5 (Slowpoke)		
EOX	ug/g Cl	<1

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 16.2 °C upon receipt.

EOX results are the sum of organic chlorine, bromine and iodine expressed as chlorine.

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Sep 21, 2016

This report was generated for samples included in SRC Group # 2016-10791

Quality Control Report

Nelson Kwan
ALS Laboratory Group
2559 29th St NE
Calgary, AB T1Y 7B5

Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
EOX	ug/g	24.8	21.4
EOX	ug/g	24.8	20.5

Duplicates:

Duplicates are used to assess problems with precision and help ensure that samples within a given batch were processed appropriately. The difference between duplicates must be within strict limits, otherwise corrective action is required. Please note, the duplicate(s) in this report are duplicates analyzed within a given batch of test samples and may not be from this specific group of samples.

Duplicate Analysis	Units	Sample ID	First Result	Second Result
EOX	ug/g Cl	28390	<1	<1
EOX	ug/g Cl	28399	<1	<1

Spikes and/or Surrogates:

Samples spiked with a known quantity of the analyte of interest or a surrogate which is a known quantity of a compound which behaves in a similar manner to the analyte of interest, are used to assess problems with the sample processing or sample matrix. The recovery must be within clearly defined limits when the quantity of spike is comparable to the sample concentration.

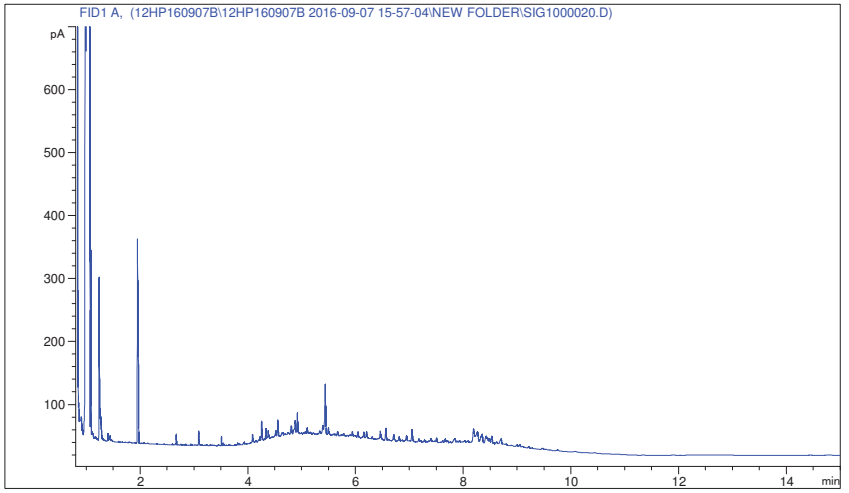
Spike Analysis	Percent Recovery
EOX	84

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

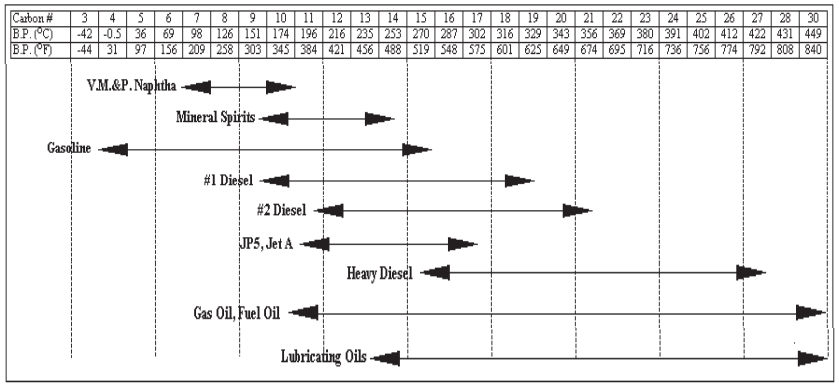
Client ID: BH-13-A

Sample ID: L1819102-22 V50
Injection Date: 9/7/2016
Injection Time: 11:01:54 PM
Instrument ID: Instrument 1
Operator: Organic



C10 C16 C34 C50

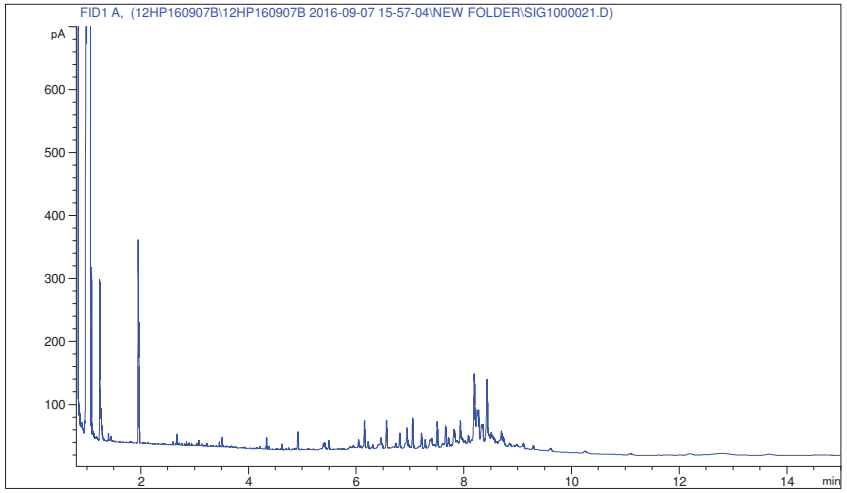
Boiling Point Distribution Range for Petroleum Based Fuel Products



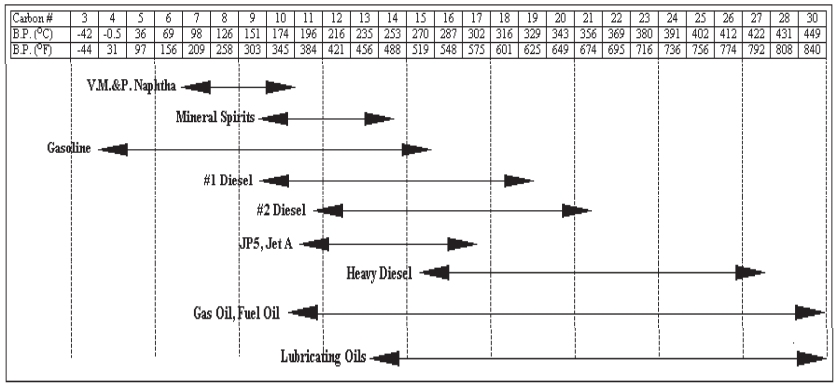
Adapted from: Drews, A.W.,ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

Client ID: BH-14-A[redacted]

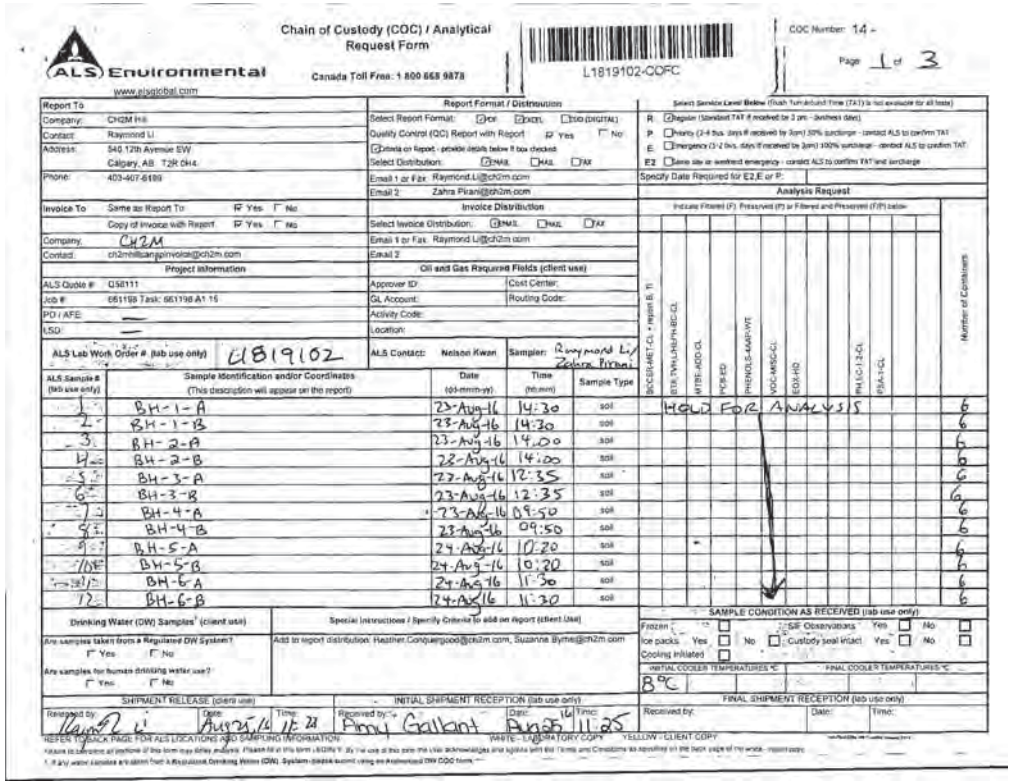
Sample ID: L1819102-23 V50
Injection Date: 9/7/2016
Injection Time: 11:24:02 PM
Instrument ID: Instrument 1
Operator: Organic



Boiling Point Distribution Range for Petroleum Based Fuel Products



Adapted from: Drews, A.W.,ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.



ALS Environmental
www.alsglobal.com
Canada Toll Free: 1 800 668 9878

Chain of Custody (COC) / Analytical Request Form

L1819102-COFC

COC Number: 14 -
Page 1 of 3

Report To
Company: CH2M Hill
Contact: Raymond Li
Address: 540 12th Avenue SW Calgary, AB T2R 0H4
Phone: 403-407-6189

Report Format / Distribution
Select Report Format: PDF EXCEL EDD (DIGITAL)
Quality Control (QC) Report with Report: Yes No
Criteria on Report - provide details below if box checked
Select Distribution: EMAIL MAIL FAX
Email 1 or Fax: Raymond.Li@ch2m.com
Email 2: Zahra.Pirani@ch2m.com

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
R Regular (Standard TAT if received by 3 pm - business days)
P Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Specify Date Required for E2,E or P:

Invoice To: Same as Report To Yes No
Copy of Invoice with Report: Yes No
Company: CH2M
Contact: ch2mhillcanadpinvoice@ch2m.com

Invoice Distribution
Select Invoice Distribution: EMAIL MAIL FAX
Email 1 or Fax: Raymond.Li@ch2m.com
Email 2:

Project Information
ALS Quote #: Q58111
Job #: 661198 Task: 661198-A1.15
PO / AFE:
LSD:

Oil and Gas Required Fields (client use)
Approver ID: Cost Center:
GL Account: Routing Code:
Activity Code:
Location:

ALS Lab Work Order # (lab use only): L1819102
ALS Contact: Nelson Kwan Sampler: Raymond Li / Zahra Pirani

Analysis Request
Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
BCCEB-HMT-CL • Hg-low-CL, TI
BTEX,TMVL,NAPH-REC-CL
MTBE-ADD-CL
PCB-SED
PHENOLS-4AAP-WT
VOC-MSD-CL
EG03-HD
PAH,LC-1,2-CL
PSA-1-CL
Number of Containers

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	
1	BH-1-A	23-Aug-16	14:30	soil	HOLD FOR ANALYSIS 6
2	BH-1-B	23-Aug-16	14:30	soil	6
3	BH-2-A	23-Aug-16	14:00	soil	6
4	BH-2-B	23-Aug-16	14:00	soil	6
5	BH-3-A	23-Aug-16	12:35	soil	6
6	BH-3-B	23-Aug-16	12:35	soil	6
7	BH-4-A	23-Aug-16	09:50	soil	6
8	BH-4-B	23-Aug-16	09:50	soil	6
9	BH-5-A	24-Aug-16	10:20	soil	6
10	BH-5-B	24-Aug-16	10:20	soil	6
11	BH-6-A	24-Aug-16	11:30	soil	6
12	BH-6-B	24-Aug-16	11:30	soil	6

Drinking Water (DW) Samples[1] (client use)
Are samples taken from a Regulated DW System? Yes No
Are samples for human drinking water use? Yes No

Special Instructions / Specify Criteria to add on report (client use)
Add to report distribution: Heather.Conquergood@ch2m.com, Suzanne.Byrne@ch2m.com

SAMPLE CONDITION AS RECEIVED (lab use only)
Frozen Yes No
Ice packs Yes No
Cooling Initiated
SIF Observations Yes No
Custody seal intact Yes No
INITIAL COOLER TEMPERATURES °C: 8°C
FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)
Released by: Date: Aug 25/16 Time: 17:23

INITIAL SHIPMENT RECEPTION (lab use only)
Received by: Amy Gallant Date: Aug 26/16 Time: 11:25

FINAL SHIPMENT RECEPTION (lab use only)
Received by: Date: Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION
WHITE - LABORATORY COPY YELLOW - CLIENT COPY

ALS Environmental
www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1819102-COFC

COC Number: 14 -

Page 2 of 3

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	CH2M Hill	Select Report Format:	PDF EXCEL EDD (DIGITAL)	R Regular (Standard TAT if received by 3 pm - business days)
Contact:	Raymond Li	Quality Control (QC) Report with Report	Yes No	P Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	540 12th Avenue SW Calgary, AB T2R 0H4	Select Distribution:	EMAIL MAIL FAX	E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	403-407-6199	Email 1 or Fax	Raymond.Li@ch2m.com	E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Invoice To	Same as Report To: Yes No	Email 2	Zahra.Pirani@ch2m.com	Specify Date Required for E2,E or P:
	Copy of Invoice with Report: Yes No	**Invoice Distribution**		**Analysis Request**
Company:	CH2M	Select Invoice Distribution:	EMAIL MAIL FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Contact:	ch2mhillcalgaryinvoice@ch2m.com	Email 1 or Fax	Raymond.Li@ch2m.com	
Project Information		Email 2		
ALS Quote #:	Q58111	**Oil and Gas Required Fields (client use)**		
Job #:	661198 Task: 661198.A1.15	Approver ID:	Cost Center:	
PO / AFE:	—	GL Account:	Routing Code:	
LSD:	—	Activity Code:		
		Location:		

ALS Lab Work Order # (lab use only):

ALS Contact: Nelson Kwan

Sampler: Raymond Li, Zahra Pirani

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BCCR-MET-CL + report to F1	BTX-THM-LHEPH-HC-CL	MTBE-ADD-CL	PCB-ED	PHENOLS-4AAP-WT	VOC-MSC-CL	EOX-HO	PH (EC-12-CL)	PSA-1-CL	Number of Containers
13	BH-7-A	24-Aug-16	12:15	soil						HOLD FOR ANALYSIS				6
14	BH-7-B	24-Aug-16	12:15	soil										6
15	BH-8-A	24-Aug-16	13:15	soil										6
16	BH-8-B	24-Aug-16	13:15	soil										6
17	BH-9-A	23-Aug-16	18:00	soil										6
18	BH-9-B	23-Aug-16	18:00	soil										6
19	BH-10-A	23-Aug-16	18:45	soil										6
20	BH-10-B	23-Aug-16	18:45	soil										6
	BH-11-A			soil										
21	BH-12-A	24-Aug-16	15:15	soil										6
22	BH-13-A	24-Aug-16	14:45	soil										6
23	BH-14-A	~~24-Aug-16~~ 23-Aug-16	~~18:45~~ 18:45	soil										6

Drinking Water (DW) Samples* (client use)	Special Instructions / Specify Criteria to add on report (client Use)	SAMPLE CONDITION AS RECEIVED (lab use only)
Are samples taken from a Regulated DW System? Yes No	Add to report distribution: Heather.Conguergood@ch2m.com, Suzanne.Byrne@ch2m.com	Frozen: SIF Observations: Yes No
Are samples for human drinking water use? Yes No		Ice packs: Yes No; Custody seal intact: Yes No; Cooling Initiated:
		INITIAL COOLER TEMPERATURES °C: 8°C; FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)	
Released by: Raymond	Date: Aug 25/16	Received by: Amy Gallant	Date: Aug 25	Received by:	Date:
	Time: 11:30		Time: 11:25		Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION. WHITE - LABORATORY COPY. YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

* If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC Form.

ALS Environmental
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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1819102-COFC

COC Number: 14 -

Page 3 of 3

Report To		Report Format / Distribution		Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)
Company:	CH2M Hill	Select Report Format:	PDF EXCEL EDD (DIGITAL)	R Regular (Standard TAT if received by 3 pm - business days)
Contact:	Raymond Li	Quality Control (QC) Report with Report	Yes No	P Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	540 12th Avenue SW Calgary, AB T2R 0H4	Select Distribution:	EMAIL MAIL FAX	E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	403-407-6199	Email 1 or Fax	Raymond.Li@ch2m.com	E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge
Invoice To	Same as Report To: Yes No	Email 2	Zahra.Pirani@ch2m.com	Specify Date Required for E2,E or P:
	Copy of Invoice with Report: Yes No	**Invoice Distribution**		**Analysis Request**
Company:		Select Invoice Distribution:	EMAIL MAIL FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Contact:	ch2mhillcalgaryinvoice@ch2m.com	Email 1 or Fax	Raymond.Li@ch2m.com	
Project Information		Email 2		
ALS Quote #:	Q58111	**Oil and Gas Required Fields (client use)**		
Job #:	661198 Task: 661198.A1.15	Approver ID:	Cost Center:	
PO / AFE:		GL Account:	Routing Code:	
LSD:		Activity Code:		
		Location:		

ALS Lab Work Order # (lab use only):

ALS Contact: Nelson Kwan

Sampler: Raymond Li, Zahra Pirani

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BCCR-MET-CL + report to F1	BTX-THM-LHEPH-HC-CL	MTBE-ADD-CL	PCB-ED	PHENOLS-4AAP-WT	VOC-MSC-CL	EOX-HO	PH (EC-12-CL)	PSA-1-CL	Number of Containers
24	BH-15-A	24-Aug-16	~~16:30~~ 16:30	soil						HOLD FOR ANALYSIS				6
25	BH-16-A	24-Aug-16	15:30	soil										6
26	BH-17A	24-Aug-16	18:15	soil										6
	BH-18-A			soil										
	BH-19-A			soil										
	BH-20-A			soil										
27	Dup-1	24-Aug-16	10:20	soil										6
28	Dup-2	24-Aug-16	16:30	soil										6
				soil										
				soil										
				soil										

Drinking Water (DW) Samples* (client use)	Special Instructions / Specify Criteria to add on report (client Use)	SAMPLE CONDITION AS RECEIVED (lab use only)
Are samples taken from a Regulated DW System? Yes No	Add to report distribution: Heather.Conguergood@ch2m.com, Suzanne.Byrne@ch2m.com	Frozen: SIF Observations: Yes No
Are samples for human drinking water use? Yes No		Ice packs: Yes No; Custody seal intact: Yes No; Cooling Initiated:
		INITIAL COOLER TEMPERATURES °C: 8°C; FINAL COOLER TEMPERATURES °C:

SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEPTION (lab use only)		FINAL SHIPMENT RECEPTION (lab use only)	
Released by:	Date: Aug 25, 16	Received by: Amy Gallant	Date: Aug 25	Received by:	Date:
	Time: 11:25		Time: 11:25		Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION. WHITE - LABORATORY COPY. YELLOW - CLIENT COPY

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

* If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC Form.

Bott L1819102-COFC

19/08/2016 1:58 PM

Bottle Order #: BR170984
Lab: FORT ST. JOHN
Account #: 18882

Order Created By: Nelson Kwan, B.Sc.
Expected Date: 22/08/2016 4:00 PM
Order Priority: Emergency
Ship/Pickup Via: Pick Up by Client
Waybill Number:
Prepared Date:
Prepared By:

Company: CH2M HILL Canada Ltd.
Client Contact: Raymond Li
Address: *** client pick-up *** ALS Fort St. John
Raymond.Li@ch2m.com
Fort St. John, BC, 000 000

Phone Number: 403-407-6199
Fax Number: 403-407-6001

Client Job Number: 661198 - SILVERBERRY LANDFILL SOIL INVESTIGATION, Q58111

Checked By: _____ Date _____ Initials

Comments:

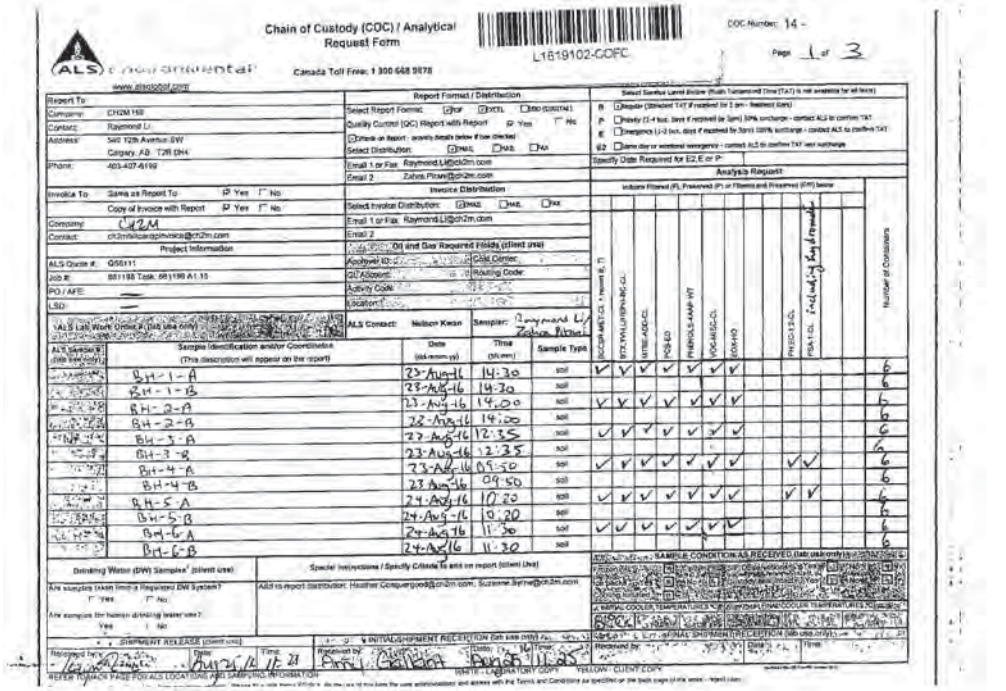
	Qty	Item (Analysis)	Container	Colour	Preservative	Instructions #
☐	13	BTEX/VPH, L/HEPH, PAH, VOCs	1 box (12x250mL Glass Jar)			3,2
☐	20	Blank ALS Labels	Label sheet 8-1/2 x 11 (15 per page)			
☐	1	Cooler (L BC) - 48qt	Cooler with Ice Packs			
☐	2	EOX-HO	1 box (24 x 125mL glass jars)			3,2
☐	1	PSA, metals/Hg, pH/EC	Bags (set of 100)			3
☐	42	TerraCore 125 mL Soil Jar	1 x 125 mL Glass Jar			3,42,44,59
☐	42	TerraCore Sampling Device - 5g soil	1 x TerraCore T-handle 5 g samplers			3,44
☐	42	VOC, BTEX, F1, VPH-TerraCore	2 x 40 mL P&T Glass Vials Precharged		Methanol	3,42,44
☐	10	custom pre-printed COC				

Please note the "Instructions #" above for the sample containers and items shipped to you. Find the corresponding number below and follow the instructions/guidelines.

Instructions #	Guideline
2	No headspace.
3	Keep cool (4oC).
42	Methanol : highly toxic/irritant and flammable-in case of contact with skin, rinse affected area with cold water for 15 mins. In case of eye contact, remove contact lenses and rinse affected area with cold water for 15 mins.

42 x $5/kit = $210

ADDRESS: Box 256, 9831 - 98A Avenue, Fort St.John, BC V1J 6W7 Canada | Phone: +1 250 261 5517 | Fax: +1 250 261 5587
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



Chain of Custody (COC) / Analytical Request Form

L1819102-COFC

COC Number: 14 -

Page 1 of 3

Canada Toll Free: 1 800 668 9878

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Report To		Report Format / Distribution		Select Service Level Below (Push Turnaround Time [TAT] is not available for all tests)
Company:	CH2M Hill	Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	B ☑ Regular (Standard TAT if received by 3 pm - business days)
Contact:	Raymond Li	Quality Control (QC) Report with Report	☑ Yes ☐ No	P ☐ Priority (2-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT
Address:	540 12th Avenue SW Calgary, AB T2R 0H4	Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	E ☐ Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT
Phone:	403-407-6199	Email 1 or Fax	Raymond.Li@ch2m.com	E2 ☐ Same day or weekend emergency - contact ALS to confirm TAT and surcharge
		Email 2	Zahra.Pirani@ch2m.com	Specify Date Required for E2, E or P:
Invoice To	Same as Report To ☐ Yes ☐ No	Invoice Distribution		Analysis Request
	Copy of Invoice with Report ☑ Yes ☐ No	Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P), or Filtered and Preserved (F/P) below
Company:	CH2M	Email 1 or Fax	Raymond.Li@ch2m.com	
Contact:	ch2mhillcanadainvoice@ch2m.com	Email 2		
Project Information		Oil and Gas Required Fields (client use)		
ALS Quote #:	Q58111	AccPayable ID:	Cost Center:	
Job #:	661198 Task: 661198 A1.15	GL Account:	Routing Code:	
PO / AFE:		Activity Code:		
LSD:		Location:		

ALS Lab Work Order # (lab use only):

ALS Contact: Nelson Kwan Sampler: Raymond Li / Zahra Pirani

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BCAP-MET-CO + Hg-low & T1	BTX,VPH,F1/PHC-CO	NITRE-ADS-CO	PCB-EO	PHENOLS-4AAP-WT	VOC-MEOH-CO	EOX-HO	PHC-F1-CO	PSA-T1CL	Number of Containers
	BH-1-A	23-Aug-16	14:30	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-1-B	23-Aug-16	14:30	soil										6
	BH-2-A	23-Aug-16	14:00	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-2-B	23-Aug-16	14:00	soil										6
	BH-3-A	23-Aug-16	12:35	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-3-B	23-Aug-16	12:35	soil										6
	BH-4-A	23-Aug-16	09:50	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6
	BH-4-B	23-Aug-16	09:50	soil										6
	BH-5-A	24-Aug-16	10:20	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6
	BH-5-B	24-Aug-16	10:20	soil										6
	BH-6-A	24-Aug-16	11:30	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-6-B	24-Aug-16	11:30	soil										6

Drinking Water (DW) Samples? (client use)
Are samples taken from a Regulated DW System? ☐ Yes ☐ No
Are samples for human drinking water use? Yes ☐ No

Special Instructions / Specify Criteria to add on report (client use)
Add to report distribution: Heather.Conquergood@ch2m.com, Suzanne.Byrne@ch2m.com

SAMPLE CONDITION AS RECEIVED (lab use only)

SHIPMENT RELEASE (client use)

INITIAL SHIPMENT RECEPTION (lab use only)

FINAL SHIPMENT RECEPTION (lab use only)

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1819102-COFC

COC Number: 14 -

Page 2 of 3

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Report To	
Company:	CH2M Hill
Contact:	Raymond Li
Address:	540 12th Avenue SW Calgary, AB T2R 0H4
Phone:	403-407-6199
Invoice To	Same as Report To: Yes / No
	Copy of Invoice with Report: Yes / No
Company:	CH2M
Contact:	ch2mhillcanadainvoice@ch2m.com
Project Information	
ALS Quote #:	Q56111
Job #:	661198 Task: 661198.A1.19
PO / AFE:	—
LSD:	—

Report Format / Distribution

Select Report Format: PDF EXCEL EDD (DIGITAL)

Quality Control (QC) Report with Report: Yes No

Criteria on Report - provide details below if box checked

Select Distribution: MAIL FAX

Email 1 or Fax: Raymond.Li@ch2m.com

Email 2: Zahra.Piran@ch2m.com

Invoice Distribution

Select Invoice Distribution: MAIL FAX

Email 1 or Fax: Raymond.Li@ch2m.com

Email 2

Oil and Gas Required Fields (client use)

Approver ID:

GL Account:

Activity Code:

Location:

Cost Center:

Routing Code:

ALS Contact: Nelson Kwan

Sampler: Raymond Li, Zahra Piran

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

R Regular (Standard TAT if received by 3 pm - business days)

P Priority (3-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT

E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT

E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2, E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BTEX,TPH,LHSPH-SIM-CL	BTEX,TPH,LHSPH-SIM-CL	VOC-MSC-CL	PCB-ED	PHENOLS-4AAP-WT	VOC-MSC-CL	EDB-HS	PAH-CL	PSA1-CL including Hydrazine	Number of Containers
	BH-7-A	24-Aug-16	12:15	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-7-B	24-Aug-16	12:15	soil										6
	BH-8-A	24-Aug-16	13:15	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-8-B	24-Aug-16	13:15	soil										6
	BH-9-A	23-Aug-16	18:00	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-9-B	23-Aug-16	18:00	soil										6
	BH-10-A	23-Aug-16	18:45	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-10-B	23-Aug-16	18:45	soil										6
	BH-11-A			soil										
	BH-12-A	24-Aug-16	15:15	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-13-A	24-Aug-16	14:45	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6
	BH-14-A	[illegible]	[illegible]	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6

Drinking Water (DW) Samples? (client use)

Are samples taken from a Regulated DW System? Yes / No

Are samples for human drinking water use? Yes / No

Special Instructions / Specify Criteria to add on report (client use)

Add to report distribution: Heather.Conquergood@ch2m.com, Suzanne.Byrne@ch2m.com

SHIPMENT RELEASE (client use)

Released by: Raymond Date: Aug 25/16 Time: 11:25

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Anna Gallant Date: Aug 25 16 Time: 11:25

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen / SIF Observations / General Comments

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L1819102-COFC

COC Number: 14 -

Page 3 of 3

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Report To

Company: CH2M Hill

Contact: Raymond Li

Address: 540 12th Avenue SW
Calgary, AB T2R 0H4

Phone: 403-407-6199

Invoice To: Same as Report To: Yes / No

Copy of Invoice with Report: Yes / No

Company:

Contact: ch2mhillcanadainvoice@ch2m.com

Project Information

ALS Quote #: Q56111

Job #: 661198 Task: 661198.A1.15

PO / AFE:

LSD:

Report Format / Distribution

Select Report Format: PDF EXCEL EDD (DIGITAL)

Quality Control (QC) Report with Report: Yes No

Criteria on Report - provide details below if box checked

Select Distribution: MAIL FAX

Email 1 or Fax: Raymond.Li@ch2m.com

Email 2: Zahra.Piran@ch2m.com

Invoice Distribution

Select Invoice Distribution: MAIL FAX

Email 1 or Fax: Raymond.Li@ch2m.com

Email 2

Oil and Gas Required Fields (client use)

Approver ID:

GL Account:

Activity Code:

Location:

Cost Center:

Routing Code:

ALS Contact: Nelson Kwan

Sampler: Raymond Li, Zahra Piran

Select Service Level Below (Rush Turnaround Time (TAT) is not available for all tests)

R Regular (Standard TAT if received by 3 pm - business days)

P Priority (3-4 bus. days if received by 3pm) 50% surcharge - contact ALS to confirm TAT

E Emergency (1-2 bus. days if received by 3pm) 100% surcharge - contact ALS to confirm TAT

E2 Same day or weekend emergency - contact ALS to confirm TAT and surcharge

Specify Date Required for E2, E or P:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BTEX,TPH,LHSPH-SIM-CL	BTEX,TPH,LHSPH-SIM-CL	VOC-MSC-CL	PCB-ED	PHENOLS-4AAP-WT	VOC-MSC-CL	EDB-HS	PAH-CL	PSA1-CL including Hydrazine	Number of Containers
	BH-15-A	24-Aug-16	16:30	soil	✓	✓	✓	✓	✓	✓	✓			6
	BH-16-A	24-Aug-16	15:30	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6
	BH-17A	24-Aug-16	18:15	soil	✓	✓	✓	✓	✓	✓	✓	✓	✓	6
	BH-18-A			soil										
	BH-19-A			soil										
	BH-20-A			soil										
	Dup-1	24-Aug-16	10:20	soil	✓	✓	✓	✓	✓	✓	✓			6
	Dup-2	24-Aug-16	16:30	soil	✓	✓	✓	✓	✓	✓	✓			6
				soil										
				soil										
				soil										
				soil										

Drinking Water (DW) Samples? (client use)

Are samples taken from a Regulated DW System? Yes / No

Are samples for human drinking water use? Yes / No

Special Instructions / Specify Criteria to add on report (client use)

Add to report distribution: Heather.Conquergood@ch2m.com, Suzanne.Byrne@ch2m.com

SHIPMENT RELEASE (client use)

Released by: Raymond Date: Aug 25 16 Time: 11:25

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Anna Gallant Date: Aug 25 16 Time: 11:25

FINAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen / SIF Observations / General Comments

INITIAL COOLER TEMPERATURES °C

FINAL COOLER TEMPERATURES °C

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

Monico-Barros, Rodrigo/MKE

From: Nelson Kwan <Nelson.Kwan@alsglobal.com>
Sent: Thursday, September 22, 2016 6:52 PM
To: Li, Raymond/CGY; Pirani, Zahra/VBC; Conquergood, Heather/VTA; Byrne, Suzanne/CGY
Subject: RE: (CH2M) L1819102 --- phenols (soil) EHT [EXTERNAL]
Attachments: ALS Hold Time Information 24Sept2012.pdf

Hi Raymond,

I got in touch with our Technical Director of Canada and he has indicated that:

> *If the samples were stored appropriately, then I would definitely not expect a very marginal hold time exceedance of 1 or 2 days on a 14 day hold time to have a significant impact on the results. I typically use a 50% exceedance of the recommended hold time as my interpretation of a "marginal" exceedance. This is based on professional judgment of course, and the 14 day hold time is still recognized as the best practice guidance, which is why we need to qualify when this is exceeded.*

He also asked me to send you the attached HT info sheet for reference.

My understanding is that phenols results should not be impacted by much, if any at all.

Nelson Kwan
Account Manager, Environmental (Calgary)

From: Raymond.Li@ch2m.com [mailto:Raymond.Li@ch2m.com]
Sent: September-22-16 3:16 PM
To: Nelson Kwan; Zahra.Pirani@ch2m.com; Heather.Conquergood@ch2m.com; Suzanne.Byrne@ch2m.com
Subject: RE: (CH2M) L1819102 --- phenols (soil) EHT

Many thanks
Raymond

From: Nelson Kwan [mailto:Nelson.Kwan@alsglobal.com]
Sent: Thursday, September 22, 2016 3:15 PM
To: Li, Raymond/CGT <Raymond.Li@ch2m.com>; Pirani, Zahra/VBC <Zahra.Pirani@ch2m.com>; Conquergood, Heather/VTA <Heather.Conquergood@ch2m.com>; Byrne, Suzanne/CGY <Suzanne.Byrne@ch2m.com>
Subject: RE: (CH2M) L1819102 --- phenols (soil) EHT [EXTERNAL]

Hi Raymond,

I did also notice the EHT issue with phenols in soil results, which was conducted by our ALS WT sister lab.

I emailed last night to inquire about whether or not the EHT was confirmed based on the date processed (in case there was a typo on analysis date). I am currently discussing this with ALS WT.

Stay tuned.

Nelson Kwan
Account Manager, Environmental (Calgary)

From: Raymond.Li@ch2m.com [mailto:Raymond.Li@ch2m.com]
Sent: September-22-16 2:51 PM
To: Nelson Kwan; Zahra.Pirani@ch2m.com; Heather.Conquergood@ch2m.com; Suzanne.Byrne@ch2m.com
Subject: RE: (CH2M) L1819102 - Group 2016-10791 - EOX results (SRC sublet)

Hi,

Thanks for your quick response.

I also noticed in your quality control report, it indicated that the hold time for Phenol exceed the recommended hold time (see attached). Just wonder why, as we submitted on the August 25 while the processed date is on September 8. Please also tell me what is the impact to the result if it did not meet the recommended hold time.

Thanks
Raymond

From: Nelson Kwan [mailto:Nelson.Kwan@alsglobal.com]
Sent: Thursday, September 22, 2016 2:17 PM
To: Li, Raymond/CGT <Raymond.Li@ch2m.com>; Pirani, Zahra/VBC <Zahra.Pirani@ch2m.com>; Conquergood, Heather/VTA <Heather.Conquergood@ch2m.com>; Byrne, Suzanne/CGY <Suzanne.Byrne@ch2m.com>
Subject: FW: (CH2M) L1819102 - Group 2016-10791 - EOX results (SRC sublet) [EXTERNAL]

Hi Raymond,

Following up with our phone conversation, I have received confirmation from SRC that the temp. doesn't affect EOX analysis.

Hope that helps in your report writing.

Nelson Kwan
Account Manager, Environmental (Calgary)

From: Snook, Vicky [mailto:Vicky.Snook@src.sk.ca]
Sent: September-22-16 2:10 PM
To: Nelson Kwan
Cc: Ortmann, Roxane
Subject: RE: (CH2M) L1819102 - Group 2016-10791 - EOX results

Hi Nelson,
I have been told by our client services personnel that ALS has requested the cooler temperature to be reported on every group regardless of its relevance.
The temperature does not affect the EOX measurement.
The report will not be revised or reissued.
Thanks,

Vicky Snook | Supervisor, Radiochemistry
Environmental Analytical Laboratories
Saskatchewan Research Council | Environment Division
102-422 Downey Rd. | Saskatoon SK | S7N 4N1
P: 306-964-2001 | F: 306-933-7922 | vicky.snook@src.sk.ca | www.src.sk.ca

From: Nelson Kwan [mailto:Nelson.Kwan@alsglobal.com]
Sent: Thursday, September 22, 2016 1:46 PM
To: Snook, Vicky <Vicky.Snook@src.sk.ca>
Cc: Ortmann, Roxane <Roxane.Ortmann@src.sk.ca>
Subject: RE: (CH2M) L1819102 - Group 2016-10791 - EOX results

Please do. Thanks Vicky.

Nelson Kwan
Account Manager, Environmental (Calgary)

From: Snook, Vicky [mailto:Vicky.Snook@src.sk.ca]
Sent: September-22-16 1:43 PM
To: Nelson Kwan
Cc: Ortmann, Roxane
Subject: FW: (CH2M) L1819102 - Group 2016-10791 - EOX results

Hi Nelson,
That note should not have been on your report. That was our mistake.
I will reissue the report without it.
Sorry!

Vicky Snook | Supervisor, Radiochemistry
Environmental Analytical Laboratories
Saskatchewan Research Council | Environment Division
102-422 Downey Rd. | Saskatoon SK | S7N 4N1
P: 306-964-2001 | F: 306-933-7922 | vicky.snook@src.sk.ca | www.src.sk.ca

From: Ortmann, Roxane
Sent: Thursday, September 22, 2016 1:31 PM
To: Snook, Vicky <Vicky.Snook@src.sk.ca>
Subject: FW: (CH2M) L1819102 - Group 2016-10791 - EOX results

From: Nelson Kwan [mailto:Nelson.Kwan@alsglobal.com]
Sent: Thursday, September 22, 2016 11:08 AM
To: Analytical <Analytical@src.sk.ca>
Subject: RE: (CH2M) L1819102 - Group 2016-10791 - EOX results

Hello,

Our client is wondering if the temp 16.2 deg C will impact EOX results.

Can someone please advise?

Nelson Kwan
Account Manager, Environmental (Calgary)

From: SRC Analytical Laboratories [mailto:analytical@src.sk.ca]
Sent: September-21-16 8:48 AM
To: Nelson Kwan
Subject: Environmental Analytical Laboratories Group 2016-10791

Enclosed file(s) for the following SRC Analytical Groups

2016-10791

If you have any problem with your enclosed file(s), feel free to give me a call.

Environmental Analytical Laboratories
102 - 422 Downey Road
Saskatoon, SK
S7N 4N1

Phone: 306-933-6932
Toll Free: 1-800-240-8808
Fax: 306-933-7922
Email: analytical@src.sk.ca
SRC Analytical Prefillable COC

We can now detect mercury in water samples as low as 1 ng/L with our new MERX Automated Total Mercury Analytical System. Starting June 1, all water samples and other sample types will be analyzed on this system.
Find out more!

3Ku6r_IjjWoDIB9K9Yq6eg8q8CiYHvRW9yH-jae4YhWsSNBkFrV6VIJOmvBFE9LEF6SdUzX8KD0Fr7HcT6EN_7GLyTA3BmBH6H1YSOZPa4E4eIkXedT5Fzf9o6yV-M/http%3A%2F%2Fwww.alsglobal.com.
****

General Comments About Hold Times & Interpretation of Hold Time Exceedances

Under some circumstances, many test parameters can be altered between the time of sampling and the time of analysis due to bacterial action, chemical reaction, evaporative loss, or other processes.

A sample hold time is the recommended maximum time between sampling and analysis, and is often matched with a specified sample preservation practice (e.g. acidification or dechlorination). Maximum hold times are established in order to protect the integrity of test samples, and to reduce potential changes in the sample before analysis.

The hold time guidelines used by most laboratories in Canada are those established by organizations such as US EPA, Environment Canada, or the American Public Health Association (APHA). ALS adopted our recommended hold times after careful review of recent literature, including guidelines established by provincial jurisdictions (notably British Columbia and Ontario).

However, rigorous scientific studies are not always available to substantiate reliable hold time recommendations for all test methods. Because of this, published hold time guidelines may sometimes be overly conservative. This problem has been recognized by the US EPA, and was the impetus for a 2006 EPA study titled "Sample Holding Time Re-Evaluation". The EPA introduction to this project stated the following:

"While holding times may appear adequate to protect sample integrity and provide sufficient time for laboratory analysis, relevant data is sparse on individually defined holding times and, thus, some of the holding times appear to be arbitrary and/or politically driven. Holding times appear to be arbitrary when a single value is applied over a large general class of compounds (e.g., pesticides or polyaromatic hydrocarbons); when the holding time was originally "established" for aqueous media and then blindly applied to other media (e.g., sediments and tissues); or when a contaminant is known to be chemically highly stable and will still be present in the sample even if the sample is not extracted in the regulatory time frame. For example, if PCBs significantly degraded after 7 days, then there would not be an environmental problem with PCBs today."

Another reason for conservatism in hold time guidelines is that a single guideline will be applied to a vast majority of sample types and compositions. A hold time guideline that is appropriate for a wastewater with complex chemical and microbiological composition may be overly conservative for less complex samples. Thus, it is important to note that for many test parameters and for many sample types, no noticeable degradation or change to results will be observed long after the recommended hold time has passed.

Apart from microbiological test requirements pertaining to human health and drinking water, we are not aware of any Canadian regulatory agencies that normally reject or invalidate laboratory test results solely because of hold time exceedances, especially where the exceedance is marginal.

Because of the conservatism applied in the establishment of most hold time guidelines, one can generally assume that the integrity of samples tested *within* the recommended hold time will be reliable if the samples have been stored under appropriate conditions (for many tests, this means under refrigeration). Although analysis within the recommended hold time is of course advisable, and is always the objective of the laboratory, it is important to understand that sample integrity is not immediately compromised once the recommended hold time has elapsed.

When analytical hold times are exceeded, it is common practice to apply professional judgement in order to determine whether the results are useable and fit for purpose. Part of this assessment should include whether the sample was appropriately preserved, whether it was appropriately stored, and whether the magnitude of the hold time exceedance was substantial. In many cases, such results are simply flagged as "estimates" to indicate that their degree of uncertainty may be higher than usual. This is a common approach used under the US EPA Contract Laboratory Program.

Another factor that may help with the evaluation of the potential impact of hold time exceedances is a comparison against historical data or with other available analytical results from related or similar samples, if available (e.g. other samples collected from the same site).

ADDRESS 8081 Lougheed Highway, Burnaby British Columbia V5A 1W9 Canada | PHONE +1 604 253 4188 | FAX +1 604 253 6700
ALS CANADA LIMITED Part of the ALS Group A Campbell Brothers Limited Company

Attachment E
2014 Surface Water Monitoring Report

March 31, 2015
Nichols Project No. 15-099-TSB

Via E-mail: tbefus@tervita.com
Original Will Remain on File

Tervita Corporation
500, 140 - 10 Avenue SE
Calgary, Alberta
T2G 0R1

ATTN: Mr. Trevor Befus
Manager, Operational Compliance

RE: 2014 Surface Water Monitoring Report
Silverberry Landfill
A-08-088-20-W6M, British Columbia

Dear Mr. Befus:

Nichols Environmental (Canada) Ltd. is pleased to present this summary report of the 2014 Surface Water Discharge for Tervita Corporation (Tervita) for the Silverberry Landfill. This facility is at a location legally described as 16-07-088-20-W6M, approximately 45 kilometres (km) northwest of Fort St. John, British Columbia (herein referred to as the 'Site'). Figure 1 (attached) shows the location of the Site relative to the surrounding area.

BACKGROUND

The facility is located within the Peace River Regional District, northwest of the City of Fort St. John, British Columbia. The Site consists of the Tervita Silverberry Landfill whose facilities are located to the north and east of the Tervita Silverberry Treatment, Recovery and Disposal (TRD) facility, with which it shares central access.

Tervita's Silverberry Landfill facility was granted an operating permit (No. 17150) on October 18, 2002, pursuant to the Waste Management Act which has since been appealed and is now the *Environmental Management Act*. The permit was last amended on February 21, 2012.

The Silverberry Landfill accepts solid hazardous wastes in accordance with the Hazardous Waste Regulation of the Environmental Management Act and the operating permit and approved operational plan. The Tervita Silverberry landfill is also the only facility in British Columbia licensed to accept naturally occurring radioactive material (NORM) that exceeds federal and provincial guidelines.

The surface drainage network on the Site is shared between the Landfill and TRD and collects surface waters from across the Site and directs flows to the Stormwater Pond located to the west of the TRD. All collected surface waters are retained in the

NICHOLS ENVIRONMENTAL

Nichols Environmental (Canada) Ltd.

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17331 - 107th Avenue
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F: 780 484 5093

Southern Region:
427 Manitou Road SE
Calgary, Alberta
T2G 4C2

P: 403 452 1820
F: 403 984 8803

Stormwater Pond, which is sampled prior to discharge to the environment. The location of the Stormwater Pond in relation the Site is presented on Figure 2.

The adjoining TRD facility activities consist of the treatment, storage, and recovery of oilfield wastes such as sludges, wastewater, pigging waste, drilling sump material, contaminated debris, and crude oil. Onsite facilities which may pose as a potential source of environmental impact include the aboveground storage tank (AST) containment area, flare stack, and all processing, terminal, and treatment areas. Leachate collected from the landfill is also disposed of by the Silverberry TRD.

ASSESSMENT GUIDELINES

Regulatory Framework

The analytical results are presented in the context of the British Columbia Ministry of Environment's (BC MOE's) Contaminated Sites Regulations (BC CSR 1997). The most recent amendment (Stage 9) to the BC CSR was issued in January 2014, and is reflected in this assessment. The BC CSR was developed to provide a system to ensure that contaminated soil, surface water, sediments and groundwater are cleaned up to scientifically based standards for sites in British Columbia.

Under the BC CSR, there are two types of remediation standards for a particular site; Numerical Standards, and Risk-Based Standards. The Numerical Standards refer to concentrations of given substances in soil or groundwater for a particular land use or a particular land use and site-specific exposure pathway. Generic Numerical Standards for some substances are applied to a site based on the applicable land use of that site, while Matrix Numerical Standards are applied for some substances in soil, taking into account various site-specific factors such as proximity to receiving waters, likelihood of human ingestion, and use of land for livestock rearing. The second type of remediation standard is the site-specific risk-based standard, which involves the generation of a standard for a specific site based on a risk assessment protocol by BC MOE.

The above remediation criteria may be used as benchmarks to evaluate the need for further investigation, remediation or to guide in the establishment of land-use restrictions. The water use pathways required to be assessed for applicability to the Site include the Drinking Water (DW) pathway, the Marine/Estuarine Aquatic Life pathway (MW), the Irrigation pathway (IW), the Livestock pathway (LW), and the Freshwater Aquatic Life pathway (FW).

Water Use Assessment

The Property is situated within an area of predominately natural land use with some surrounding oil and gas and forestry related activities. The are no adjacent agricultural land uses, however, agricultural activities are present to the northeast of the Site and the Site is within the provincial Agriculture Land Reserve (ALR).

Several lakes were noted within a 10-km radius of the Site including two unnamed lakes (approximately 4.5 km east), as well as several oxbow lakes located to the north along the Blueberry River system. Two small unnamed creeks are located to the immediate north and west

of the Site that are tributary to the Blueberry River, which is located approximately 6.5 km to the north.

The topography of the Site is generally flat, with a local area slope generally to the northwest toward the Blueberry River system. A surface water collection ditch is present across the Site and to the east, south, and west of the TRD's processing infrastructure, through which storm and melt waters are directed to the Stormwater Pond located towards the west perimeter of the Site. Based on previous assessments groundwater flow direction is to the north by northwest.

Based on the current land uses, all drinking water use pathways would be operative with the exception of the marine/estuarine aquatic life (MW) pathway.

RESULTS

Nichols Environmental reviewed the laboratory analysis completed on samples collected from the Stormwater Pond by Tervita personnel. Samples were collected on May 12, 2014, and July 11, 2014.

Surface water samples collected from the Stormwater Pond on May 12, 2014, were submitted for laboratory analysis of metals, nutrients and water quality, phenols, and oil and grease. Surface water samples collected from the Stormwater Pond on July 11, 2014, were submitted for laboratory analysis of metals, nutrients and water quality, petroleum hydrocarbons and oil and grease. The results of these analyses are discussed below.

Surface Water Analysis - Metals

The results metals analyses reported concentrations for all analysed parameters that were below their respective standards, where applicable. The results of the metals analyses are presented in Table 1 (attached).

Surface Water Analysis - Nutrients and Water Quality

The results of the nutrients and water quality analyses reported concentrations for all analysed parameters that were below their respective standards, where applicable. The results of the nutrients and water quality analyses are presented in Table 2.

Surface Water Analysis - Petroleum Hydrocarbons

The results of the PHC analyses reported detectable concentrations of xylenes (1 parts per billion [ppb]) in the July 11, 2014, sample, which was below the applicable standard of 300 ppb. Concentrations of all other parameters were below their respective laboratory method detection limits (MDLs) and standards, where applicable. The results of the PHC analyses are presented in Table 3.

Surface Water Analysis - Phenols

The results of the May 12, 2014, reported detectable concentrations of phenols (5.1 ppb), which was below the most conservative applicable standard of 10 ppb. Concentrations of all other parameters were below their respective laboratory MDLs and standards, where applicable. The results of the May 12, 2014, phenols analyses are presented in Table 4.

A copy of the final signed groundwater laboratory reports is attached.

CONCLUSIONS

Nichols Environmental has completed the 2014 Surface Water Monitoring Report for the Silverberry Landfill at A-08-088-20-W6M, British Columbia. The field and analytical results are summarized as follows:

- Surface water samples were collected from the Storm Pond on May 12, 2014, and July 11, 2014, and submitted for laboratory analysis of select metals, nutrients and water quality, phenols, and PHC parameters;
- All analytical results were compared to the BC CSR standards for the DW, IW, LW, and FW pathways;
- All concentrations were reported below their respective laboratory MDLs and/or BC CSR standards, where applicable; and
- It is the opinion of Nichols Environmental that there were no deleterious effects on the environment due to surface water discharge from the Silverberry Landfill.

LIMITATIONS

In conducting the 2014 Surface Water Monitoring Report at the Property and in rendering our conclusions on the potential presence or level of contamination, Nichols Environmental (Canada) Ltd. gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of investigation. Our conclusions are limited by the following:

- Nichols Environmental spent only a limited amount of time on the Property. Thus, any activities conducted on the Property following the site inspection that Nichols Environmental is not aware of may have an impact on the conclusions and recommendations presented;
- The sampling areas were limited to the sample locations outlined in Figure 2; and
- It was not possible to test for all forms of contamination at each and every location in the study areas. Although site-specific locations were used during testing, it is our opinion that the information obtained is representative of the conditions at the time the assessment was conducted.

This report is intended to provide information to reduce, but not necessarily eliminate, uncertainty regarding the potential for contamination of a property. This report has been prepared for the exclusive use of Tervita Corporation for the purpose of assessing the current environmental conditions that may be present at the Property. Any uses which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Nichols Environmental (Canada) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

CLOSURE

We trust this meets your current requirements. If you have any questions, please contact our office at (780) 484-3377 at your convenience.

Yours truly,
NICHOLS ENVIRONMENTAL (CANADA) LTD.

Sean Kennelly, E.I.T.
Environmental Engineer

Reviewed by:

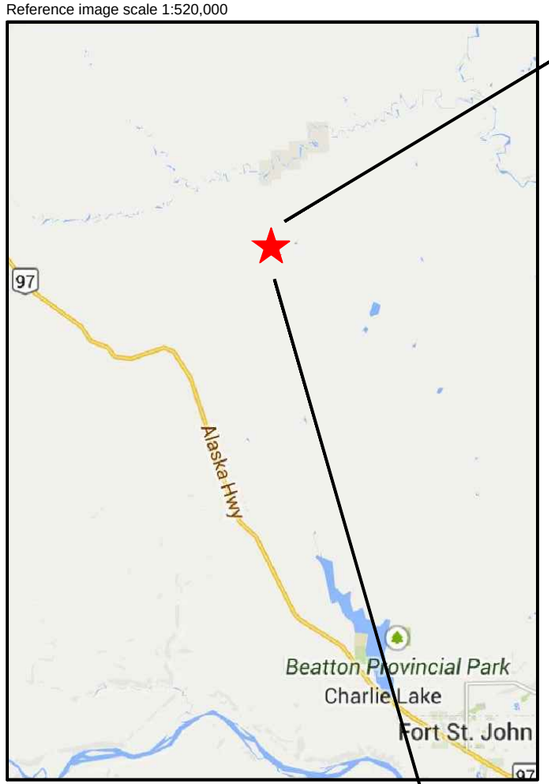
Barry Rakewich, P.Ag.
General Manager - Environment

SK/br

Attachments

cc: Paul Mraz, Tervita Corporation (via email: pmraz@tervita.com)
Peter Nelson, Tervita Corporation (via email: pnelson@tervita.com)

Reference image scale 1:520,000



Legend:

Approximate Site Boundary

2011 Air Photo Source: Bing Maps

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-85 0 85 170 255m

CLIENT
Tervita Corporation

PROJECT
2014 Surface Water Monitoring Report
Silverberry Landfill Block A
18-088-20 W6M, British Columbia

DRAWING TITLE
Site Location

BASE/SITE PLAN PROVIDED BY
NLR/AE Consultants,
Project No. 20123525-35-307

REVISION DATE
March 2015

SCALE	APPROVED
1:9,000	SK/KK

PROJECT NO.
15-099-TSB

DRAWING NO.
Figure 1

DRAWINGS COMPILED BY NLR/AE CONSULTANTS.

CP35972	6279403.182	612765.774	772.289
CP800	6279297.037	612782.953	775.291
CP720	6279303.978	613346.688	780.958
CP770	6279364.932	613899.358	776.345
SCM 218205	6282991.309	610625.482	779.995
BM3970	6278859.866	612765.315	780.503

SEC. 18 – TWP 88 – RGE 20 – W6

SEC. 17 – TWP 88 – RGE 20 – W6

BRASS MONUMENT
N 6280402.537
E 612701.289

CELL 3

TREATMENT FACILITY

CELL 2

CELL 1

CELL 4

EXISTING SUBSOIL STOCKPILE

EXISTING CLAY STOCKPILE

EXISTING TOPSOIL STOCKPILE

SPIKE
N 6279449.751
E 612727.977

GEOD-EXIC-SM
CP #35972

EXISTING 10m WIDE ACCESS ROAD

N 6279474.433
E 613951.437

SECTION LINE (TYP.)

Storm Pond

EXISTING TRO FACILITY

CP 800

CP 770

CP 720

EXISTING CELL 1

EXISTING CELL 2

EXISTING CELL 3

NEW CELL 4

EXISTING FENCE

775 m

775 m

785 m

785 m

790 m

795 m

GEODESIC-SM
HUB TAG #2970
N 6278833.655
E 612744.001

6m WIDE ACCESS ROAD

BEATON RIVER AIRPORT ROAD

CANADIAN NATIONAL RAILWAY

UNION R/W PLAN 21880

SEC. 7 – TWP 88 – RGE 20 – W6

SEC. 8 – TWP 88 – RGE 20 – W6

Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012.

NICHOLS ENVIRONMENTAL (CANADA) LTD.

100 0 100 200 300m

CLIENT
Tervita Corporation

PROJECT
2014 Surface Water Monitoring Report
Silverberry Landfill Block A
18-088-20 W6M, British Columbia

DRAWING TITLE
Site Detail

BASE/SITE PLAN PROVIDED BY
NLR/AE Consultants,
Project No. 20123525-35-307

REVISION DATE
March 2015

SCALE	APPROVED
1:10,000	SK/KK

PROJECT NO.
15-099-TSB

DRAWING NO.
Figure 2

Nichols Environmental (Canada) Ltd.

TABLE: 1

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - METALS

PROJECT#: 15-099-TSB
CLIENT: Tervita Corporation
PROJECT: 2014 Surface Water Monitoring Report
SITE: Silverberry Landfill
LOCATION: Block A 18-088-20 W6M, British Columbia

	BC Standards*														
Land Use	**Aluminum**	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Bismuth**	**Boron**	**Cadmium****	**Chromium (III)**	**Cobalt**	**Copper****	**Cyanide^{WAD}**	**Fluoride****	**Iron**	**Lead****
Freshwater Aquatic Life	**--**	**200**	**50**	**10,000**	**53**	**--**	**50000**	**0.5**	**90**	**40**	**50**	**50**	**3,000**	**--**	**60**
Marine/Estuarine Aquatic Life	---	200	125	5,000	1,000	---	50,000	1	560	40	20	10	15,000	---	20
Irrigation	**5,000**	**----**	**100**	**----**	**100**	**----**	**500**	**5**	**5**	**50**	**200**	**----**	**1,000**	**5,000**	**200**
Livestock	**5,000**	**-----**	**25**	**-----**	**100**	**-----**	**5,000**	**80**	**50**	**1,000**	**300**	**-----**	**1,000**	**-----**	**100**
Drinking Water	**9,500**	**6**	**10**	**1,000**	**------**	**------**	**5000.00001**		**50**	**------**	**1,000**	**------**	**1,500**	**6,500**	**10**

					Aluminum	**Antimony**	**Arsenic**	**Barium**	**Beryllium**	**Bismuth**	**Boron**	**Cadmium**	**Chromium (III)**	**Cobalt**	**Copper**	**Cyanide^{WAD}**	**Fluoride**	**Iron**	**Lead**
Land Use					**5,000**	**6**	**10**	**1,000**	**53**	**---**	**500**	**0.5**	**5**	**40**	**50**	**50**	**1,000**	**5,000**	**10**
Sample ID	**Date**	**pH**	**Sulphate**	**$CaCO_3$ (mg/L)**															
Storm Pond	12-May-2014	7.88	63,600	112	2,810	<5.0	1.2	85	<5	<200	<100	<0.05	3.86	5.3	3.9	<5	164	1360	1.2
Storm Pond	11-Jul-2014	8.17	189,000	148	324	<0.2	0.8	58	<0.1	<0.5	61	0.015	0.8	0.2	3	NM	NM	273	0.2

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 4/2014 - Schedule 6, Strontium, Lithium - Schedule 10)
(All concentrations in µg/L = ppb, unless noted)

ORP = Oxygen Redox Potential (mV)
** = Hardness Dependent, See Guidelines for Guidance
pH = pH Dependent, See Guidelines for Guidance
WAD = Weak Acid Dissociable
SAD = Strong Acid Dissociable
crops = Use 20 ug/L for continuous application on crops or use 50 ug/L for intermittent application on crops.
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 1

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - METALS

PROJECT#: 15-099-TSB
CLIENT: Tervita Corporation
PROJECT: 2014 Surface Water Monitoring Report
SITE: Silverberry Landfill
LOCATION: Block A 18-088-20 W6M, British Columbia

	BC Standards*																
Land Use	**Lithium**	**Manganese**	**Mercury**	**Molybdenum**	**Nickel****	**Selenium**	**Silicon**	**Silver****	**Strontium**	**Sulfur**	**Thallium**	**Tin**	**Titanium**	**Uranium**	**Vanadium**	**Zinc****	**Zirconium**
Freshwater Aquatic Life	**--**	**--**	**1**	**10,000**	**650**	**10**	**--**	**15**	**--**	**--**	**3**	**--**	**1,000**	**3000**	**--**	**900**	**--**
Marine/Estuarine Aquatic Life	---	---	1	10,000	83	540	---	15	---	---	---	---	---	1,000	---	100	---
Irrigation	**2,500**	**200**	**1**	**10 - 30**	**200**	**20 or 50** crops	**----**	**---**	**----**	**----**	**----**	**----**	**----**	**10**	**100**	**5,000**	**----**
Livestock	**5,000**	**-----**	**2**	**50**	**1,000**	**50**	**-----**	**----**	**-----**	**-----**	**-----**	**-----**	**-----**	**200**	**100**	**2,000**	**-----**
Drinking Water	**730**		**550**		**------**	**10**	**------**	**-----**	**22,000**	**------**	**------**	**22,000**	**------**		**20**		**------**

					Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silicon	Silver	Strontium	Sulfur	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc**	Zirconium
Land Use					**730**	**200**	**1**	**50**	**200**	**10**	**---**	**15**	**22,000**	**---**	**3**	**22,000**	**1,000**	**10**	**100**	**900**	**---**
Sample ID	**Date**	**pH**	**Sulphate**	**$CaCO_3$ (mg/L)**																	
Storm Pond	12-May-2014	7.88	63,600	112	50	210	<0.05	1	5	<1	<1	<0.05	112	NM	2	<30	129	0.42	<30	11.1	NM
Storm Pond	11-Jul-2014	8.17	189,000	148	4	NM	<0.005	<1	2.9	0.5	1,170	<0.01	142	63,000	<0.05	<1	13.2	<0.5	1.2	7	<1

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 4/2014 - Schedule 6, Strontium, Lithium - Schedule 10)
(All concentrations in µg/L = ppb, unless noted)
ORP = Oxygen Redox Potential (mV)
** = Hardness Dependent, See Guidelines for Guidance
pH = pH Dependent, See Guidelines for Guidance
WAD = Weak Acid Dissociable
SAD = Strong Acid Dissociable
crops = Use 20 ug/L for continuous application on crops or use 50 ug/L for intermittent application on crops.
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 2

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - NUTRIENTS/QUALITY

PROJECT#: 15-099-TSB
CLIENT: Tervita Corporation
PROJECT: 2014 Surface Water Monitoring Report
SITE: Silverberry Landfill
LOCATION: Block A 18-088-20 W6M, British Columbia

	BC Standards*												
BC Standards*	**Ammonia****	**BOD (mg/L)**	**Bromide (mg/L)**	**Calcium (mg/L)**	**Chloride (mg/L)**	**Magnesium (mg/L)**	**Manganese**	**Nitrate (mg/L)**	**Nitrite*** (mg/L)**	**Sodium (mg/L)**	**Sulphate (mg/L)**	**TSS (mg/L)**	**Trout Bioassay (LC50)**
Freshwater Aquatic Life	**3,700**	**--**	**--**	**--**	**1,500**	**--**	**--**	**400**	**800**	**--**	**1,000**	**--**	**--**
Marine/Estuarine Aquatic Life	2,300 to 200,000	---	---	---	---	---	---	400	800	---	1,000	---	---
Irrigation	**----**	**----**	**----**	**----**	**100**	**----**	**200**	**----**	**----**	**----**	**----**	**----**	**----**
Livestock	**-----**	**-----**	**-----**	**1,000**	**600**	**-----**	**-----**	**100**	**10**	**-----**	**1,000**	**-----**	**-----**
Drinking Water	**------**	**------**	**------**	**------**	**250**	**100**	**550**	**10**	**3.2**	**200**	**500**	**------**	**------**

				Ammonia**	BOD (mg/L)	Bromide (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Magnesium (mg/L)	Manganese	Nitrate (mg/L)	Nitrite (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	TSS (mg/L)	Trout Bioassay (LC50)
Land Use				**3,700**	**---**	**---**	**1,000**	**100**	**100**	**200**	**10**	**3**	**200**	**500**	**---**	**0**
Sample ID	**Date**	**pH**	**Temp (°C)**													
Storm Pond	12-May-2014	7.88	22	15.7	2.2	<0.050	30.4	6.31	8.86	21	0.0388	<0.0010	3.9	63.6	33.3	>100%
Storm Pond	11-Jul-2014	8.17	22.9	NM	NM	NM	40.4	11.7	11.4	10	NM	NM	5.1	189	<2	NM

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 4/2014 - Schedule 6)
(All concentrations in µg/L = ppb, unless noted)
DO = Dissolved Oxygen
** = pH Dependent, See Guidelines for Guidance
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 3

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - PETROLEUM HYDROCARBONS

PROJECT#: 15-099-TSB
CLIENT: Tervita Corporation
PROJECT: 2014 Surface Water Monitoring Report
SITE: Silverberry Landfill
LOCATION: Block A 18-088-20 W6M, British Columbia

BC Standards*									
Land Use	**Benzene**	**Toluene**	**Ethylbenzene**	**Xylenes**	**Styrene**	**MTBE**	**VPH_w**	**$VH_{w\ 6\text{-}10}$**	**Oil & Grease (mg/L)**
Freshwater Aquatic Life	**4,000**	**390**	**2,000**	**--**	**720**	**34,000**	**1,500**	**15,000**	**--**
Marine/Estuarine Aquatic Life	1,000	3,300	2,500	---	720	4,400	1,500	15,000	---
Irrigation	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**----**
Livestock	**-----**	**-----**	**-----**	**-----**	**-----**	**11,000**	**-----**	**15,000**	**-----**
Drinking Water	**5**	**24**	**2.4**	**300**	**------**	**15**	**------**	**15,000**	**------**

		Benzene	**Toluene**	**Ethylbenzene**	**Xylenes**	**Styrene**	**MTBE**	**VPH_w**	**VHw 6-10**	**Oil & Grease (mg/L)**
Land Use		**5**	**24**	**2.4**	**300**	**720**	**15**	**1,500**	**15,000**	**---**
Sample ID	**Date**									
Storm Pond	12-May-2014	NM	NM	NM	NM	NM	NM	NM	NM	<5
Storm Pond	11-Jul-2014	<1	<1	<1	1	<1	<1	<50	<50	<5

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 4/2014 - Schedule 6)
(All concentrations in µg/L = ppb, unless noted)

OVC = Organic Vapour Concentration (ppmv)
MTBE = Methyl tertiary butyl ether
VPH_w = Volatile petroleum hydrocarbons with the exception of benzene, toluene, ethylbenzene and xylenes.
$LEPH_w$ = Light extractable petroleum hydrocarbons with the exception of benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, debenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene.
$VH_{w\ 6\text{-}10}$ = Included volatile petroleum hydrocarbons.
$EH_{w\ 10\text{-}19}$ = Includes light extractable petroleum hydrocarbons.
$HEPH_w$ = Heavy extractable petroleum hydrocarbons with the exception of benzo(a)anthrancene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene and pyrene.
ND = Non-detect (<0.1 ppmv OVC)
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 4

TITLE: **GENERIC NUMERICAL STANDARDS FOR WATER - PHENOLS**

PROJECT#: 15-099-TSB
CLIENT: Tervita Corporation
PROJECT: 2014 Surface Water Monitoring Report
SITE: Silverberry Landfill
LOCATION: Block A 18-088-20 W6M, British Columbia

Sample ID	Storm Pond	BC Generic Numerical Soil Criteria*				
Date	12-May-2014	AW	MW	IW	LW	DW
Cresol	<1.0	-	--	---	----	-----
Dichlorophenol (3,4-)	<0.5	-	--	---	----	-----
Dichlorophenol (3,5-)	<0.5	-	--	---	----	-----
Dimethylphenol (2,4-)	<1.0	-	--	---	----	**730**
Dinitrophenol (2,4-)	<10	-	--	---	----	-----
Nitrophenol (2-)	<1.0	-	--	---	----	-----
Nitrophenol (4-)	<5.0	-	--	---	----	-----
Pentachlorophenol	<0.5	**1**	1	---	**30**	**30**
Phenol	5.1	**10**	--	---	----	**11,000**
Tetrachlorophenols (2,3,4,5-)	<0.5	-	--	---	----	-----
Tetrachlorophenols (2,3,4,6-)	<0.5	-	--	---	----	-----
Tetrachlorophenols (2,3,5,6-)	<0.5	-	--	---	----	-----
Total PCBs	<0.5	-	--	---	----	-----
Trichlorophenols (2,3,4-)	<0.5	-	--	---	----	-----
Trichlorophenols (2,3,5-)	<0.5	-	--	---	----	-----
Trichlorophenols (2,3,6-)	<0.5	-	--	---	----	-----
Trichlorophenols (2,4,5-)	<0.5	-	--	---	----	-----
Trichlorophenols (2,4,6-)	<0.5	-	--	---	----	-----
Trichlorophenols (3,4,5-)	<0.5	-	--	---	----	-----

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Soil Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 4/2014 - Schedule 6 & 10)
(All concentrations in ug/L = ppb, unless noted)

OVC = Organic Vapour Concentration (ppmv)
ND = Non-detect (<0.1 ppmv OVC)
--- = No Value Provided in Guidelines

TERVITA CORPORATION - PLANT# 1334 -
SILVERBERRY LANDFILL
ATTN: Lisa Jordan
10125 - 100 St.
Fort St. John BC V1J 3Y8

Date Received: 12-MAY-14
Report Date: 16-JUN-14 21:18 (MT)
Version: FINAL

Client Phone: 250-827-6834

Certificate of Analysis

Lab Work Order #: **L1454055**
Project P.O. #: 310-0000005728
Job Reference: STORM POND
C of C Numbers: 10-146460
Legal Site Desc: A-08-088-20W6M

Geoff Archibald
Account Manager

ADDRESS: Box 256, 9831 - 98A Avenue, Fort St John, BC V1J 6W7 Canada | Phone: +1 250 261 5517 | Fax: +1 250 261 5587
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1454055-1 STORM POND							
Sampled By: CLIENT on 12-MAY-14 @ 15:00							
Matrix: LIQUID							
Anions by Ion Chromatography							
Bromide by Ion Chromatography							
Bromide (Br)	<0.050		0.050	mg/L		14-MAY-14	R2839429
Chloride by Ion Chromatography							
Chloride (Cl)	6.31		0.50	mg/L		14-MAY-14	R2839429
Fluoride by Ion Chromatography							
Fluoride (F)	0.164		0.020	mg/L		14-MAY-14	R2839429
Nitrate in Water by Ion Chromatography							
Nitrate (as N)	0.0388		0.0050	mg/L		14-MAY-14	R2839429
Nitrite in Water by Ion Chromatography							
Nitrite (as N)	<0.0010		0.0010	mg/L		14-MAY-14	R2839429
Sulfate by Ion Chromatography							
Sulfate (SO4)	63.6		0.50	mg/L		14-MAY-14	R2839429
Dissolved Metals in Water (CSR) + ICP							
Dissolved Metals in Water by ICPMS(Low)							
Dissolved Metals Filtration Location	FIELD					15-MAY-14	R2838780
Aluminum (Al)-Dissolved	2.81		0.010	mg/L	15-MAY-14	20-MAY-14	R2842429
Antimony (Sb)-Dissolved	<0.00050		0.00050	mg/L	15-MAY-14	20-MAY-14	R2842429
Arsenic (As)-Dissolved	0.0012		0.0010	mg/L	15-MAY-14	20-MAY-14	R2842429
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L	15-MAY-14	20-MAY-14	R2842429
Chromium (Cr)-Dissolved	0.00386	DTC	0.00050	mg/L	15-MAY-14	20-MAY-14	R2842429
Cobalt (Co)-Dissolved	0.00053		0.00050	mg/L	15-MAY-14	20-MAY-14	R2842429
Copper (Cu)-Dissolved	0.0039		0.0010	mg/L	15-MAY-14	20-MAY-14	R2842429
Lead (Pb)-Dissolved	0.0012		0.0010	mg/L	15-MAY-14	20-MAY-14	R2842429
Molybdenum (Mo)-Dissolved	<0.0010		0.0010	mg/L	15-MAY-14	20-MAY-14	R2842429
Nickel (Ni)-Dissolved	<0.0050		0.0050	mg/L	15-MAY-14	20-MAY-14	R2842429
Selenium (Se)-Dissolved	<0.0010		0.0010	mg/L	15-MAY-14	20-MAY-14	R2842429
Silver (Ag)-Dissolved	<0.000050		0.000050	mg/L	15-MAY-14	20-MAY-14	R2842429
Thallium (Tl)-Dissolved	<0.00020		0.00020	mg/L	15-MAY-14	20-MAY-14	R2842429
Uranium (U)-Dissolved	0.00042		0.00020	mg/L	15-MAY-14	20-MAY-14	R2842429
Dissolved Metals in Water by ICPOES							
Dissolved Metals Filtration Location	FIELD					15-MAY-14	R2838780
Barium (Ba)-Dissolved	0.085		0.020	mg/L	15-MAY-14	15-MAY-14	R2840531
Beryllium (Be)-Dissolved	<0.0050		0.0050	mg/L	15-MAY-14	15-MAY-14	R2840531
Bismuth (Bi)-Dissolved	<0.20		0.20	mg/L	15-MAY-14	15-MAY-14	R2840531
Boron (B)-Dissolved	<0.10		0.10	mg/L	15-MAY-14	15-MAY-14	R2840531
Calcium (Ca)-Dissolved	30.4		0.10	mg/L	15-MAY-14	15-MAY-14	R2840531
Iron (Fe)-Dissolved	1.36		0.030	mg/L	15-MAY-14	15-MAY-14	R2840531
Lithium (Li)-Dissolved	<0.050		0.050	mg/L	15-MAY-14	15-MAY-14	R2840531
Magnesium (Mg)-Dissolved	8.86		0.10	mg/L	15-MAY-14	15-MAY-14	R2840531
Manganese (Mn)-Dissolved	0.021		0.010	mg/L	15-MAY-14	15-MAY-14	R2840531
Phosphorus (P)-Dissolved	<0.30		0.30	mg/L	15-MAY-14	15-MAY-14	R2840531
Potassium (K)-Dissolved	4.3		2.0	mg/L	15-MAY-14	15-MAY-14	R2840531
Silicon (Si)-Dissolved	7.03		0.050	mg/L	15-MAY-14	15-MAY-14	R2840531
Sodium (Na)-Dissolved	3.9		2.0	mg/L	15-MAY-14	15-MAY-14	R2840531
Strontium (Sr)-Dissolved	0.112		0.0050	mg/L	15-MAY-14	15-MAY-14	R2840531
Tin (Sn)-Dissolved	<0.030		0.030	mg/L	15-MAY-14	15-MAY-14	R2840531
Titanium (Ti)-Dissolved	0.129		0.050	mg/L	15-MAY-14	15-MAY-14	R2840531
Vanadium (V)-Dissolved	<0.030		0.030	mg/L	15-MAY-14	15-MAY-14	R2840531
Zinc (Zn)-Dissolved	0.0111		0.0050	mg/L	15-MAY-14	15-MAY-14	R2840531
Hardness							
Hardness (as CaCO3)	112		0.50	mg/L		21-MAY-14	
Single Metal in Water by ICPMS (Total)							

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1454055-1 STORM POND							
Sampled By: CLIENT on 12-MAY-14 @ 15:00							
Matrix: LIQUID							
Total Metals in Water by CRC ICPMS							
Chromium (Cr)-Total	0.00143		0.00010	mg/L		16-MAY-14	R2841410
Miscellaneous Parameters							
Ammonia, Total (as N)	0.0157		0.0050	mg/L		20-MAY-14	R2841748
BOD	2.2		2.0	mg/L		14-MAY-14	R2840859
Hexavalent Chromium-Dissolved	<0.0010		0.0010	mg/L		16-MAY-14	R2842377
Oil and Grease	<5.0		5.0	mg/L		15-MAY-14	R2840071
Phenols (4AAP)	0.0051		0.0010	mg/L		15-MAY-14	R2839144
pH / Conductivity Sample Temperature	22		-50	C		15-MAY-14	R2838391
Mercury (Hg)-Total	<0.000050		0.000050	mg/L		15-MAY-14	R2839586
Total Polychlorinated Biphenyls	<0.0010		0.0010	mg/L		21-MAY-14	
Total Suspended Solids	33.3		3.0	mg/L		14-MAY-14	R2839261
Trout Bioassay LC50	See attached.				16-MAY-14	16-MAY-14	R2842122
Cyanide, Weak Acid Diss	<0.0050		0.0050	mg/L		15-MAY-14	R2839603
pH	7.86		0.10	pH		15-MAY-14	R2838391
Chlorinated and Non-Chlorinated Phenols							
2,3,4,5-Tetrachlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3,4,6-Tetrachlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3,4-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3,5,6-Tetrachlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3,5-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3,6-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,3-Dichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,4 & 2,5-Dichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,4,5-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,4,6-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2,4-Dimethylphenol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
2,4-Dinitrophenol	<0.010		0.010	mg/L	16-MAY-14	22-MAY-14	R2844301
2,6-Dichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2-Chlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
2-Nitrophenol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
3,4,5-Trichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
3,4-Dichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
3,5-Dichlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
3-Chlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
4,6-Dinitro-2-methylphenol	<0.010		0.010	mg/L	16-MAY-14	22-MAY-14	R2844301
4-Chloro-3-methylphenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
4-Chlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
4-Nitrophenol	<0.0050		0.0050	mg/L	16-MAY-14	22-MAY-14	R2844301
Pentachlorophenol	<0.00050		0.00050	mg/L	16-MAY-14	22-MAY-14	R2844301
Phenol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
m-Cresol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
o-Cresol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
p-Cresol	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
Total Cresols	<0.0010		0.0010	mg/L	16-MAY-14	22-MAY-14	R2844301
Surrogate: 2-Fluorophenol	76.1		20-130	%	16-MAY-14	22-MAY-14	R2844301
Surrogate: Phenol d5	54.7		20-130	%	16-MAY-14	22-MAY-14	R2844301
Surrogate: 2,4,6-Tribromophenol	125.2		40-130	%	16-MAY-14	22-MAY-14	R2844301
PCB by Extraction with GCECD							
PCB-1016	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1221	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1454055-1 STORM POND							
Sampled By: CLIENT on 12-MAY-14 @ 15:00							
Matrix: LIQUID							
PCB by Extraction with GCECD							
PCB-1232	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1242	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1248	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1254	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1260	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1262	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
PCB-1268	<0.0010		0.0010	mg/L	16-MAY-14	20-MAY-14	R2841719
Dioxins and Furans HR 1613B							
2,3,7,8-TCDD	<0.32	[U]	0.32	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,7,8-PeCDD	<0.14	[U]	0.14	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,4,7,8-HxCDD	<0.13	[U]	0.13	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,6,7,8-HxCDD	<0.13	[U]	0.13	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,7,8,9-HxCDD	<0.13	[U]	0.13	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,4,6,7,8-HpCDD	0.38	J,R	0.11	pg/L	06-JUN-14	14-JUN-14	R2862470
OCDD	1.20	J,R	0.097	pg/L	06-JUN-14	14-JUN-14	R2862470
2,3,7,8-TCDF	<0.29	[U]	0.29	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,7,8-PeCDF	0.21	M,J,B	0.14	pg/L	06-JUN-14	14-JUN-14	R2862470
2,3,4,7,8-PeCDF	<0.12	[U]	0.12	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,4,7,8-HxCDF	<0.068	[U]	0.068	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,6,7,8-HxCDF	<0.061	[U]	0.061	pg/L	06-JUN-14	14-JUN-14	R2862470
2,3,4,6,7,8-HxCDF	<0.060	[U]	0.060	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,7,8,9-HxCDF	0.510	J,B	0.082	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,4,6,7,8-HpCDF	<0.12	[U]	0.12	pg/L	06-JUN-14	14-JUN-14	R2862470
1,2,3,4,7,8,9-HpCDF	<0.18	[U]	0.18	pg/L	06-JUN-14	14-JUN-14	R2862470
OCDF	0.23	M,J	0.12	pg/L	06-JUN-14	14-JUN-14	R2862470
Total-TCDD	<0.32	[U]	0.32	pg/L	06-JUN-14	14-JUN-14	R2862470
Total TCDD # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Total-PeCDD	<0.14	[U]	0.14	pg/L	06-JUN-14	14-JUN-14	R2862470
Total PeCDD # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Total-HxCDD	<0.13	[U]	0.13	pg/L	06-JUN-14	14-JUN-14	R2862470
Total HxCDD # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Total-HpCDD	<0.11	[U]	0.11	pg/L	06-JUN-14	14-JUN-14	R2862470
Total HpCDD # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Total-TCDF	<0.29	[U]	0.29	pg/L	06-JUN-14	14-JUN-14	R2862470
Total TCDF # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Total-PeCDF	0.21		0.14	pg/L	06-JUN-14	14-JUN-14	R2862470
Total PeCDF # Homologues	1				06-JUN-14	14-JUN-14	R2862470
Total-HxCDF	1.48		0.082	pg/L	06-JUN-14	14-JUN-14	R2862470
Total HxCDF # Homologues	2				06-JUN-14	14-JUN-14	R2862470
Total-HpCDF	<0.18	[U]	0.18	pg/L	06-JUN-14	14-JUN-14	R2862470
Total HpCDF # Homologues	0				06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-2,3,7,8-TCDD	75.0		20-175	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,7,8-PeCDD	94.0		21-227	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,4,7,8-HxCDD	76.0		21-193	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,6,7,8-HxCDD	98.0		25-163	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,4,6,7,8-HpCDD	82.0		23-166	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-OCDD	80.0		13-138	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-2,3,7,8-TCDF	74.0		22-152	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,7,8-PeCDF	101.0		24-185	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-2,3,4,7,8-PeCDF	104.0		21-178	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,4,7,8-HxCDF	85.0		26-152	%	06-JUN-14	14-JUN-14	R2862470

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1454055-1 STORM POND							
Sampled By: CLIENT on 12-MAY-14 @ 15:00							
Matrix: LIQUID							
Dioxins and Furans HR 1613B							
Surrogate: 13C12-1,2,3,6,7,8-HxCDF	96.0		21-159	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-2,3,4,6,7,8-HxCDF	95.0		17-205	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,7,8,9-HxCDF	92.0		26-136	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,4,6,7,8-HpCDF	87.0		21-158	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 13C12-1,2,3,4,7,8,9-HpCDF	88.0		20-186	%	06-JUN-14	14-JUN-14	R2862470
Surrogate: 37Cl4-2,3,7,8-TCDD (Cleanup)	77.0		31-191	%	06-JUN-14	14-JUN-14	R2862470
Lower Bound PCDD/F TEQ (WHO 2005)	0.0573			pg/L	06-JUN-14	14-JUN-14	R2862470
Mid Point PCDD/F TEQ (WHO 2005)	0.354			pg/L	06-JUN-14	14-JUN-14	R2862470
Upper Bound PCDD/F TEQ (WHO 2005)	0.647			pg/L	06-JUN-14	14-JUN-14	R2862470

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
A	Method Blank exceeds ALS DQO. Refer to narrative comments for further information.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
DTC	Dissolved concentration exceeds total. Results were confirmed by re-analysis.
J,B	The analyte was detected below the calibrated range but above the EDL, and was detected in the Method Blank at >10% of the sample concentration.
J,R	The analyte was detected below the calibrated range but above the EDL, and the ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
M,J	A peak has been manually integrated, and the analyte was detected below the calibrated range but above the EDL.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
[J]	The analyte was detected below the calibrated range but above the EDL.
[U]	The analyte was not detected above the EDL.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ANIONS-BR-IC-VA	Water	Bromide by Ion Chromatography	APHA 4110 B

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-CL-IC-VA	Water	Chloride by Ion Chromatography	APHA 4110 B

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-F-IC-VA	Water	Fluoride by Ion Chromatography	APHA 4110 B

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

ANIONS-NO2-IC-VA	Water	Nitrite in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrite is detected by UV absorbance.

ANIONS-NO3-IC-VA	Water	Nitrate in Water by Ion Chromatography	EPA 300.0

This analysis is carried out using procedures adapted from EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Nitrate is detected by UV absorbance.

ANIONS-SO4-IC-VA	Water	Sulfate by Ion Chromatography	APHA 4110 B

This analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- "BIOCHEMICAL OXYGEN DEMAND"

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

BOD5-VA	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND

This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

CN-WAD-CFA-VA	Water	Weak Acid Diss. Cyanide in water by CFA	APHA 4500-CN CYANIDE

This analysis is carried out using procedures adapted from APHA Method 4500-CN I. "Weak Acid Dissociable Cyanide". Weak Acid Dissociable (WAD) cyanide is determined by in-line sample distillation with final determination by colourimetric analysis.

CR6-D-IC-ED	Water	Chromium, Dissolved Hexavalent (Cr +6)	APHA 3500-Cr C (Ion Chromatography)

This analysis is carried out using procedures adapted from method 3500-Cr C in "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from Method 1636 published by the United States Environmental Protection Agency (EPA). The procedure involves analysis for chromium (VI) by ion chromatography using diphenylcarbazide in a sulphuric acid solution.
Results are based on a field-filtered, field-preserved sample.

DX-1613B-HRMS-BU	Water	Dioxins and Furans HR 1613B	USEPA 1613B

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-TOT-CVAFS-VA	Water	Total Mercury in Water by CVAFS	EPA 245.7

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

MET-DIS-ICP-VA	Water	Dissolved Metals in Water by ICPOES	EPA SW-846 3005A/6010B

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedure involves filtration (EPA Method 3005A) and analysis by inductively coupled plasma - optical emission spectrophotometry (EPA Method 6010B).

MET-DIS-LOW-MS-VA	Water	Dissolved Metals in Water by ICPMS(Low)	EPA SW-846 3005A/6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures involves preliminary sample treatment by filtration (EPA Method 3005A). Instrumental analysis is by inductively coupled plasma - mass spectrometry (EPA Method 6020A).

MET-T-CCMS-VA	Water	Total Metals in Water by CRC ICPMS	APHA 3030 B&E / EPA SW-846 6020A

This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). The procedures may involve preliminary sample treatment by acid digestion, using hotblock, or filtration (APHA 3030B&E). Instrumental analysis is by collision cell inductively coupled plasma - mass spectrometry (modified from EPA Method 6020A).

NH3-F-VA	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

OGG-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2010), EPA1664A

The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.

PCB-SF-ECD-VA	Water	PCB by Extraction with GCECD	EPA 3510/8082 Liq-Liq GCECD

This analysis is carried out using procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846, Methods 3510, 3620, 3660, 3665 & 8082, published by the United States Environmental Protection Agency (EPA). The procedure involves a liquid-liquid extraction of the entire water sample using dichloromethane. The extract is then solvent exchanged to hexane followed by one or more of the following clean-up procedures (if required): florisil clean-up, sulphur clean-up and/or sulphuric acid clean-up. The final extract is analysed by capillary column gas chromatography with electron capture detection (GC/ECD).

PCB-SUM-CALC-VA	Water	Total PCBs in water	CALCULATION

Calculation of Total PCB. Total PCB is the sum of the concentrations of PCB aroclors 1016, 1221, 1232, 1242, 1248, 1254, 1260, 1262, and 1268. Results below detection limit (DL) are treated as zero. The Total PCB detection limit is equal to the highest of the aroclor detection limits used in the sum.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H "pH Value"

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

It is recommended that this analysis be conducted in the field.

PHENOLS-4AAP-ED	Water	Phenols (4AAP)	AB ENV.06537-COLORIMETRIC

This analysis is carried out using procedures adapted from ENVIRODAT VMV 06537 689, Method Code 154, in "Methods Manual for Chemical Analysis of Water and Wastes" published by the Alberta Environmental Centre. This automated method is based on the distillation of phenol and subsequent reaction of the distillate with alkaline ferricyanide and 4-aminoantipyrine to form a red complex which is measured at 505 nm.

PHN-ED	Water	Chlorinated and Non-Chlorinated Phenols	EPA 3510/8270-GC/MS

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
TEMP-SAMP-PCT-VA	Water	Sample Temperature of pH/EC Analysis	APHA 2550 B

Measured sample temperature during pH/EC analysis.

TROUT-LC50-WP	Water	Trout Bioassay LC50	EPS 1/RM/13, EPS 1/RM/9

Certified, disease-free rainbow trout (Oncorhynchus mykiss) are exposed to several concentrations of a sample including full strength, under static conditions in order to estimate the median lethal concentration (LC50) - the concentration of the sample in water that is estimated to be lethal to 50% of the test organisms within a 96-hour exposure period.

Studies have shown that the major contributor to measurement uncertainty (MU) for this test is biological response. The best estimation of MU is therefore provided in the test report as the 95% CI of the reference toxicant.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter. TSS is determined by drying the filter at 104 degrees celsius.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
BU	ALS ENVIRONMENTAL - BURLINGTON, ONTARIO, CANADA
ED	ALS ENVIRONMENTAL - EDMONTON, ALBERTA, CANADA
WP	ALS ENVIRONMENTAL - WINNIPEG, MANITOBA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

10-146460

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

ALS Environmental

Quality Control Report

Workorder: L1454055 Report Date: 16-JUN-14

Client: TERVITA CORPORATION - PLANT# 1334 - SILVERBERRY LANDFILL
10125 - 100 St.
Fort St. John BC V1J 3Y8

Contact: Lisa Jordan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-BR-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Bromide (Br)			105.9		%		85-115	14-MAY-14
WG1873382-2 LCS Bromide (Br)			106.7		%		85-115	14-MAY-14
WG1873382-1 MB Bromide (Br)			<0.050		mg/L		0.05	14-MAY-14
WG1873382-10 MB Bromide (Br)			<0.050		mg/L		0.05	14-MAY-14
WG1873382-13 MB Bromide (Br)			<0.050		mg/L		0.05	14-MAY-14
WG1873382-4 MB Bromide (Br)			<0.050		mg/L		0.05	14-MAY-14
WG1873382-7 MB Bromide (Br)			<0.050		mg/L		0.05	14-MAY-14
WG1873382-11 MS Bromide (Br)		L1455031-5	103.6		%		75-125	14-MAY-14
WG1873382-14 MS Bromide (Br)		L1455217-2	104.9		%		75-125	14-MAY-14
WG1873382-5 MS Bromide (Br)		L1454988-1	104.8		%		75-125	14-MAY-14
ANIONS-CL-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Chloride (Cl)			102.8		%		90-110	14-MAY-14
WG1873382-2 LCS Chloride (Cl)			102.9		%		90-110	14-MAY-14
WG1873382-1 MB Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-10 MB Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-13 MB Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-4 MB Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-7 MB Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-11 MS Chloride (Cl)		L1455031-5	101.8		%		75-125	14-MAY-14
WG1873382-5 MS		L1454988-1						

ALS Environmental

Quality Control Report

Workorder: L1454055 Report Date: 16-JUN-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-CL-IC-VA	Water							
Batch R2839429								
WG1873382-5 MS Chloride (Cl)		L1454988-1	102.5		%		75-125	14-MAY-14
WG1873382-8 MS Chloride (Cl)		L1454244-1	103.2		%		75-125	14-MAY-14
ANIONS-F-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Fluoride (F)			108.2		%		90-110	14-MAY-14
WG1873382-2 LCS Fluoride (F)			108.3		%		90-110	14-MAY-14
WG1873382-1 MB Fluoride (F)			<0.020		mg/L		0.02	14-MAY-14
WG1873382-10 MB Fluoride (F)			<0.020		mg/L		0.02	14-MAY-14
WG1873382-13 MB Fluoride (F)			<0.020		mg/L		0.02	14-MAY-14
WG1873382-4 MB Fluoride (F)			<0.020		mg/L		0.02	14-MAY-14
WG1873382-7 MB Fluoride (F)			<0.020		mg/L		0.02	14-MAY-14
WG1873382-11 MS Fluoride (F)		L1455031-5	105.4		%		75-125	14-MAY-14
WG1873382-14 MS Fluoride (F)		L1455217-2	101.2		%		75-125	14-MAY-14
WG1873382-5 MS Fluoride (F)		L1454988-1	106.3		%		75-125	14-MAY-14
WG1873382-8 MS Fluoride (F)		L1454244-1	102.1		%		75-125	14-MAY-14
ANIONS-NO2-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Nitrite (as N)			102.8		%		90-110	14-MAY-14
WG1873382-2 LCS Nitrite (as N)			103.6		%		90-110	14-MAY-14
WG1873382-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-14
WG1873382-10 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-NO2-IC-VA	Water							
Batch R2839429								
WG1873382-13 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-14
WG1873382-4 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-14
WG1873382-7 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-14
WG1873382-11 MS Nitrite (as N)		L1455031-5	102.2		%		75-125	14-MAY-14
WG1873382-14 MS Nitrite (as N)		L1455217-2	101.3		%		75-125	14-MAY-14
WG1873382-5 MS Nitrite (as N)		L1454988-1	102.5		%		75-125	14-MAY-14
WG1873382-8 MS Nitrite (as N)		L1454244-1	102.9		%		75-125	14-MAY-14
ANIONS-NO3-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Nitrate (as N)			102.4		%		90-110	14-MAY-14
WG1873382-2 LCS Nitrate (as N)			102.4		%		90-110	14-MAY-14
WG1873382-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-14
WG1873382-10 MB Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-14
WG1873382-13 MB Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-14
WG1873382-4 MB Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-14
WG1873382-7 MB Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-14
WG1873382-11 MS Nitrate (as N)		L1455031-5	101.3		%		75-125	14-MAY-14
WG1873382-14 MS Nitrate (as N)		L1455217-2	101.0		%		75-125	14-MAY-14
WG1873382-5 MS Nitrate (as N)		L1454988-1	102.1		%		75-125	14-MAY-14
WG1873382-8 MS Nitrate (as N)		L1454244-1	102.5		%		75-125	14-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ANIONS-SO4-IC-VA	Water							
Batch R2839429								
WG1873382-15 LCS Sulfate (SO4)			103.6		%		90-110	14-MAY-14
WG1873382-2 LCS Sulfate (SO4)			103.5		%		90-110	14-MAY-14
WG1873382-1 MB Sulfate (SO4)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-10 MB Sulfate (SO4)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-13 MB Sulfate (SO4)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-4 MB Sulfate (SO4)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-7 MB Sulfate (SO4)			<0.50		mg/L		0.5	14-MAY-14
WG1873382-11 MS Sulfate (SO4)		L1455031-5	102.3		%		75-125	14-MAY-14
WG1873382-14 MS Sulfate (SO4)		L1455217-2	94.6		%		75-125	14-MAY-14
WG1873382-5 MS Sulfate (SO4)		L1454988-1	102.9		%		75-125	14-MAY-14
WG1873382-8 MS Sulfate (SO4)		L1454244-1	101.7		%		75-125	14-MAY-14
BOD5-VA	Water							
Batch R2840859								
WG1873231-2 LCS BOD			97.2		%		85-115	14-MAY-14
WG1873231-1 MB BOD			<2.0		mg/L		2	14-MAY-14
CN-WAD-CFA-VA	Water							
Batch R2839603								
WG1874362-14 LCS Cyanide, Weak Acid Diss			103.0		%		80-120	15-MAY-14
WG1874362-2 LCS Cyanide, Weak Acid Diss			105.3		%		80-120	15-MAY-14
WG1874362-6 LCS Cyanide, Weak Acid Diss			105.4		%		80-120	15-MAY-14
WG1874362-8 LCS Cyanide, Weak Acid Diss			104.3		%		80-120	15-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CN-WAD-CFA-VA	Water							
Batch R2839603								
WG1874362-1 MB								
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	15-MAY-14
WG1874362-13 MB								
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	15-MAY-14
WG1874362-5 MB								
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	15-MAY-14
WG1874362-7 MB								
Cyanide, Weak Acid Diss			<0.0050		mg/L		0.005	15-MAY-14
WG1874362-10 MS		L1454705-1						
Cyanide, Weak Acid Diss			101.2		%		70-130	15-MAY-14
WG1874362-12 MS		L1455471-6						
Cyanide, Weak Acid Diss			97.4		%		70-130	15-MAY-14
CR6-D-IC-ED	Water							
Batch R2842377								
WG1874944-7 DUP		L1454055-1						
Hexavalent Chromium-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	15	16-MAY-14
WG1874944-6 LCS								
Hexavalent Chromium-Dissolved			99.96		%		80-120	16-MAY-14
WG1874944-5 MB								
Hexavalent Chromium-Dissolved			<0.0010		mg/L		0.001	16-MAY-14
WG1874944-10 MS		L1455507-2						
Hexavalent Chromium-Dissolved			106.4		%		75-125	16-MAY-14
WG1874944-12 MS		L1455507-20						
Hexavalent Chromium-Dissolved			94.6		%		75-125	16-MAY-14
WG1874944-8 MS		L1454055-1						
Hexavalent Chromium-Dissolved			105.0		%		75-125	16-MAY-14
DX-1613B-HRMS-BU	Water							
Batch R2862470								
WG1886160-2 LCS								
2,3,7,8-TCDD			109.0		%		67-158	14-JUN-14
1,2,3,7,8-PeCDD			101.0		%		70-142	14-JUN-14
1,2,3,4,7,8-HxCDD			106.0		%		70-164	14-JUN-14
1,2,3,6,7,8-HxCDD			98.0		%		76-134	14-JUN-14
1,2,3,7,8,9-HxCDD			104.0		%		64-162	14-JUN-14
1,2,3,4,6,7,8-HpCDD			100.0		%		70-140	14-JUN-14
OCDD			97.0		%		78-144	14-JUN-14
2,3,7,8-TCDF			98.0		%		75-158	14-JUN-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DX-1613B-HRMS-BU	Water							
Batch R2862470								
WG1886160-2 LCS								
1,2,3,7,8-PeCDF			100.0		%		80-134	14-JUN-14
2,3,4,7,8-PeCDF			100.0		%		68-160	14-JUN-14
1,2,3,4,7,8-HxCDF			99.0		%		72-134	14-JUN-14
1,2,3,6,7,8-HxCDF			96.0		%		84-130	14-JUN-14
2,3,4,6,7,8-HxCDF			97.0		%		78-130	14-JUN-14
1,2,3,7,8,9-HxCDF			100.0		%		70-156	14-JUN-14
1,2,3,4,6,7,8-HpCDF			99.0		%		82-122	14-JUN-14
1,2,3,4,7,8,9-HpCDF			102.0		%		78-138	14-JUN-14
OCDF			97.0		%		63-170	14-JUN-14
WG1886160-1 MB								
2,3,7,8-TCDD			<0.28	[U]	pg/L		0.28	14-JUN-14
1,2,3,7,8-PeCDD			<0.14	[U]	pg/L		0.14	14-JUN-14
1,2,3,4,7,8-HxCDD			<0.16	[U]	pg/L		0.16	14-JUN-14
1,2,3,6,7,8-HxCDD			<0.15	[U]	pg/L		0.15	14-JUN-14
1,2,3,7,8,9-HxCDD			<0.15	[U]	pg/L		0.15	14-JUN-14
1,2,3,4,6,7,8-HpCDD			<0.21	[U]	pg/L		0.21	14-JUN-14
OCDD			0.38	J,R	pg/L		0.1	14-JUN-14
2,3,7,8-TCDF			<0.16	[U]	pg/L		0.16	14-JUN-14
1,2,3,7,8-PeCDF			0.27	[J]	pg/L		0.13	14-JUN-14
2,3,4,7,8-PeCDF			<0.11	[U]	pg/L		0.11	14-JUN-14
1,2,3,4,7,8-HxCDF			<0.11	[U]	pg/L		0.11	14-JUN-14
1,2,3,6,7,8-HxCDF			<0.10	[U]	pg/L		0.1	14-JUN-14
2,3,4,6,7,8-HxCDF			<0.10	[U]	pg/L		0.1	14-JUN-14
1,2,3,7,8,9-HxCDF			0.54	[J]	pg/L		0.13	14-JUN-14
1,2,3,4,6,7,8-HpCDF			<0.12	[U]	pg/L		0.12	14-JUN-14
1,2,3,4,7,8,9-HpCDF			<0.17	[U]	pg/L		0.17	14-JUN-14
OCDF			<0.16	[U]	pg/L		0.16	14-JUN-14
Total-TCDD			<0.28	[U]	pg/L		0.28	14-JUN-14
Total-PeCDD			<0.14	[U]	pg/L		0.14	14-JUN-14
Total-HxCDD			<0.16	[U]	pg/L		0.16	14-JUN-14
Total-HpCDD			<0.21	[U]	pg/L		0.21	14-JUN-14
Total-TCDF			<0.16	[U]	pg/L		0.16	14-JUN-14
Total-PeCDF			0.27	A	pg/L		0.13	14-JUN-14
Total-HxCDF			0.54	A	pg/L		0.13	14-JUN-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
DX-1613B-HRMS-BU	Water							
Batch R2852470								
WG1886160-1 MB								
Total-HpCDF			<0.17	[U]	pg/L		0.17	14-JUN-14
Surrogate: 13C12-2,3,7,8-TCDD			90.0		%		20-175	14-JUN-14
Surrogate: 13C12-1,2,3,7,8-PeCDD			95.0		%		21-227	14-JUN-14
Surrogate: 13C12-1,2,3,4,7,8-HxCDD			71.0		%		21-193	14-JUN-14
Surrogate: 13C12-1,2,3,6,7,8-HxCDD			91.0		%		25-163	14-JUN-14
Surrogate: 13C12-1,2,3,4,6,7,8-HpCDD			81.0		%		23-166	14-JUN-14
Surrogate: 13C12-OCDD			79.0		%		13-138	14-JUN-14
Surrogate: 13C12-2,3,7,8-TCDF			104.0		%		22-152	14-JUN-14
Surrogate: 13C12-1,2,3,7,8-PeCDF			102.0		%		24-185	14-JUN-14
Surrogate: 13C12-2,3,4,7,8-PeCDF			106.0		%		21-178	14-JUN-14
Surrogate: 13C12-1,2,3,4,7,8-HxCDF			82.0		%		26-152	14-JUN-14
Surrogate: 13C12-1,2,3,6,7,8-HxCDF			92.0		%		21-159	14-JUN-14
Surrogate: 13C12-2,3,4,6,7,8-HxCDF			90.0		%		17-205	14-JUN-14
Surrogate: 13C12-1,2,3,7,8,9-HxCDF			89.0		%		28-136	14-JUN-14
Surrogate: 13C12-1,2,3,4,6,7,8-HpCDF			86.0		%		21-158	14-JUN-14
Surrogate: 13C12-1,2,3,4,7,8,9-HpCDF			86.0		%		20-186	14-JUN-14
Surrogate: 37Cl4-2,3,7,8-TCDD (Cleanup)			92.0		%		31-191	14-JUN-14
COMMENTS: There are some hits for selected targets within the reference method control limits. Impact to overall data quality is expected to be minimal								
HG-TOT-CVAFS-VA	Water							
Batch R2839586								
WG1874359-9 DUP		**L1454055-1**						
Mercury (Hg)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	15-MAY-14
WG1874359-3 LCS								
Mercury (Hg)-Total			107.8		%		80-120	15-MAY-14
WG1874359-1 MB								
Mercury (Hg)-Total			<0.000050		mg/L		0.00005	15-MAY-14
WG1874359-2 MB								
Mercury (Hg)-Total			<0.000050		mg/L		0.00005	15-MAY-14
MET-DIS-ICP-VA	Water							
Batch R2840225								
WG1873659-2 CRM		**VA-HIGH-WATRM**						
Barium (Ba)-Dissolved			93.4		%		80-120	16-MAY-14
Beryllium (Be)-Dissolved			93.5		%		80-120	16-MAY-14
Bismuth (Bi)-Dissolved			98.6		%		80-120	16-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA	Water							
Batch R2840225								
WG1873659-2 CRM		**VA-HIGH-WATRM**						
Boron (B)-Dissolved			97.2		%		80-120	16-MAY-14
Calcium (Ca)-Dissolved			96.4		%		80-120	16-MAY-14
Iron (Fe)-Dissolved			92.9		%		80-120	16-MAY-14
Lithium (Li)-Dissolved			95.3		%		80-120	16-MAY-14
Magnesium (Mg)-Dissolved			97.3		%		80-120	16-MAY-14
Manganese (Mn)-Dissolved			94.5		%		80-120	16-MAY-14
Phosphorus (P)-Dissolved			100.4		%		80-120	16-MAY-14
Potassium (K)-Dissolved			94.2		%		80-120	16-MAY-14
Silicon (Si)-Dissolved			95.3		%		80-120	16-MAY-14
Sodium (Na)-Dissolved			94.0		%		80-120	16-MAY-14
Strontium (Sr)-Dissolved			97.8		%		80-120	16-MAY-14
Tin (Sn)-Dissolved			98.0		%		80-120	16-MAY-14
Titanium (Ti)-Dissolved			96.6		%		80-120	16-MAY-14
Vanadium (V)-Dissolved			96.4		%		80-120	16-MAY-14
Zinc (Zn)-Dissolved			96.1		%		80-120	16-MAY-14
WG1873659-1 MB								
Barium (Ba)-Dissolved			<0.010		mg/L		0.01	16-MAY-14
Beryllium (Be)-Dissolved			<0.0050		mg/L		0.005	16-MAY-14
Bismuth (Bi)-Dissolved			<0.20		mg/L		0.2	16-MAY-14
Boron (B)-Dissolved			<0.10		mg/L		0.1	16-MAY-14
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	16-MAY-14
Iron (Fe)-Dissolved			<0.030		mg/L		0.03	16-MAY-14
Lithium (Li)-Dissolved			<0.010		mg/L		0.01	16-MAY-14
Magnesium (Mg)-Dissolved			<0.10		mg/L		0.1	16-MAY-14
Manganese (Mn)-Dissolved			<0.0050		mg/L		0.005	16-MAY-14
Phosphorus (P)-Dissolved			<0.30		mg/L		0.3	16-MAY-14
Potassium (K)-Dissolved			<2.0		mg/L		2	16-MAY-14
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	16-MAY-14
Sodium (Na)-Dissolved			<2.0		mg/L		2	16-MAY-14
Strontium (Sr)-Dissolved			<0.0050		mg/L		0.005	16-MAY-14
Tin (Sn)-Dissolved			<0.030		mg/L		0.03	16-MAY-14
Titanium (Ti)-Dissolved			<0.010		mg/L		0.01	16-MAY-14
Vanadium (V)-Dissolved			<0.030		mg/L		0.03	16-MAY-14
Zinc (Zn)-Dissolved			<0.0050		mg/L		0.005	16-MAY-14
WG1873659-17 MS		**L1455471-6**						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA	Water							
Batch R2840225								
WG1873659-17 MS		**L1455471-6**						
Boron (B)-Dissolved			98.3		%		70-130	16-MAY-14
Calcium (Ca)-Dissolved			101.7		%		70-130	16-MAY-14
Iron (Fe)-Dissolved			102.0		%		70-130	16-MAY-14
Magnesium (Mg)-Dissolved			102.9		%		70-130	16-MAY-14
Manganese (Mn)-Dissolved			102.3		%		70-130	16-MAY-14
Phosphorus (P)-Dissolved			106.3		%		70-130	16-MAY-14
Potassium (K)-Dissolved			110.5		%		70-130	16-MAY-14
Silicon (Si)-Dissolved			N/A	MS-B	%		-	16-MAY-14
Sodium (Na)-Dissolved			111.7		%		70-130	16-MAY-14
Titanium (Ti)-Dissolved			111.4		%		70-130	16-MAY-14
Zinc (Zn)-Dissolved			94.1		%		70-130	16-MAY-14
Batch R2840531								
WG1873659-10 MS		**L1454225-4**						
Boron (B)-Dissolved			99.8		%		70-130	15-MAY-14
Calcium (Ca)-Dissolved			101.4		%		70-130	15-MAY-14
Iron (Fe)-Dissolved			97.2		%		70-130	15-MAY-14
Magnesium (Mg)-Dissolved			103.0		%		70-130	15-MAY-14
Manganese (Mn)-Dissolved			96.1		%		70-130	15-MAY-14
Phosphorus (P)-Dissolved			104.7		%		70-130	15-MAY-14
Potassium (K)-Dissolved			106.3		%		70-130	15-MAY-14
Silicon (Si)-Dissolved			101.4		%		70-130	15-MAY-14
Sodium (Na)-Dissolved			106.3		%		70-130	15-MAY-14
Titanium (Ti)-Dissolved			109.7		%		70-130	15-MAY-14
Zinc (Zn)-Dissolved			94.7		%		70-130	15-MAY-14
WG1873659-11 MS		**L1454238-9**						
Boron (B)-Dissolved			102.2		%		70-130	15-MAY-14
Calcium (Ca)-Dissolved			96.6		%		70-130	15-MAY-14
Iron (Fe)-Dissolved			94.7		%		70-130	15-MAY-14
Magnesium (Mg)-Dissolved			103.3		%		70-130	15-MAY-14
Manganese (Mn)-Dissolved			93.8		%		70-130	15-MAY-14
Phosphorus (P)-Dissolved			106.2		%		70-130	15-MAY-14
Potassium (K)-Dissolved			107.8		%		70-130	15-MAY-14
Silicon (Si)-Dissolved			101.4		%		70-130	15-MAY-14
Sodium (Na)-Dissolved			107.2		%		70-130	15-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA	Water							
Batch R2840531								
WG1873659-11 MS		**L1454238-9**						
Titanium (Ti)-Dissolved			110.0		%		70-130	15-MAY-14
Zinc (Zn)-Dissolved			92.9		%		70-130	15-MAY-14
Batch R2842639								
WG1873659-19 MS		**L1456018-8**						
Boron (B)-Dissolved			92.6		%		70-130	16-MAY-14
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	16-MAY-14
Iron (Fe)-Dissolved			89.1		%		70-130	16-MAY-14
Magnesium (Mg)-Dissolved			85.5		%		70-130	16-MAY-14
Manganese (Mn)-Dissolved			89.7		%		70-130	16-MAY-14
Phosphorus (P)-Dissolved			98.7		%		70-130	16-MAY-14
Potassium (K)-Dissolved			98.9		%		70-130	16-MAY-14
Silicon (Si)-Dissolved			N/A	MS-B	%		-	16-MAY-14
Sodium (Na)-Dissolved			87.6		%		70-130	16-MAY-14
Titanium (Ti)-Dissolved			97.5		%		70-130	16-MAY-14
Zinc (Zn)-Dissolved			81.7		%		70-130	16-MAY-14
WG1873659-23 MS		**L1456246-3**						
Boron (B)-Dissolved			96.3		%		70-130	16-MAY-14
Calcium (Ca)-Dissolved			93.1		%		70-130	16-MAY-14
Iron (Fe)-Dissolved			92.5		%		70-130	16-MAY-14
Magnesium (Mg)-Dissolved			91.4		%		70-130	16-MAY-14
Manganese (Mn)-Dissolved			91.7		%		70-130	16-MAY-14
Phosphorus (P)-Dissolved			98.1		%		70-130	16-MAY-14
Potassium (K)-Dissolved			102.5		%		70-130	16-MAY-14
Silicon (Si)-Dissolved			N/A	MS-B	%		-	16-MAY-14
Sodium (Na)-Dissolved			93.1		%		70-130	16-MAY-14
Titanium (Ti)-Dissolved			100.2		%		70-130	16-MAY-14
Zinc (Zn)-Dissolved			87.5		%		70-130	16-MAY-14
WG1873659-25 MS		**L1456247-2**						
Boron (B)-Dissolved			97.7		%		70-130	16-MAY-14
Calcium (Ca)-Dissolved			95.9		%		70-130	16-MAY-14
Iron (Fe)-Dissolved			92.8		%		70-130	16-MAY-14
Magnesium (Mg)-Dissolved			98.9		%		70-130	16-MAY-14
Manganese (Mn)-Dissolved			91.0		%		70-130	16-MAY-14
Phosphorus (P)-Dissolved			100.3		%		70-130	16-MAY-14
Potassium (K)-Dissolved			102.7		%		70-130	16-MAY-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-ICP-VA	Water							
Batch R2842639								
WG1873659-25 MS		L1456247-2						
Silicon (Si)-Dissolved			N/A	MS-B	%		-	16-MAY-14
Sodium (Na)-Dissolved			93.6		%		70-130	16-MAY-14
Titanium (Ti)-Dissolved			99.4		%		70-130	16-MAY-14
Zinc (Zn)-Dissolved			89.5		%		70-130	16-MAY-14
WG1873659-8 MS		L1454996-3						
Boron (B)-Dissolved			96.2		%		70-130	16-MAY-14
Calcium (Ca)-Dissolved			94.8		%		70-130	16-MAY-14
Iron (Fe)-Dissolved			93.8		%		70-130	16-MAY-14
Magnesium (Mg)-Dissolved			94.9		%		70-130	16-MAY-14
Manganese (Mn)-Dissolved			95.7		%		70-130	16-MAY-14
Phosphorus (P)-Dissolved			100.4		%		70-130	16-MAY-14
Potassium (K)-Dissolved			101.4		%		70-130	16-MAY-14
Silicon (Si)-Dissolved			97.0		%		70-130	16-MAY-14
Sodium (Na)-Dissolved			94.5		%		70-130	16-MAY-14
Titanium (Ti)-Dissolved			99.6		%		70-130	16-MAY-14
Zinc (Zn)-Dissolved			89.4		%		70-130	16-MAY-14
Batch R2843642								
WG1873659-13 MS		L1455515-3						
Boron (B)-Dissolved			100.0		%		70-130	22-MAY-14
Calcium (Ca)-Dissolved			95.8		%		70-130	22-MAY-14
Iron (Fe)-Dissolved			95.7		%		70-130	22-MAY-14
Magnesium (Mg)-Dissolved			100.6		%		70-130	22-MAY-14
Manganese (Mn)-Dissolved			92.7		%		70-130	22-MAY-14
Phosphorus (P)-Dissolved			100.7		%		70-130	22-MAY-14
Potassium (K)-Dissolved			94.6		%		70-130	22-MAY-14
Silicon (Si)-Dissolved			93.9		%		70-130	22-MAY-14
Sodium (Na)-Dissolved			97.1		%		70-130	22-MAY-14
Titanium (Ti)-Dissolved			101.6		%		70-130	22-MAY-14
Zinc (Zn)-Dissolved			88.5		%		70-130	22-MAY-14
MET-DIS-LOW-MS-VA	Water							
Batch R2840021								
WG1873659-2 CRM		VA-HIGH-WATRM						
Aluminum (Al)-Dissolved			100.6		%		80-120	15-MAY-14
Antimony (Sb)-Dissolved			100.0		%		80-120	15-MAY-14
Arsenic (As)-Dissolved			98.4		%		80-120	15-MAY-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-LOW-MS-VA	Water							
Batch R2840021								
WG1873659-2 CRM		VA-HIGH-WATRM						
Cadmium (Cd)-Dissolved			101.7		%		80-120	15-MAY-14
Chromium (Cr)-Dissolved			100.4		%		80-120	15-MAY-14
Cobalt (Co)-Dissolved			96.9		%		80-120	15-MAY-14
Copper (Cu)-Dissolved			94.9		%		80-120	15-MAY-14
Lead (Pb)-Dissolved			96.0		%		80-120	15-MAY-14
Molybdenum (Mo)-Dissolved			100.2		%		80-120	15-MAY-14
Nickel (Ni)-Dissolved			97.8		%		80-120	15-MAY-14
Selenium (Se)-Dissolved			101.1		%		80-120	15-MAY-14
Silver (Ag)-Dissolved			100.0		%		80-120	15-MAY-14
Thallium (Tl)-Dissolved			98.5		%		80-120	15-MAY-14
Uranium (U)-Dissolved			95.1		%		80-120	15-MAY-14
WG1873659-1 MB								
Aluminum (Al)-Dissolved			<0.0030		mg/L		0.003	15-MAY-14
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	15-MAY-14
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	15-MAY-14
Cadmium (Cd)-Dissolved			<0.000050		mg/L		0.00005	15-MAY-14
Chromium (Cr)-Dissolved			<0.00050		mg/L		0.0005	15-MAY-14
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	15-MAY-14
Copper (Cu)-Dissolved			<0.00050		mg/L		0.0005	15-MAY-14
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	15-MAY-14
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	15-MAY-14
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	15-MAY-14
Selenium (Se)-Dissolved			<0.0010		mg/L		0.001	15-MAY-14
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	15-MAY-14
Thallium (Tl)-Dissolved			<0.00010		mg/L		0.0001	15-MAY-14
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	15-MAY-14
Batch R2841661								
WG1873659-25 MS		L1456247-2						
Aluminum (Al)-Dissolved			N/A	MS-B	%		-	17-MAY-14
Antimony (Sb)-Dissolved			104.7		%		70-130	17-MAY-14
Arsenic (As)-Dissolved			97.4		%		70-130	17-MAY-14
Cadmium (Cd)-Dissolved			98.0		%		70-130	17-MAY-14
Chromium (Cr)-Dissolved			93.5		%		70-130	17-MAY-14
Cobalt (Co)-Dissolved			91.5		%		70-130	17-MAY-14

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-DIS-LOW-MS-VA	Water							
Batch R2841661								
WG1873659-25 MS		L1456247-2						
Copper (Cu)-Dissolved			91.2		%		70-130	17-MAY-14
Lead (Pb)-Dissolved			98.6		%		70-130	17-MAY-14
Molybdenum (Mo)-Dissolved			95.4		%		70-130	17-MAY-14
Nickel (Ni)-Dissolved			92.4		%		70-130	17-MAY-14
Selenium (Se)-Dissolved			103.6		%		70-130	17-MAY-14
Thallium (Tl)-Dissolved			99.3		%		70-130	17-MAY-14
Uranium (U)-Dissolved			101.3		%		70-130	17-MAY-14
Batch R2842429								
WG1873659-23 MS		L1456246-3						
Aluminum (Al)-Dissolved			95.7		%		70-130	20-MAY-14
Antimony (Sb)-Dissolved			101.9		%		70-130	20-MAY-14
Arsenic (As)-Dissolved			99.0		%		70-130	20-MAY-14
Cadmium (Cd)-Dissolved			101.0		%		70-130	20-MAY-14
Chromium (Cr)-Dissolved			94.5		%		70-130	20-MAY-14
Cobalt (Co)-Dissolved			95.2		%		70-130	20-MAY-14
Copper (Cu)-Dissolved			98.6		%		70-130	20-MAY-14
Lead (Pb)-Dissolved			91.6		%		70-130	20-MAY-14
Molybdenum (Mo)-Dissolved			92.2		%		70-130	20-MAY-14
Nickel (Ni)-Dissolved			106.5		%		70-130	20-MAY-14
Selenium (Se)-Dissolved			103.0		%		70-130	20-MAY-14
Silver (Ag)-Dissolved			73.8		%		70-130	20-MAY-14
Thallium (Tl)-Dissolved			92.1		%		70-130	20-MAY-14
Uranium (U)-Dissolved			95.5		%		70-130	20-MAY-14
WG1873659-25 MS		L1456247-2						
Silver (Ag)-Dissolved			74.2		%		70-130	20-MAY-14
MET-T-CCMS-VA	Water							
Batch R2840021								
WG1873663-3 CRM		VA-HIGH-WATRM						
Chromium (Cr)-Total			97.4		%		80-120	15-MAY-14
WG1873663-1 MB								
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	15-MAY-14
NH3-F-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-F-VA	Water							
Batch R2841748								
WG1875016-10 CRM		VA-NH3-F						
Ammonia, Total (as N)			103.8		%		85-115	20-MAY-14
WG1875016-2 CRM		VA-NH3-F						
Ammonia, Total (as N)			106.8		%		85-115	20-MAY-14
WG1875016-4 CRM		VA-NH3-F						
Ammonia, Total (as N)			96.8		%		85-115	20-MAY-14
WG1875016-6 CRM		VA-NH3-F						
Ammonia, Total (as N)			98.4		%		85-115	20-MAY-14
WG1875016-8 CRM		VA-NH3-F						
Ammonia, Total (as N)			99.3		%		85-115	20-MAY-14
WG1875016-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	20-MAY-14
WG1875016-3 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	20-MAY-14
WG1875016-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	20-MAY-14
WG1875016-7 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	20-MAY-14
WG1875016-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	20-MAY-14
WG1875016-12 MS		L1453468-5						
Ammonia, Total (as N)			100.6		%		75-125	20-MAY-14
WG1875016-14 MS		L1453468-13						
Ammonia, Total (as N)			100.3		%		75-125	20-MAY-14
WG1875016-16 MS		L1453780-1						
Ammonia, Total (as N)			97.2		%		75-125	20-MAY-14
WG1875016-18 MS		L1453419-5						
Ammonia, Total (as N)			86.7		%		75-125	20-MAY-14
OGG-SF-VA	Water							
Batch R2840071								
WG1874338-2 LCS								
Oil and Grease			100.2		%		70-130	15-MAY-14
WG1874338-1 MB								
Oil and Grease			<5.0		mg/L		5	15-MAY-14
PCB-SF-ECD-VA	Water							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PCB-SF-ECD-VA	Water							
Batch R2841719								
WG1874819-2 LCS								
PCB-1260			70.5		%		65-130	20-MAY-14
WG1874819-1 MB								
PCB-1016			<0.0010		mg/L		0.001	20-MAY-14
PCB-1221			<0.0010		mg/L		0.001	20-MAY-14
PCB-1232			<0.0010		mg/L		0.001	20-MAY-14
PCB-1242			<0.0010		mg/L		0.001	20-MAY-14
PCB-1248			<0.0010		mg/L		0.001	20-MAY-14
PCB-1254			<0.0010		mg/L		0.001	20-MAY-14
PCB-1260			<0.0010		mg/L		0.001	20-MAY-14
PCB-1262			<0.0010		mg/L		0.001	20-MAY-14
PCB-1268			<0.0010		mg/L		0.001	20-MAY-14
PH-PCT-VA	Water							
Batch R2838391								
WG1872990-25 CRM		VA-PH7-BUF						
pH			7.02		pH		6.9-7.1	14-MAY-14
WG1872990-26 CRM		VA-PH7-BUF						
pH			7.05		pH		6.9-7.1	15-MAY-14
WG1872990-27 CRM		VA-PH7-BUF						
pH			7.04		pH		6.9-7.1	15-MAY-14
WG1872990-28 CRM		VA-PH7-BUF						
pH			7.04		pH		6.9-7.1	15-MAY-14
WG1872990-29 CRM		VA-PH7-BUF						
pH			7.04		pH		6.9-7.1	15-MAY-14
WG1872990-30 CRM		VA-PH7-BUF						
pH			7.02		pH		6.9-7.1	15-MAY-14
WG1872990-31 CRM		VA-PH7-BUF						
pH			7.02		pH		6.9-7.1	15-MAY-14
WG1872990-32 CRM		VA-PH7-BUF						
pH			7.02		pH		6.9-7.1	15-MAY-14
PHENOLS-4AAP-ED	Water							
Batch R2839144								
WG1873970-3 LCS								
Phenols (4AAP)			92.0		%		85-115	15-MAY-14
WG1873970-2 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	15-MAY-14
WG1873970-5 MS		L1454955-10						

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-ED	Water							
Batch R2839144								
WG1873970-5 MS		L1454955-10						
Phenols (4AAP)			100.0		%		75-125	15-MAY-14
PHN-ED	Water							
Batch R2844301								
WG1874545-2 LCS								
2,3,4,5-Tetrachlorophenol			110.0		%		60-130	22-MAY-14
2,3,4,6-Tetrachlorophenol			99.6		%		60-130	22-MAY-14
2,3,4-Trichlorophenol			95.1		%		50-130	22-MAY-14
2,3,5,6-Tetrachlorophenol			97.6		%		60-130	22-MAY-14
2,3,5-Trichlorophenol			88.4		%		50-130	22-MAY-14
2,3,6-Trichlorophenol			88.6		%		50-130	22-MAY-14
2,3-Dichlorophenol			84.2		%		40-130	22-MAY-14
2,4 & 2,5-Dichlorophenol			84.2		%		40-130	22-MAY-14
2,4,5-Trichlorophenol			90.2		%		50-130	22-MAY-14
2,4,6-Trichlorophenol			84.8		%		50-130	22-MAY-14
2,4-Dimethylphenol			47.7		%		30-130	22-MAY-14
2,6-Dichlorophenol			81.4		%		40-130	22-MAY-14
2-Chlorophenol			80.6		%		30-130	22-MAY-14
2-Nitrophenol			84.1		%		40-140	22-MAY-14
3,4,5-Trichlorophenol			101.2		%		50-130	22-MAY-14
3,4-Dichlorophenol			88.2		%		40-130	22-MAY-14
3,5-Dichlorophenol			85.2		%		40-130	22-MAY-14
3-Chlorophenol			78.8		%		40-130	22-MAY-14
4,6-Dinitro-2-methylphenol			122.7		%		40-140	22-MAY-14
4-Chloro-3-methylphenol			79.8		%		40-130	22-MAY-14
4-Chlorophenol			80.7		%		40-130	22-MAY-14
4-Nitrophenol			109.3		%		30-130	22-MAY-14
Pentachlorophenol			124.1		%		60-130	22-MAY-14
Phenol			59.9		%		20-130	22-MAY-14
m-Cresol			62.8		%		30-130	22-MAY-14
o-Cresol			55.1		%		30-130	22-MAY-14
p-Cresol			69.0		%		30-130	22-MAY-14
WG1874545-1 MB								
2,3,4,5-Tetrachlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,3,4,6-Tetrachlorophenol			<0.00050		mg/L		0.0005	22-MAY-14

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHN-ED	Water							
Batch R2844301								
WG1874545-1 MB								
2,3,4-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,3,5,6-Tetrachlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,3,5-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,3,6-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,3-Dichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,4 & 2,5-Dichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,4,5-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,4,6-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2,4-Dimethylphenol			<0.0010		mg/L		0.001	22-MAY-14
2,4-Dinitrophenol			<0.010		mg/L		0.01	22-MAY-14
2,6-Dichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2-Chlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
2-Nitrophenol			<0.0010		mg/L		0.001	22-MAY-14
3,4,5-Trichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
3,4-Dichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
3,5-Dichlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
3-Chlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
4,6-Dinitro-2-methylphenol			<0.010		mg/L		0.01	22-MAY-14
4-Chloro-3-methylphenol			<0.00050		mg/L		0.0005	22-MAY-14
4-Chlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
4-Nitrophenol			<0.0050		mg/L		0.005	22-MAY-14
Pentachlorophenol			<0.00050		mg/L		0.0005	22-MAY-14
Phenol			<0.0010		mg/L		0.001	22-MAY-14
m-Cresol			<0.0010		mg/L		0.001	22-MAY-14
o-Cresol			<0.0010		mg/L		0.001	22-MAY-14
p-Cresol			<0.0010		mg/L		0.001	22-MAY-14
Surrogate: 2-Fluorophenol			82.4		%		20-130	22-MAY-14
Surrogate: Phenol d5			60.6		%		20-130	22-MAY-14
Surrogate: 2,4,6-Tribromophenol			114.6		%		40-130	22-MAY-14
TSS-VA	Water							
Batch R2839261								
WG1873661-2 LCS								
Total Suspended Solids			95.2		%		85-115	14-MAY-14
WG1873661-5 LCS								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-VA	Water							
Batch R2839261								
WG1873661-5 LCS								
Total Suspended Solids			100.0		%		85-115	14-MAY-14
WG1873661-8 LCS								
Total Suspended Solids			89.9		%		85-115	14-MAY-14
WG1873661-1 MB								
Total Suspended Solids			<3.0		mg/L		3	14-MAY-14
WG1873661-4 MB								
Total Suspended Solids			<3.0		mg/L		3	14-MAY-14
WG1873661-7 MB								
Total Suspended Solids			<3.0		mg/L		3	14-MAY-14

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
A	Method Blank exceeds ALS DQO. Refer to narrative comments for further information.
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects.
J	Duplicate results and limits are expressed in terms of absolute difference.
J,R	The analyte was detected below the calibrated range but above the EDL, and the ion abundance ratio(s) did not meet the acceptance criteria. Value is an estimated maximum.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.
[J]	The analyte was detected below the calibrated range but above the EDL.
[U]	The analyte was not detected above the EDL.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)	1	12-MAY-14 15:00	15-MAY-14 07:18	0.25	64	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L1454055 were received on 12-MAY-14 17:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

23-May-2014

Geoff Archibald
ALS Environmental
10345A Dogwood Street
Fort St. John, BC V1J 6W7

Re: **L1454055** Work Order: **1405809**

Dear Geoff,

ALS Environmental received 1 sample on 15-May-2014 02:00 PM for the analyses presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested.

Sample results are compliant with NELAP standard requirements and QC results achieved laboratory specifications. Any exceptions are noted in the Case Narrative, or noted with qualifiers in the report or QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained from ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

The total number of pages in this report is 8.

If you have any questions regarding this report, please feel free to contact me.

Sincerely,

Electronically approved by: Bill Carver

Tom Beamish
Senior Project Manager

Certificate No: MN 532786

Report of Laboratory Analysis

ALS Group USA, Corp

Date: 23-May-14

Client: ALS Environmental
Project: L1454055
Work Order: 1405809

Work Order Sample Summary

Lab Samp ID	Client Sample ID	Matrix	Tag Number	Collection Date	Date Received	Hold
1405809-01	L1454055-1	Water		5/12/2014	5/15/2014 14:00	☐

ALS Group USA, Corp

Date: 23-May-14

Client: ALS Environmental
Project: L1454055
WorkOrder: 1405809

QUALIFIERS, ACRONYMS, UNITS

Qualifier	Description
*	Value exceeds Regulatory Limit
a	Not accredited
B	Analyte detected in the associated Method Blank above the Reporting Limit
E	Value above quantitation range
H	Analyzed outside of Holding Time
J	Analyte is present at an estimated concentration between the MDL and Report Limit
n	Not offered for accreditation
ND	Not Detected at the Reporting Limit
Q	Sample amount is > 4 times amount spiked
P	Dual Column results percent difference > 40%
R	RPD above laboratory control limit
S	Spike Recovery outside laboratory control limits
U	Analyzed but not detected above the MDL

Acronym	Description
DUP	Method Duplicate
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOD	Limit of Detection (see MDL)
LOQ	Limit of Quantitation (see PQL)
MBLK	Method Blank
MDL	Method Detection Limit
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PQL	Practical Quantitation Limit
RPD	Relative Percent Difference
TDL	Target Detection Limit
TNTC	Too Numerous To Count
A	APHA Standard Methods
D	ASTM
E	EPA
SW	SW-846 Update III

Units Reported	Description
mg/L	Milligrams per Liter

ALS Group USA, Corp

Date: *23-May-14*

Client: ALS Environmental
Project: L1454055
Sample ID: L1454055-1
Collection Date: 5/12/2014

Work Order: 1405809
Lab ID: 1405809-01
Matrix: WATER

Analyses	Result	Qual	Report Limit	Units	Dilution Factor	Date Analyzed
TOTAL ORGANIC HALIDES			**SW9020**		Prep: E1650 / 5/20/14	Analyst: **MB**
Total Organic Halides	ND		0.025	mg/L	1	5/20/2014 02:00 PM

Note: See Qualifiers page for a list of qualifiers and their definitions.

ALS Group USA, Corp

Client: ALS Environmental
Work Order: 1405809
Project: L1454055

Date: 23-May-14

QC BATCH REPORT

Batch ID: **58948** Instrument ID **AOX1** Method: **SW9020**

MBLK Sample ID: **MBLK-58948-58948** Units: µg/L Analysis Date: **5/20/2014 02:00 PM**
Client ID: Run ID: **AOX1_140520A** SeqNo: **2776321** Prep Date: **5/20/2014** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Organic Halides	13.66	25								J

LCS Sample ID: **LCS-58948-58948** Units: µg/L Analysis Date: **5/20/2014 02:00 PM**
Client ID: Run ID: **AOX1_140520A** SeqNo: **2776319** Prep Date: **5/20/2014** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Organic Halides	44.21	25	50	0	88.4	78-116	0			

LCSD Sample ID: **LCSD-58948-58948** Units: µg/L Analysis Date: **5/20/2014 02:00 PM**
Client ID: Run ID: **AOX1_140520A** SeqNo: **2776320** Prep Date: **5/20/2014** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Organic Halides	40.25	25	50	0	80.5	78-116	44.21	9.38		

MS Sample ID: **1405809-01A MS** Units: µg/L Analysis Date: **5/20/2014 02:00 PM**
Client ID: **L1454055-1** Run ID: **AOX1_140520A** SeqNo: **2776317** Prep Date: **5/20/2014** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Organic Halides	124.6	25	100	16.53	108	70-130	0			

MSD Sample ID: **1405809-01A MSD** Units: µg/L Analysis Date: **5/20/2014 02:00 PM**
Client ID: **L1454055-1** Run ID: **AOX1_140520A** SeqNo: **2776318** Prep Date: **5/20/2014** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Total Organic Halides	122.5	25	100	16.53	108	70-130	124.6	1.68	25	

The following samples were analyzed in this batch: 1405809-01A

Note: See Qualifiers Page for a list of Qualifiers and their explanation.

PO 5809
L1454055
FORT ST. JOHN

ALS Environmental

Subcontract Request Form

Subcontract To:

ALS ENVIRONMENTAL - HOLLAND, MICHIGAN, USA
3352 128TH AVENUE
HOLLAND,MI 49424

NOTES: Please reference on final report and invoice: PO# *L1454055*
ALS requires QC data to be provided with your final results.

Please see enclosed 1 sample(s) in 1 Container(s)

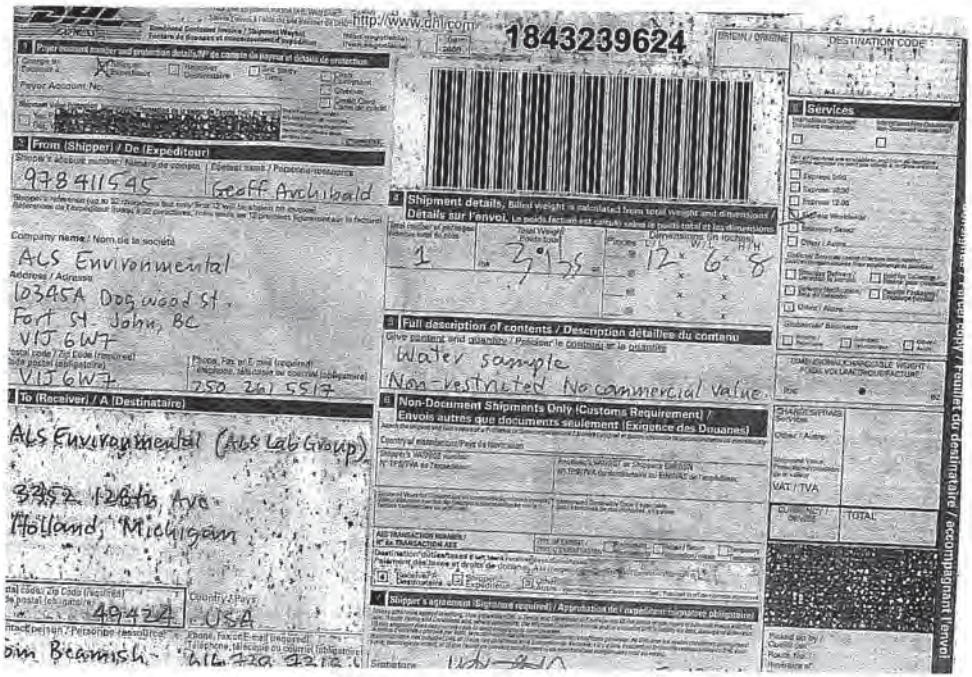
SAMPLE NUMBER	CLIENT ID / ANALYTICAL REQUIRED	DATE SAMPLED / DUE DATE	Priority Flag
L1454055-1	STORM POND Total Organic Halides (TOX) (TOX-HO 14)	5/12/2014 5/28/2014	

Subcontract Info Contact: Geoff Archibald (250) 261-5517
Analysis and reporting info contact: Geoff Archibald
10345 A DOGWOOD STREET
GRANDHAVEN, FORT ST. JOHN,BC V1J 6W7
Phone: (250) 261-5517 Email: geoff.archibald@alsglobal.com

Please email confirmation of receipt to: **geoff.archibald@alsglobal.com**

Shipped By: _____ Date Shipped: _____
Received By: _____ Date Received: 5/15/14 1400
Verified By: _____ Date Verified: _____
Temperature: 5.6°c
Sample Integrity Issues: _____

189



ALS Group USA, Corp

Sample Receipt Checklist

Client Name: **ALS - FORT ST JOHN**
Work Order: **1405809**
Date/Time Received: **15-May-14 14:00**
Received by: **DS**

Checklist completed by Diane Sham (eSignature) 16-May-14 (Date)
Reviewed by: Tom Bramish (eSignature) 16-May-14 (Date)

Matrices: Water
Carrier name: Courier

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐
Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Present ☑
Custody seals intact on sample bottles?	Yes ☐	No ☐	Not Present ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
Sufficient sample volume for indicated test?	Yes ☑	No ☐	
All samples received within holding time?	Yes ☑	No ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	
Sample(s) received on ice?	Yes ☑	No ☐	
Temperature(s)/Thermometer(s):	5.6 c		
Cooler(s)/Kit(s):			
Date/Time sample(s) sent to storage:	5/16/2014 9:04:02 AM		
Water - VOA vials have zero headspace?	Yes ☐	No ☐	No VOA vials submitted ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	N/A ☐
pH adjusted?	Yes ☐	No ☑	N/A ☐
pH adjusted by:			

Login Notes:

Client Contacted: Date Contacted: Person Contacted:
Contacted By: Regarding:

Comments:

CorrectiveAction:

Rainbow Trout Bioassay Test Report - LC50

Sample ID:	L1454055-1

Summary Results

96-hour LC50 v/v (%):	>100
95% Lower Confidence Interval (%):	n/a
95% Upper Confidence Interval (%):	n/a
Method of Calculation:	n/a
Confirmed by Graph:	n/a

Sample Information

Sample Origin:	Tervita Corporation
Sample Description:	Storm Pond
Sampling Date and Time:	12-May-14 15:00
Sampling Method:	Grab
Sampled By:	Not Provided
Container(s) Description:	3 x 10L polyethylene pails with liners
Sample Volume:	30L
Date and Time Received:	12-May-14 17:00
Transit Irregularities:	None
Storage Temperature (°C):	4

Test Information

Test Organism:	Oncorhynchus mykiss
Test Description:	Acute, 96-hour, Static, LC50
Reference Method(s):	EPS 1/RM/13, 2nd Ed. Dec. 2000, with May 2007 amendments, Environment Canada EPS 1/RM/9, May 1996 with May 2007 amendments, Environment Canada
Performed By:	KF
Starting Date and Time:	16-May-14 15:00
Deviations from Reference Method:	None

Initial Parameters

Observations

Colour:	Brown				
Odour:	Mild				
Turbidity:	High				
Solids:	Moderate				
Hardness (mg/L):	1.2	mL Titration Solution/	10	mL of Sample x 1000 =	120
Alkalinity (mg/L):	0.4	mL Titration Solution/	10	mL of Sample x 1000 =	40
Temperature (°C):	15				
Dissolved Oxygen (mg/L):	9.71				
Conductivity (µmhos/cm):	239				
pH (5.5-8.5 pH units):	7.45				
pH Adjustment:	Not Adjusted				
pH Adjustment Procedure:	n/a				

Pre-Aeration

Aeration Rate (5.5-7.5 mL/min/L):	6.40 ± 0.6	
Aeration Time (min):	30	
Sample Test Concentration (v/v):	100%	0%
Dissolved Oxygen (D.O.) Before Pre-Aeration (%):	95.6	93.3
Average D.O. After Pre-Aeration (%):	96.5	95.2

Test Organism Data

Lot Number:	19/03/14 T4
Weekly Mortality Preceeding Test (%):	0.77
Sample Size:	10

Conditions Common to All Concentrations During Test

Source of Holding/Dilution Water:	Dechlorinated UV Treated City of Winnipeg Tap Water
Container Description:	20 L Polyethylene Pail with Liner
Aeration Method:	Compressed air bubbled through silica-glass air diffuser
Aeration Rate (5.5-7.5 mL/min/L):	6.40 ± 0.6
Test Solution Volume (L):	20
Test Solution Depth (cm):	34
Number of Test Organisms per Container:	10
Loading Density (g/L):	0.38

ADDRESS 1329 Niakwa Road East Unit 12, Winnipeg Manitoba R2J 3T4 Canada | PHONE +1 204 255 9720 | FAX +1 204 255 9721
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Conditions During Test

Concentration (% v/v)	Temperature (°C) (15 ± 1°C)					Dissolved Oxygen (mg/L)					pH (pH units)				
	0h	24h	48h	72h	96h	0h	24h	48h	72h	96h	0h	24h	48h	72h	96h
0	15	n/a	n/a	n/a	15	9.56	n/a	n/a	n/a	9.68	7.34	n/a	n/a	n/a	7.76
6.25	15	n/a	n/a	n/a	15	9.54	n/a	n/a	n/a	8.88	7.32	n/a	n/a	n/a	7.47
12.5	15	n/a	n/a	n/a	15	9.59	n/a	n/a	n/a	9.89	7.34	n/a	n/a	n/a	7.60
25	15	n/a	n/a	n/a	15	9.60	n/a	n/a	n/a	9.90	7.34	n/a	n/a	n/a	7.58
50	15	n/a	n/a	n/a	15	9.74	n/a	n/a	n/a	9.85	7.34	n/a	n/a	n/a	7.58
100	15	n/a	n/a	n/a	15	9.75	n/a	n/a	n/a	9.75	7.37	n/a	n/a	n/a	7.48

Conc. (% v/v)	Conductivity (umhos/cm)	Number of Fish Dead				Number of Fish Stressed			
	0h	24h	48h	72h	96h	24h	48h	72h	96h
0	321	0	n/a	n/a	0	0	n/a	n/a	0
6.25	319	0	n/a	n/a	0	0	n/a	n/a	0
12.5	315	0	n/a	n/a	1	0	n/a	n/a	0
25	307	0	n/a	n/a	0	0	n/a	n/a	0
50	290	0	n/a	n/a	0	0	n/a	n/a	0
100	257	0	n/a	n/a	0	0	n/a	n/a	0

Control Fish Information at End of Test

Mean Fork Length (mm):	44
Lower Range Fork Length (mm):	39
Upper Range Fork Length (mm):	48
Mean Wet Weight:	0.76

Mortality and Stressed Behaviour Information

Conc. (% v/v)	Mean Number of Fish at End of Test		Mean Rate of Fish at End of Test (%)	
	Dead	Stressed	Dead	Stressed
0	0	0	0	0
6.25	0	0	0	0
12.5	1	0	10	0
25	0	0	0	0
50	0	0	0	0
100	0	0	0	0

Median Lethal Concentration Results for Multi-Concentration Tests

LC50:	>100%
LC50 Lower 95% Confidence Limit:	n/a
LC50 Upper 95% Confidence Limit:	n/a
Statistical Method:	n/a

Note: Non-lethal = 0 mortality

Reference Toxicant Test Results

Reference Toxicant:	Zinc Sulfate
Date Reference Toxicant Initiated:	10-May-14
Recent 96h Reference Toxicant Test LC50 (mg/L Zinc):	0.5
Lower 95% Confidence Limit (mg/L Zinc):	0.34
Upper 95% Confidence Limit (mg/L Zinc):	0.68
Historic Geometric Mean LC50 (mg/L Zinc):	0.65
Lower 95% Confidence Limit (mg/L Zinc):	0.24
Upper 95% Confidence Limit (mg/L Zinc):	1.72
Method of Calculation:	Stephan LC50 Program, Probit
Confirmed by Graph:	Yes

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Sublethal Biological Effects

No sublethal biological effects observed.

Observations/Comments

No toxicity observed.

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L1454055-COFC

10-146460

Chain of Custody / Analytical Request Form
Canada Toll Free: 1 800 668 9878
www.alsglobal.com

Page ___ of ___

Report To	**Report Format / Distribution**
Company: TERVITA	Standard: ✓ Other (specify):
Contact: LISA JORDAN	Select: PDF ✓ Excel Digital Fax
Address: 500, NO-10th AVE SE CALGARY, AB T2P 0R2	Email 1: lijordan@tervita.com
Phone: 250-761-4429 Fax:	Email 2:
Invoice To Same as Report ? (circle) Yes or No (if No, provide details)	**Client / Project Information**
Copy of invoice with Report? (circle) Yes or No	Job #: STORM POND
Company:	PO / AFE: 310-0000005728
Contact:	LSD: A-08-085-20W6M
Address:	
Phone: Fax:	Quote #:
Lab Work Order # (lab use only): L1454055	ALS Contact: Sampler:

Service Request (Rush subject to availability - Contact ALS to confirm TAT)
- Regular (Standard Turnaround Times - Business Days)
- Priority (2-4 Business Days) - 50% surcharge - Contact ALS to confirm TAT
- Emergency (1-2 Business Days) - 100% Surcharge - Contact ALS to confirm TAT
- Same Day or Weekend Emergency - Contact ALS to confirm TAT

Analysis Request
(indicate Filtered or Preserved, F/P)

See attached

Sample #	Sample Identification (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Number of Containers
	STORM POND	12-MAY-14	15:00	LIQUID	

Special Instructions / Regulation with water or land use (CCME - Freshwater Aquatic Life/BC CSR-Commercial/AB Tier 1-Natural/ETC)/ Hazardous Details

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY.

By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

SHIPMENT RELEASE (client use)			SHIPMENT RECEPTION (lab use only)				SHIPMENT VERIFICATION (lab use only)			
Released by:	Date:	Time:	Received by:	Date:	Time:	Temperature:	Verified by:	Date:	Time:	Observations: Yes / No ? If Yes add SIF
	05-12-14	17:00	Geoff	May 12	17:00	20 °C				

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION | WHITE - LABORATORY COPY | YELLOW - CLIENT COPY | GENF 16.01 Front

BC Landfill Surface Water Discharge Record Form

Landfill: Silverberry Landfill - Storm Pond
Estimate Volume Released (m^3)
Discharge Location (LSD/Description) A-08-088-20W6M
Other chemical contamination[1] (yes/no) no
Landowner consent[2] (yes/no/(n/a)) n/a

PARAMETERS	REGULATORY LIMITS	Results	Pass	Fail
Chlorides	250 mg/l	11.7	Pass	
pH	6.5 - 8.5	8.17	Pass	
Oil and Grease	10 mg/l	5	Pass	
Total Suspended Solids	20 mg/l	2	Pass	
Sulphate	500 mg/l	189	Pass	
Benzene	0.5 mg/l	0.001	Pass	
Toluene	2.4 mg/l	0.001	Pass	
Ethyl Benzene	0.24 mg/l	0.001	Pass	
Xylenes	30 mg/l	0.001	Pass	
Aluminum, dissolved	0.5 mg/l	0.324	Pass	
Antimony, dissolved	0.25 mg/l	0.0002	Pass	
Arsenic, dissolved	0.1 mg/l	0.0008	Pass	
Barium, dissolved	1.0 mg/l	0.058	Pass	
Boron, dissolved	10.0 mg/l	0.061	Pass	
Cadmium, dissolved	0.05 mg/l	0.000015	Pass	
Cobalt, dissolved	0.1 mg/l	0.0002	Pass	
Copper, dissolved	0.1 mg/l	0.0002	Pass	
Lead, dissolved	0.1 mg/l	0.0002	Pass	
Mangnese, dissolved	0.5 mg/l	0.01	Pass	
Molybdenum, dissolved	0.5 mg/l	0.001	Pass	
Nickel, dissolved	0.5 mg/l	0.0029	Pass	
Selenium, dissolved	0.05 mg/l	0.0005	Pass	
Tin, dissolved	0.5 mg/l	0.00005	Pass	
Zinc, dissolved	0.2 mg/l	0.007	Pass	
Mercury, total	0.001 mg/l	0.000005	Pass	

Laboratory Report #	1013745
Date:	18-Jul-14
Operator (Print Name)	Lisa Jordan
Operator (Signature)	

Comments:

[1] *if it is suspected that other chemical have entered the surface water retention pond the water is not suitable for discharge*
[2] *landowner consent must be obtained and kept on file*

Exova
#1 9822-106 Street
Fort St. John, British Columbia
V1J 5W9, Canada
T: +1 (250) 785-2731
F: +1 (250) 785-1092
E: FortStJohn@exova.com
W: www.exova.com

Exova

Report Transmission Cover Page

Bill To: Tervita Corporation
Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silverberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
Acct code:

Lot ID: **1013745**
Control Number:
Date Received: Jul 11, 2014
Date Reported: Jul 18, 2014
Report Number: 1931853

Contact & Affiliation	Address	Delivery Commitments
Accounts Payable Tervita Corporation	500, 140 - 10 Avenue SE Calgary, Alberta T2G 0R1 Phone: (403) 234-6412 Fax: (403) 261-5812 Email: accountspayable@tervita.com	On [Lot Approval and Final Test Report Approval] send (invoice) by Email - Single Report
Lisa Jordan Tervita Corporation	9940 102 Avenue Fort St. John, Alberta V1J 2E1 Phone: (250) 827-6834 Fax: null Email: ljordan@tervita.com	On [Lot Verification] send (COA, COC) by Email - Single Report On [Report Approval] send (COC, Test Report) by Email - Merge Reports On [Lot Approval and Final Test Report Approval] send (Invoice) by Email - Single Report

Notes To Clients:

- Sample 1013745-1; 4794993 Sample 1013745-1: There was insufficient sample volume to reach a detection limit of 1 mg/L for TSS analysis. The detection limit was adjusted accordingly.
- Sample 1013745-1; 4794993 Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.

Exova
#1 8822-100 Street
Fort St. John, British Columbia
V1J 3W9, Canada

T: +1 (250) 785-2731
F: +1 (250) 785-7052
E: FortStJohn@exova.com
W: www.exova.com

Exova

Analytical Report

Bill To: Tervita Corporation
Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silverberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
Acct code:

Lot ID: **1013745**
Control Number:
Date Received: Jul 11, 2014
Date Reported: Jul 18, 2014
Report Number: 1931853

		Reference Number	1013745-1	1013745-2		
		Sample Date	Jul 11, 2014	Jul 11, 2014		
		Sample Time	13:30	13:30		
		Sample Location				
		Sample Description	Storm Pond	Leak Detection		
		Matrix	Water	Water		
Analyte		**Units**	**Results**	**Results**	**Results**	**Nominal Detection Limit**
Aggregate Organic Constituents						
Oil and Grease	Total	mg/L	<5	<5		5
pH	adjustment required for O&G		No	No		
Metals Dissolved						
Silicon	Dissolved	mg/L	1.17	2.95		0.05
Sulfur	Dissolved	mg/L	63.0	226		0.3
Mercury	Dissolved	mg/L	<0.000005	<0.000005		0.000005
Aluminum	Dissolved	mg/L	0.324	0.238		0.002
Antimony	Dissolved	mg/L	<0.0002	0.0002		0.0002
Arsenic	Dissolved	mg/L	0.0008	0.0008		0.0002
Barium	Dissolved	mg/L	0.058	0.040		0.001
Beryllium	Dissolved	mg/L	<0.0001	<0.0001		0.0001
Bismuth	Dissolved	mg/L	<0.0005	<0.0005		0.0005
Boron	Dissolved	mg/L	0.061	0.10		0.002
Cadmium	Dissolved	mg/L	0.000015	0.000132		0.00001
Chromium	Dissolved	mg/L	0.0008	0.0011		0.0005
Cobalt	Dissolved	mg/L	0.0002	0.0010		0.0001
Copper	Dissolved	mg/L	0.003	0.004		0.001
Iron	Dissolved	mg/L	0.273	0.316		0.02
Lead	Dissolved	mg/L	0.0002	0.0002		0.0001
Lithium	Dissolved	mg/L	0.004	0.029		0.001
Molybdenum	Dissolved	mg/L	<0.001	<0.001		0.001
Nickel	Dissolved	mg/L	0.0029	0.0071		0.0005
Selenium	Dissolved	mg/L	0.0005	0.0008		0.0002
Silver	Dissolved	mg/L	<0.00001	<0.00001		0.00001
Strontium	Dissolved	mg/L	0.142	0.691		0.001
Thallium	Dissolved	mg/L	<0.00005	<0.00005		0.00005
Tin	Dissolved	mg/L	<0.001	<0.001		0.001
Titanium	Dissolved	mg/L	0.0132	0.0082		0.0005
Uranium	Dissolved	mg/L	<0.0005	0.0036		0.0005
Vanadium	Dissolved	mg/L	0.0012	0.0014		0.0001
Zinc	Dissolved	mg/L	0.007	0.012		0.001
Zirconium	Dissolved	mg/L	<0.001	<0.001		0.001
Subsample	Field Filtered		Field Filtered	Field Filtered		
Metals Total						
Mercury	Total	mg/L	<0.000005	<0.000005		0.000005

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Analytical Report

Bill To: Tervita Corporation
Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silverberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
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		Reference Number	1013745-1	1013745-2		
		Sample Date	Jul 11, 2014	Jul 11, 2014		
		Sample Time	13:30	13:30		
		Sample Location				
		Sample Description	Storm Pond	Leak Detection		
		Matrix	Water	Water		
Analyte		**Units**	**Results**	**Results**	**Results**	**Nominal Detection Limit**
Physical and Aggregate Properties						
Solids	Total Suspended	mg/L	<2	<5		1
Routine Water						
pH			8.17	7.40		
Temperature of observed pH		°C	22.9	23.1		
Calcium	Dissolved	mg/L	40.4	185		0.2
Magnesium	Dissolved	mg/L	11.4	84.6		0.2
Sodium	Dissolved	mg/L	5.1	28.1		0.4
Potassium	Dissolved	mg/L	4.4	5.2		0.4
Iron	Dissolved	mg/L	0.24	0.25		0.01
Manganese	Dissolved	mg/L	0.01	0.181		0.005
Chloride	Dissolved	mg/L	11.7	41.0		0.4
Sulfate (SO4)	Dissolved	mg/L	189	680		0.9
Hardness	Dissolved as CaCO3	mg/L	148	810		
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001	<0.001		0.001
Ethylbenzene		mg/L	<0.001	<0.001		0.001
Methyl t-Butyl Ether		mg/L	<0.001	<0.001		0.001
Styrene		mg/L	<0.001	<0.001		0.001
Toluene		mg/L	<0.001	<0.001		0.001
Total Xylenes (m,p,o)		mg/L	0.001	<0.001		0.001
VHw6-10		mg/L	<0.05	<0.05		0.05
VPHw (VHw6-10 minus BTEX)		mg/L	<0.05	<0.05		0.05
Water Salinity						
pH			8.05	6.96		
Temperature of observed pH		°C	20	19		

Approved by:
Deanna Giesbrecht, BSc.
Quality Officer

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS)
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process

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Quality Control

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Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silvarberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
Acct code:

Lot ID: **1013745**
Control Number:
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Aggregate Organic Constituents

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Oil and Grease	mg/L	40	37	43	yes
Date Acquired: July 17, 2014					

Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	-0.0057	-0.04	0.05	yes
Sulfur	mg/L	-0.0548	-0.3	0.2	yes
Mercury	ug/L	-0.0031	-0.038000	0.064000	yes
Aluminum	ug/L	0.180727	-2	2	yes
Antimony	ug/L	0.0400247	-0.2	0.2	yes
Arsenic	ug/L	-0.000427605	-0.2	0.2	yes
Barium	ug/L	0.0699535	-1	1	yes
Beryllium	ug/L	0.00319817	-0.0	0.1	yes
Bismuth	ug/L	0.00833226	-1.5	1.5	yes
Boron	ug/L	-0.106505	-2	2	yes
Cadmium	ug/L	0.00334673	-0.01	0.01	yes
Chromium	ug/L	-0.0126115	-0.3	0.3	yes
Cobalt	ug/L	0.00174859	-0.1	0.1	yes
Copper	ug/L	0.141859	-1	1	yes
Lead	ug/L	0.007368	-0.1	0.1	yes
Lithium	ug/L	0.00173833	-1	1	yes
Molybdenum	ug/L	0.0164482	-1	1	yes
Nickel	ug/L	-0.000259818	-0.5	0.5	yes
Selenium	ug/L	-0.0237792	-0.2	0.2	yes
Silver	ug/L	-0.0069443	-0.10	0.10	yes
Strontium	ug/L	0.0330957	-1	1	yes
Thallium	ug/L	-0.000578963	-0.05	0.05	yes
Tin	ug/L	0.0198144	-1	1	yes
Titanium	ug/L	-0.00320207	-0.5	0.5	yes
Uranium	ug/L	0.0030645	-0.5	0.5	yes
Vanadium	ug/L	-0.00160267	-0.1	0.1	yes
Zinc	ug/L	0.292168	-0	2	yes
Zirconium	ug/L	0.00063489	-1	1	yes
Date Acquired: July 17, 2014					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Silicon	mg/L	7.07	7.09	10	0.01	yes
Sulfur	mg/L	13.5	13.4	10	0.1	yes
Mercury	mg/L	<0.000005	<0.000005	10	0.000300	yes
Aluminum	ug/L	238	252	10	11	yes
Antimony	ug/L	0.2	<0.2	10	0.4	yes
Arsenic	ug/L	0.8	0.8	10	0.4	yes
Barium	ug/L	40	39	10	2	yes

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Metals Dissolved - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Beryllium	ug/L	<0.1	<0.1	10	0.2	yes
Bismuth	ug/L	<0.5	<0.5	10	1.1	yes
Boron	ug/L	100	99	10	4	yes
Cadmium	ug/L	0.13	0.13	10	0.02	yes
Chromium	ug/L	1.1	1.0	10	1.1	yes
Cobalt	ug/L	1.0	1	10	0.2	yes
Copper	ug/L	4	4	10	2	yes
Lead	ug/L	0.2	0.2	10	0.2	yes
Lithium	ug/L	29	30	10	2	yes
Molybdenum	ug/L	<1	<1	10	2	yes
Nickel	ug/L	7.1	7.0	10	1.1	yes
Selenium	ug/L	0.6	0.5	10	0.4	yes
Silver	ug/L	<0.01	<0.01	10	0.22	yes
Strontium	ug/L	691	700	10	2	yes
Thallium	ug/L	<0.05	<0.05	10	0.11	yes
Tin	ug/L	<1	<1	10	2	yes
Titanium	ug/L	8.2	8.1	10	1.1	yes
Uranium	ug/L	3.6	3.6	10	1.1	yes
Vanadium	ug/L	1.4	1.3	10	0.2	yes
Zinc	ug/L	12	11	10	2	yes
Zirconium	ug/L	<1	<1	10	2	yes
Date Acquired: July 17, 2014						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	mg/L	0.000822	0.000600	0.000960	yes
Date Acquired: July 17, 2014					
Mercury	mg/L	0.00297	0.002610	0.003210	yes
Aluminum	ug/L	1020	914	1068	yes
Antimony	ug/L	39.8	35.2	43.0	yes
Arsenic	ug/L	39.8	36.7	43.3	yes
Barium	ug/L	196	191	214	yes
Beryllium	ug/L	20.7	17.3	22.1	yes
Bismuth	ug/L	109	94.7	114.8	yes
Boron	ug/L	400	344	434	yes
Cadmium	ug/L	2.05	1.86	2.26	yes
Chromium	ug/L	97.5	89.7	107.7	yes
Cobalt	ug/L	20.5	16.0	21.2	yes
Copper	ug/L	187	184	208	yes
Lead	ug/L	20.1	18.4	22.0	yes
Lithium	ug/L	209	175	223	yes
Molybdenum	ug/L	199	187	226	yes
Nickel	ug/L	97.7	92.5	104.6	yes
Selenium	ug/L	38.3	35.8	43.0	yes

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Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silver	ug/L	21.0	17.98	21.40	yes
Strontium	ug/L	192	174	210	yes
Thallium	ug/L	10.4	9.40	11.20	yes
Tin	ug/L	193	180	220	yes
Titanium	ug/L	98.3	88.9	108.7	yes
Uranium	ug/L	101	92.7	107.5	yes
Vanadium	ug/L	19.5	16.0	22.0	yes
Zinc	ug/L	200	183	219	yes
Zirconium	ug/L	202	180	220	yes
Date Acquired:	July 17, 2014				
Mercury	mg/L	0.000769	0.000715	0.000885	yes
Date Acquired:	July 17, 2014				
Mercury	mg/L	0.000084	0.000065	0.000089	yes
Aluminum	ug/L	50	45	55	yes
Antimony	ug/L	1.9	1.8	2.3	yes
Arsenic	ug/L	2.0	1.8	2.2	yes
Barium	ug/L	10	9	11	yes
Beryllium	ug/L	1.0	0.9	1.1	yes
Bismuth	ug/L	4.7	4.3	5.2	yes
Boron	ug/L	19	18	22	yes
Cadmium	ug/L	0.10	0.09	0.11	yes
Chromium	ug/L	4.6	4.5	5.5	yes
Cobalt	ug/L	1.0	0.9	1.1	yes
Copper	ug/L	10	9	11	yes
Lead	ug/L	1	0.9	1.1	yes
Lithium	ug/L	11	9	11	yes
Molybdenum	ug/L	10	9	10	yes
Nickel	ug/L	4.7	4.4	5.5	yes
Selenium	ug/L	1.9	1.7	2.1	yes
Silver	ug/L	0.87	0.84	1.08	yes
Strontium	ug/L	10	9	11	yes
Thallium	ug/L	0.52	0.47	0.56	yes
Tin	ug/L	10	9	11	yes
Titanium	ug/L	5.4	4.5	5.5	yes
Uranium	ug/L	5.2	4.5	5.5	yes
Vanadium	ug/L	1	0.9	1.1	yes
Zinc	ug/L	10	9	11	yes
Zirconium	ug/L	10	9	11	yes
Date Acquired:	July 17, 2014				
Silicon	mg/L	9.42	8.70	10.50	yes
Sulfur	mg/L	142	140.5	158.5	yes
Date Acquired:	July 17, 2014				

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Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	1.96	1.80	2.20	yes
Sulfur	mg/L	9.7	9.0	11.0	yes
Date Acquired:	July 17, 2014				
Silicon	mg/L	0.18	0.18	0.22	yes
Sulfur	mg/L	2.9	2.8	3.3	yes
Date Acquired:	July 17, 2014				

Metals Total

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	ug/L	-0.003	-0.038000	0.070000	yes
Date Acquired:	July 17, 2014				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000300	yes
Date Acquired:	July 17, 2014					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	mg/L	0.000727	0.000600	0.000960	yes
Date Acquired:	July 17, 2014				
Mercury	mg/L	0.00287	0.002600	0.003200	yes
Date Acquired:	July 17, 2014				
Mercury	mg/L	0.000741	0.000700	0.000880	yes
Date Acquired:	July 17, 2014				
Mercury	mg/L	0.000084	0.000065	0.000089	yes
Date Acquired:	July 17, 2014				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Solids	mg/L	80	75	10	2	yes
Date Acquired:	July 16, 2014					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Solids	mg/L	188	181	205	yes
Date Acquired:	July 16, 2014				
Solids	mg/L	15	15	24	yes
Date Acquired:	July 16, 2014				

Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chloride	mg/L	0	-1.0	1.0	yes
Date Acquired:	July 15, 2014				
Calcium	mg/L	-0.0234	-0.2	0.2	yes
Magnesium	mg/L	-0.0237	-0.1	0.1	yes

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Routine Water - Continued

Blanks	Units	Measured	Lower Limit	Upper Limit		Passed QC
Sodium	mg/L	0.0268	-0.4	0.4		yes
Potassium	mg/L	-0.052	-0.4	0.4		yes
Iron	mg/L	0.00177	-0.01	0.01		yes
Manganese	mg/L	-0.0006	-0.004	0.004		yes
Date Acquired:	July 17, 2014					
Client Sample Replicates	**Units**	**Replicate 1**	**Replicate 2**	**% RSD Criteria**	**Absolute Criteria**	**Passed QC**
pH		8.01	7.99	10	0.10	yes
Calcium	mg/L	97.1	97.0	10	0.6	yes
Magnesium	mg/L	28.6	28.5	10	0.7	yes
Sodium	mg/L	46.2	46.0	10	1.2	yes
Potassium	mg/L	3.1	3.1	10	1.2	yes
Iron	mg/L	0.82	0.81	10	0.05	yes
Manganese	mg/L	2.28	2.28	10	0.010	yes
Date Acquired:	July 17, 2014					
Chloride	mg/L	11.7	11.7	20	3.0	yes
Date Acquired:	July 15, 2014					
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Chloride	mg/L	73.4	72.0	88.0		yes
Date Acquired:	July 15, 2014					
Chloride	mg/L	31.2	27.0	33.0		yes
Date Acquired:	July 15, 2014					
pH		9.20	9.05	9.25		yes
Calcium	mg/L	238	228.0	258.0		yes
Magnesium	mg/L	95.4	92.7	101.1		yes
Sodium	mg/L	242	233.3	257.3		yes
Potassium	mg/L	241	235.2	259.2		yes
Iron	mg/L	9.35	8.91	10.20		yes
Manganese	mg/L	2.34	2.240	2.540		yes
Date Acquired:	July 17, 2014					
pH		6.89	6.78	6.96		yes
Calcium	mg/L	50.2	47.3	54.5		yes
Magnesium	mg/L	19.5	18.0	22.0		yes
Sodium	mg/L	49.3	47.7	55.5		yes
Potassium	mg/L	48.9	45.0	55.0		yes
Iron	mg/L	1.97	1.91	2.21		yes
Manganese	mg/L	0.500	0.450	0.550		yes
Date Acquired:	July 17, 2014					
Calcium	mg/L	5.0	4.6	5.7		yes
Magnesium	mg/L	1.9	1.8	2.2		yes
Sodium	mg/L	5.1	4.7	5.7		yes

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Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Potassium	mg/L	4.8	4.5	5.5	yes
Iron	mg/L	0.18	0.18	0.22	yes
Manganese	mg/L	0.049	0.045	0.055	yes
Date Acquired:	July 17, 2014				

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-1	1	yes
Ethylbenzene	ng	0	-1	1	yes
m,p-Xylene	ng	0	-1	1	yes
Methyl t-Butyl Ether	ng	0	-1	1	yes
o-Xylene	ng	0	-1	1	yes
Styrene	ng	0	-1	1	yes
Toluene	ng	0	-1	1	yes
Total Xylenes (m,p,o)	ng	0	-1	1	yes
Date Acquired:	July 15, 2014				
Calibration Check	**Units**	**% Recovery**	**Lower Limit**	**Upper Limit**	**Passed QC**
Benzene	ng	102.00	80	120	yes
Ethylbenzene	ng	116.00	80	120	yes
Methyl t-Butyl Ether	ng	112.00	80	120	yes
Styrene	ng	114.00	80	120	yes
Toluene	ng	106.00	80	120	yes
Total Xylenes (m,p,o)	ng	117.33	80	120	yes
Date Acquired:	July 15, 2014				

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	ug/L	<1	<1	25		yes
Ethylbenzene	ug/L	<1	<1	30		yes
Methyl t-Butyl Ether	ug/L	<1	<1	25		yes
Styrene	ug/L	<1	<1	25		yes
Toluene	ug/L	<1	<1	25		yes
Total Xylenes (m,p,o)	ug/L	1	1	30		yes
Date Acquired:	July 15, 2014					
Matrix Spike	**Units**	**% Recovery**	**Lower Limit**	**Upper Limit**		**Passed QC**
Benzene	ug/L	114	75	125		yes
Ethylbenzene	ug/L	115	70	130		yes
Methyl t-Butyl Ether	ug/L	97	75	125		yes
Styrene	ug/L	118	75	125		yes
Toluene	ug/L	110	75	125		yes
Total Xylenes (m,p,o)	ug/L	115	70	130		yes
Date Acquired:	July 15, 2014					

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W: www.exova.com

Exova

Quality Control

Bill To: Tervita Corporation
Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silverberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
Acct code:

Lot ID: **1013745**
Control Number:
Date Received: Jul 11, 2014
Date Reported: Jul 18, 2014
Report Number: 1931853

Volatile Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit		Passed QC
VHw6-10	ng	0	-50	50		yes
VHw6-oXylene	ng	0	-50	50		yes
VHwoXylene-10	ng	0	-50	50		yes
Date Acquired:	July 15, 2014					
Replicates	**Units**	**Replicate 1**	**Replicate 2**	**% RSD Criteria**	**Absolute Criteria**	**Passed QC**
VHw6-10	ug/L	<50	<50	25		yes
VPHw (VHw6-10 minus	ug/L	<50	<50	25		yes
Date Acquired:	July 15, 2014					

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Methodology and Notes

Bill To: Tervita Corporation
Report To: Tervita Corporation
9940 102 Avenue
Fort St. John, AB, Canada
V1J 2E1
Attn: Lisa Jordan
Sampled By: Shane Leader
Company: Tervita

Project:
ID:
Name: Random Samples
Location: Silverberry Landfill
LSD: A-08-088-20W6M
P.O.: 310-0000007045
Acct code:

Lot ID: **1013745**
Control Number:
Date Received: Jul 11, 2014
Date Reported: Jul 18, 2014
Report Number: 1931853

Method of Analysis

Method Name	Reference	Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	* pH - Electrometric Method, 4500-H+ B	16-Jul-14	Exova Edmonton
BTEX-VPH - Water (MS) (FSJ)	BCELM	* Volatile Hydrocarbons in Water by GC/FID, VH Water	15-Jul-14	Exova Fort St. John
Chloride in Water	APHA	* Automated Ferricyanide Method, 4500-Cl- E	15-Jul-14	Exova Fort St. John
Mercury (Dissolved) in water	APHA	* Cold Vapour Atomic Absorption Spectrometric Method, 3112 B	17-Jul-14	Exova Edmonton
Mercury (Total) in water	EPA	* Mercury in Water by Cold Vapor Atomic Fluorescence Spectrometry, 245.7	17-Jul-14	Exova Edmonton
Metals ICP-MS (Dissolved) in water	APHA/USEPA	* Metals By Inductively Coupled Plasma/Mass Spectrometry, APHA 3125 B / USEPA 200.2, 200.8	17-Jul-14	Exova Edmonton
Metals Trace (Dissolved) in water	APHA	Hardness by Calculation, 2340 B	17-Jul-14	Exova Edmonton
Metals Trace (Dissolved) in water	APHA	* Inductively Coupled Plasma (ICP) Method, 3120 B	17-Jul-14	Exova Edmonton
Oil and Grease in water	US EPA	* n-Hexane Extractable Material and Silica Gel Treated n-Hexane Extractable Material by Extraction and Gravimetry, 1664	16-Jul-14	Exova Edmonton
pH in water	APHA	* pH - Electrometric Method, 4500-H+ B	15-Jul-14	Exova Fort St. John
Solids Suspended (Total, Fixed and Volatile)	APHA	* Total Suspended Solids Dried at 103-105°C, 2540 D	16-Jul-14	Exova Edmonton

*Reference Method Modified

References

APHA	Standard Methods for the Examination of Water and Wastewater
US EPA	US Environmental Protection Agency Test Methods

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Methodology and Notes

Bill To:	Tervita Corporation	Project:	
Report To:	Tervita Corporation	ID:	
	9940 102 Avenue	Name:	Random Samples
	Fort St. John, AB, Canada	Location:	Silverberry Landfill
	V1J 2E1	LSD:	A-08-088-20W6M
Attn:	Lisa Jordan	P.O.:	310-0000007045
Sampled By:	Shane Leader	Acct code:	
Company:	Tervita		

Lot ID:	**1013745**
Control Number:	
Date Received:	Jul 11, 2014
Date Reported:	Jul 18, 2014
Report Number:	1931853

Comments:

- Sample 1013745-1; 4794993 Sample 1013745-1: There was insufficient sample volume to reach a detection limit of 1 mg/L for TSS analysis. The detection limit was adjusted accordingly.
- Sample 1013745-1; 4794993 Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.

Exova
www.exova.com

Project Information

Project ID	
Project Name	Random Samples
Project Location	Silverberry Landfill
Legal Location	A-08-088-20W5M
PO/AFE#	310-0000007045
Proj. Acct.Code	n/a

Billing Information:

Company	Tervita Corporation
Address	500,140-10th Ave, SE
	Calgary, AB T2P 0R1
Attention	Lisa Jordan
Phone	250-827-6834
Cell	250-261-4429
Fax	
E-mail	lijordan@tervita.com
Agreement ID	
Copy of Report	

Copy of Report To:

Company	
Address	
Attention	
Phone	
Cell	
Fax	
E-mail	lijordan@tervita.com
Copy of Invoice	lijordan@tervita.com

RUSH Priority

Upon filling out this section, client accepts that surcharges will be applied to the analysis

Date Required
As Indicated [ ] All Analysis

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples

Signature

Sample Custody (please print)

Sampled by: SHANE LEADER
Company: TERVITA

I authorize Exova to proceed with the work indicated on this form
Date: 07-11-14 Initial: LF

This section for Lab use only

Date/Time stamp: JUL 14 15:40 IN

Report Results: [X] E-Mail [ ] Mail | [ ] Online [X] PDF [ ] Fax [ ] Excel | [X] QA/QC Report

Special Instructions/Comments (please include contact information including ph. # if different from above).

Indicate Regulatory Requirements below

	Sample Identification	Location	Depth in cm m	Date/Time sampled	Matrix	Sampling method	Number of Containers	See attached	Enter tests above (√ relevant samples below)
1	Storm Pond		Surface	07/11/2014 1:30PM	Liquid	Pour	*1		
2	Leak Detection		Surface	07/11/2014 1:30PM	Liquid	Pour	*1		
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

Indicate below any deficiencies in the condition of samples:

- Were Exova supplies used?
- Was there any damage to the shipping container?
- Were the containers packaged well?
- Were the expected number of samples received (document below)?
- Are samples within recommended holding times/temp?

Environmental Sample Information Sheet

Note: Proper completion of this form is required in order to proceed with analysis

Please indicate any potentially hazardous samples

of Control #

LOT: 1013745 COC

Shipping: COD Y/N

Cooler temp: 21 C

and size of coolers received:

Delivery Method:

Waybill:

Received by:

Appendix 2A
Volatile Organic Compound Air Sampling Report

CH2M
540 12 Ave SW
Calgary, AB T2R 0H4
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www.ch2m.com

Peter Nelson
Environmental and Regulatory Advisor
Tervita Corporation
500, 140 10th Avenue S.E.
Calgary, AB Canada
T2G 0R1

October 28, 2016

Subject: Results of Volatile Organic Compound Air Sampling Activities
August 23 and 24 2016
Tervita Silverberry Landfill

Dear Mr. Nelson,

1. Introduction

Based on comments from the Working Group to Tervita Corporation (Tervita) for the Silverberry Landfill Capacity Replacement Project, Tervita has retained CH2M Hill Energy Canada Limited (CH2M) to conduct volatile organic compound (VOC) air sampling for the Silverberry site. The landfill is used primarily for the disposal of waste associated with oil and gas exploration. The landfill has the potential to generate some emissions from the hydrocarbon contaminated waste accepted. The waste inherently contains petroleum hydrocarbons.

The Silverberry landfill is located approximately 50 kilometres northwest of Fort St John in northeastern British Columbia. The VOC air sampling study was done over a two-day period on August 23 and August 24, 2016.

Details of the study and the results are provided in the sections below.

2. Sampling Activities

The objective of the study was to evaluate the chemical composition of potential landfill gas emissions generated from the Silverberry landfill. The VOC air sampling concentrated on the active cell #7 since the majority of cells are now under a progressive cap (a bitumen or low density polyurethane), which would limit the potential release of landfill gas. Due to the possible effects of winds on collection of the landfill gas, the measurements were taken on days of relatively low wind speeds.

The sampling was comprised of a preliminary monitoring phase where a portable handheld landfill gas analyzer was used to potentially identify areas in the active cell where emissions may be greater than other areas (“hotspots”). This sampling was conducted on August 23, 2016. The intent of the preliminary monitoring was to help identify possible locations where summa canister samples were taken on August 24, 2016.

The sampling program provides a snapshot of the VOCs at the time the measurements were recorded. It does not provide a method to estimate the quantity or rate of landfill gas emissions.

Preliminary Sampling:

Landfill gas can migrate through pores and opening in the soil and these gases have a tendency to emit from high points in the landfill terrain. Therefore, a portable instrument was used to identify possible "hotspots" or locations on the landfill surface where relatively high concentrations of methane or other landfill gas emissions might be detected. A Landfill GEM5000 gas analyzer was used to survey the landfill surface. Measurements using the portable instrument were taken at 12 points spaced approximately 50-75 metres apart on the landfill surface to identify possible hotspots. The portable gas monitor measured CH_4 (methane), CO_2 (carbon dioxide), H_2S (hydrogen sulfide), and CO (carbon monoxide). The monitor is sensitive to 0.1% by volume of CH_4 and CO_2 and to 1 ppm H_2S and CO.

Over the grid of measurement locations described above, there were no detectable concentrations of CH_4, CO_2, H_2S, or CO.

Summa Canister Samples:

Due to the less than detectable concentrations of gases taken in the preliminary sampling phase, CH2M identified two locations on the landfill surface site that were higher in elevation than the surrounding areas and therefore may potentially emit more landfill gas than other (slightly) lower terrain areas. One air sample (1/2-hr collection) in proximity to each of these two locations were then taken using a Summa canister and flow controller and sent to an accredited laboratory for quantitative analyses of several contaminants composing the landfill gas, specifically volatile organic compounds (VOCs). The samples were taken near the surface of the landfill at a height of approximately 0.5 metres to help minimize the effect of wind on the collection.

VOC samples collected were analyzed in accordance with US EPA Method TO-15 Determination of Volatile Organic Compounds (VOCs) In Air Collected in Specially-Prepared Canister and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS) (US EPA, January 1999). The method is based on the measured intake of VOC-containing air into a specially prepared canister over a known period of time.

Constituent VOCs will be quantified consistent with Table 1 of US EPA Compendium Method TO-15 EPA/625/R-96/010b (US Environmental Protection Agency, January 1999). The list of VOCs that are measured through this technique are shown in the Certificate of Analysis shown in Attachment 1. The lab analyses were performed by ALS Environmental (ALS), accredited by the Standards Council of Canada for VOC analysis.

The locations for the canister sample collections are shown in Attachment 2. The geographical coordinates of the sample locations are shown in the Table 1 below. Table 2 summarizes the time of collection and prevailing winds at that time as recorded at the Environment Canada Fort St John Automated weather station.

Field notes for the preliminary and summa canister sampling are provided in Attachment 3.

Table 1. Location of Summa Canister Sample Collections

Sample	UTM Easting (m)	UTM Northing (m)	Latitude	Longitude
SA01 – south central location of Cell 7	612817	6276755	56.6214 N	121.16137 W
SA02 – south west corner of Cell 7	612606	6276721	56.621145	121.164821 W

Table 2. Sampling Schedule and Wind Conditions

Contaminants	Sampling Event #	Sampling Period		Predominant Wind at the Site	
		Start	End	Wind Direction (blow from)	Wind Speed (km/h)
CH_4, CO, H_2S	NA	08/23/2016, Approx. 4:01 pm	08/23/2016, Approx. 4:35 pm	South southwest	6
VOCs	SA01	08/24/2016, Approx. 8:15 am	08/24/2016, Approx. 8:45 am	Southwest	10
	SA02	08/24/2016, Approx. 8:41am	08/24/2016, Approx. 9:11 am	Southwest and northwest	7-10

Notes: Data from Environment Canada Fort St John meteorological station (WMO 71943)

3. Results

ALS Certificate of Analysis (COA) for VOCs are included in Attachment 1. A summary of the results of the two VOC samples are provided below in Table 3. This list shows only the VOCs that had at least one measured concentration above the method detection limit at either one of the two sampling locations.

British Columbia has no applicable ambient air criteria for any of the speciated VOCs analyzed using the TO-15 method. Therefore, for comparison purposes only, ambient air guidelines are listed preferentially from Alberta (Alberta Environment, 2013), and then from Ontario (Ontario Ministry of the Environment, 2012) as necessary. Some of the compounds have both 1-hour and 24-hour averaging periods, and in those cases, the lower of the two (i.e. the 24-hr average) is listed in the Table.

The results indicate that one VOC (benzene) for sample (SA-01) was at the Alberta 1-hour average ambient air standard. None of the remaining VOC concentrations are greater than the listed standards or guidelines at both sampling locations during the sampling event.

The identifier **ND** in the table below means that the contaminant was not detectable by the laboratory for that sample, meaning that within the uncertainties in the analysis method, the concentration is not statistically greater than zero.

Table 3. Summary of VOC Lab Results

Contaminants	CAS Number	Ambient Air Objective, Standard, or Guideline ($\mu g/m^3$)	Sample Concentration ($\mu g/m^3$)	
			SA01	SA02
Acetone	67-64-1	5,900 (1-hr; Alberta)[1]	34	7.9
Benzene	71-43-2	30 (1-hr; Alberta)	30	ND
Chloromethane	74-87-3	320 (24-hr; Ontario)[2]	ND	1.2
Cyclohexane	110-82-7	6100 (24-hr; Ontario)	152	1.23
Dichlorodifluoromethane	75-71-8	500,000 (24-hr; Ontario Guideline)[3]	ND	2.41
4-Ethyltoluene	25550-14-5	500 (24-hr; Ontario JSL)[4]	36	ND
n-Heptane	142-82-5	11,000 (24-hr; Ontario)	438	2.29
n-Hexane	110-54-3	7,000 (24-hr; Alberta)	201	4.24

Table 3. Summary of VOC Lab Results

Contaminants	CAS Number	Ambient Air Objective, Standard, or Guideline (µg/m³)	Sample Concentration (µg/m³) SA01	SA02
Toluene	108-88-3	400 (24-hr; Alberta)	168	1.26
Trichlorofluoromethane	75-69-4	6,000 (24-hr; Ontario Guideline)	ND	1.9
1,2,4-trimethylbenzene	95-63-6	220 (24-hr; Ontario)	175	ND
1,3,5-trimethylbenzene	108-67-8	220 (24-hr; Ontario)	91	ND
m&p xylenes	1330-20-7	700 (24-hr; Alberta)[5]	371	ND
o xylenes	1330-20-7	700 (24-hr; Alberta)[5]	107	ND

Notes:

ND - Not detected

1 Alberta Ambient Air Quality Objectives and Guidelines Summary, August 2013.

2 Ontario Ambient Air Quality Criteria, April 2012.

3 Summary of Standards and Guidelines, to support Ontario Regulation 419/05 – Air Pollution – Local Air Quality, April 2012.

4 Jurisdictional Screening Level (JSL) List – A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality, February 2008.

5 Total Xylenes.

Need conclusion or opinion on the whether there are landfill gases being emitted into the atmosphere and if mitigation/monitoring is required.

4. Conclusion

The VOCs concentrations measured at the Silverberry site were compared against ambient air quality standards from Alberta and Ontario as described in Section 3. The VOCs that were detected by the analysis method are all less than the ambient air standards listed in Table 3 except for benzene, which was just at the 1-hr ambient air quality standard of 30 µg/m^3 for one of the two samples. The samples were taken directly over the landfill and did not account for any dispersion that would occur as the landfill gas migrates off-property. Therefore, it is unlikely that the off-site concentration of any landfill gases (including benzene) are at or higher than the standard due to the dispersion and dilution of the landfill emissions. Based on the results presented above, additional monitoring is not warranted.

5. Closure

The results presented in this report are reflective of the conditions at the time of the sample collection, and at the locations where the samples were collected. CH2M does not attest to the conditions at the Facility or emissions therefrom at any other time or location.

CH2M's air quality specialist has reviewed the information contained in this report. Darryl Chartrand, Ph.D., has over 18 years of ambient air quality monitoring, emissions inventory development, and dispersion modelling expertise for many different industrial sectors including automotive, iron and steel, upstream and downstream oil and gas, and several manufacturing sectors. Darryl has significant experience in atmospheric monitoring and data analysis, including QA/QC, the formation of ambient air and source monitoring plans, and fugitive dust and odour mitigation plans.

Use of this Report or any information contained herein, if by any party other than Tervita, shall be at the sole risk of such party and shall constitute a release and agreement by such party to defend and indemnify CH2M and its affiliates, officers, employees and subcontractors from and against any liability for direct, indirect, incidental, consequential or special loss or damage or other liability of any nature arising from its use of the Report or reliance upon any of its content. To the maximum extent permitted by law, such release from and indemnification against liability shall apply in contract, tort (including negligence), strict liability, or any other theory of liability.

6. References

Alberta Environment, 2013. Alberta Ambient Air Quality Objectives and Guidelines Summary, August 2013.

Ministry of the Environment (MOE). 2012. Ontario's Ambient Air Quality Criteria, April.

Ministry of the Environment (MOE). 2012. Summary of Standards and Guidelines to support Ontario Regulation 419: Air Pollution – Local Air Quality. April.

Ontario Ministry of the Environment, 2008. Jurisdictional Screening Level (JSL) List – A Screening Tool for Ontario Regulation 419: Air Pollution – Local Air Quality, February.

US EPA Compendium Method TO-15 EPA/625/R-96/010b, US Environmental Protection Agency, January 1999.

Attachments: 1, Certificates of Analyses – Data for Most Recent Sampling Events Only
2, VOC Sampling Locations
3, Field Notes

Copy: Nelson Liu, Tervita
Heather Conquergood, CH2M

Attachment 1
Certificate of Analysis

CH2M HILL, INC
ATTN: Suzanne Byrne
540 12 Ave SW
Calgary AB T2R 0H4

Date Received: 25-AUG-16
Report Date: 06-SEP-16 15:16 (MT)
Version: FINAL

Client Phone: 403-807-6133

Certificate of Analysis

Lab Work Order #: L1819107

Project P.O. #: NOT SUBMITTED
Job Reference: 661198
C of C Numbers:
Legal Site Desc:

Amber Springer, B.Sc
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-1 SA01							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:15							
Matrix: AA							
Canister EPA TO-15							
1,1,1-Trichloroethane	<27	DLHC	27	ug/m3		02-SEP-16	R3539922
1,1,1-Trichloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,1,2,2-Tetrachloroethane	<34	DLHC	34	ug/m3		02-SEP-16	R3539922
1,1,2,2-Tetrachloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,1,2-Trichloroethane	<27	DLHC	27	ug/m3		02-SEP-16	R3539922
1,1,2-Trichloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,1-Dichloroethane	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
1,1-Dichloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,1-Dichloroethene	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
1,1-Dichloroethene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2,4-Trichlorobenzene	<37	DLHC	37	ug/m3		02-SEP-16	R3539922
1,2,4-Trichlorobenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2,4-Trimethylbenzene	175	DLHC	25	ug/m3		02-SEP-16	R3539922
1,2,4-Trimethylbenzene	35.7	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2-Dibromoethane	<38	DLHC	38	ug/m3		02-SEP-16	R3539922
1,2-Dibromoethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2-Dichlorobenzene	<30	DLHC	30	ug/m3		02-SEP-16	R3539922
1,2-Dichlorobenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2-Dichloroethane	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
1,2-Dichloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,2-Dichloropropane	<23	DLHC	23	ug/m3		02-SEP-16	R3539922
1,2-Dichloropropane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,3,5-Trimethylbenzene	91	DLHC	25	ug/m3		02-SEP-16	R3539922
1,3,5-Trimethylbenzene	18.5	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,3-Butadiene	<11	DLHC	11	ug/m3		02-SEP-16	R3539922
1,3-Butadiene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,3-Dichlorobenzene	<30	DLHC	30	ug/m3		02-SEP-16	R3539922
1,3-Dichlorobenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,4-Dichlorobenzene	<30	DLHC	30	ug/m3		02-SEP-16	R3539922
1,4-Dichlorobenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
1,4-Dioxane	<18	DLHC	18	ug/m3		02-SEP-16	R3539922
1,4-Dioxane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
2-Hexanone	<100	DLHC	100	ug/m3		02-SEP-16	R3539922
2-Hexanone	<25	DLHC	25	ppb(V)		02-SEP-16	R3539922
4-Ethyltoluene	36	DLHC	25	ug/m3		02-SEP-16	R3539922
4-Ethyltoluene	7.4	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Acetone	34	DLHC	30	ug/m3		02-SEP-16	R3539922
Acetone	14	DLHC	13	ppb(V)		02-SEP-16	R3539922
Allyl chloride	<16	DLHC	16	ug/m3		02-SEP-16	R3539922
Allyl chloride	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Benzene	30	DLHC	16	ug/m3		02-SEP-16	R3539922
Benzene	9.3	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Benzyl chloride	<26	DLHC	26	ug/m3		02-SEP-16	R3539922
Benzyl chloride	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Bromodichloromethane	<34	DLHC	34	ug/m3		02-SEP-16	R3539922
Bromodichloromethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Bromoform	<52	DLHC	52	ug/m3		02-SEP-16	R3539922
Bromoform	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Bromomethane	<19	DLHC	19	ug/m3		02-SEP-16	R3539922
Bromomethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-1 SA01							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:15							
Matrix: AA							
Canister EPA TO-15							
Carbon Disulfide	<16	DLHC	16	ug/m3		02-SEP-16	R3539922
Carbon Disulfide	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Carbon Tetrachloride	<31	DLHC	31	ug/m3		02-SEP-16	R3539922
Carbon Tetrachloride	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Chlorobenzene	<23	DLHC	23	ug/m3		02-SEP-16	R3539922
Chlorobenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Chloroethane	<13	DLHC	13	ug/m3		02-SEP-16	R3539922
Chloroethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Chloroform	<24	DLHC	24	ug/m3		02-SEP-16	R3539922
Chloroform	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Chloromethane	<10	DLHC	10	ug/m3		02-SEP-16	R3539922
Chloromethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
cis-1,2-Dichloroethene	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
cis-1,2-Dichloroethene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
cis-1,3-Dichloropropene	<23	DLHC	23	ug/m3		02-SEP-16	R3539922
cis-1,3-Dichloropropene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Cyclohexane	152	DLHC	17	ug/m3		02-SEP-16	R3539922
Cyclohexane	44.1	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Dibromochloromethane	<43	DLHC	43	ug/m3		02-SEP-16	R3539922
Dibromochloromethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Dichlorodifluoromethane	<25	DLHC	25	ug/m3		02-SEP-16	R3539922
Dichlorodifluoromethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Ethyl acetate	<18	DLHC	18	ug/m3		02-SEP-16	R3539922
Ethyl acetate	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Ethylbenzene	<22	DLHC	22	ug/m3		02-SEP-16	R3539922
Ethylbenzene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Freon 113	<38	DLHC	38	ug/m3		02-SEP-16	R3539922
Freon 113	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Freon 114	<35	DLHC	35	ug/m3		02-SEP-16	R3539922
Freon 114	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Hexachlorobutadiene	<53	DLHC	53	ug/m3		02-SEP-16	R3539922
Hexachlorobutadiene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Isooctane	<23	DLHC	23	ug/m3		02-SEP-16	R3539922
Isooctane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Isopropyl alcohol	<61	DLHC	61	ug/m3		02-SEP-16	R3539922
Isopropyl alcohol	<25	DLHC	25	ppb(V)		02-SEP-16	R3539922
m&p-Xylene	371	DLHC	43	ug/m3		02-SEP-16	R3539922
m&p-Xylene	85	DLHC	10	ppb(V)		02-SEP-16	R3539922
Methyl ethyl ketone	<15	DLHC	15	ug/m3		02-SEP-16	R3539922
Methyl ethyl ketone	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Methyl isobutyl ketone	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
Methyl isobutyl ketone	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Methylene chloride	<17	DLHC	17	ug/m3		02-SEP-16	R3539922
Methylene chloride	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
MTBE	<18	DLHC	18	ug/m3		02-SEP-16	R3539922
MTBE	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
n-Heptane	438	DLHC	20	ug/m3		02-SEP-16	R3539922
n-Heptane	107	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
n-Hexane	201	DLHC	18	ug/m3		02-SEP-16	R3539922
n-Hexane	57.1	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
o-Xylene	107	DLHC	22	ug/m3		02-SEP-16	R3539922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-1 SA01							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:15							
Matrix: AA							
Canister EPA TO-15							
o-Xylene	24.7	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Propylene	<8.6	DLHC	8.6	ug/m3		02-SEP-16	R3539922
Propylene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Styrene	<21	DLHC	21	ug/m3		02-SEP-16	R3539922
Styrene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Tetrachloroethylene	<34	DLHC	34	ug/m3		02-SEP-16	R3539922
Tetrachloroethylene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Tetrahydrofuran	<15	DLHC	15	ug/m3		02-SEP-16	R3539922
Tetrahydrofuran	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Toluene	168	DLHC	19	ug/m3		02-SEP-16	R3539922
Toluene	44.5	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
trans-1,2-Dichloroethene	<20	DLHC	20	ug/m3		02-SEP-16	R3539922
trans-1,2-Dichloroethene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
trans-1,3-Dichloropropene	<23	DLHC	23	ug/m3		02-SEP-16	R3539922
trans-1,3-Dichloropropene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Trichloroethylene	<27	DLHC	27	ug/m3		02-SEP-16	R3539922
Trichloroethylene	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Trichlorofluoromethane	<28	DLHC	28	ug/m3		02-SEP-16	R3539922
Trichlorofluoromethane	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Vinyl acetate	<44	DLHC	44	ug/m3		02-SEP-16	R3539922
Vinyl acetate	<13	DLHC	13	ppb(V)		02-SEP-16	R3539922
Vinyl bromide	<22	DLHC	22	ug/m3		02-SEP-16	R3539922
Vinyl bromide	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Vinyl chloride	<13	DLHC	13	ug/m3		02-SEP-16	R3539922
Vinyl chloride	<5.0	DLHC	5.0	ppb(V)		02-SEP-16	R3539922
Surrogate: 4-Bromofluorobenzene	81.6		50-150	%		02-SEP-16	R3539922
Canister Information							
Pressure on Receipt	-2.4		-30	in Hg	31-AUG-16	31-AUG-16	R3538207
Canister ID	06000-0366				31-AUG-16	31-AUG-16	R3538207
Regulator ID	CS1200-0024				31-AUG-16	31-AUG-16	R3538207
Batch Proof ID	160808.118				31-AUG-16	31-AUG-16	R3538207
L1819107-2 SA02							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:41							
Matrix: AA							
Canister EPA TO-15							
1,1,1-Trichloroethane	<1.1		1.1	ug/m3		06-SEP-16	R3539922
1,1,1-Trichloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,1,2,2-Tetrachloroethane	<1.4		1.4	ug/m3		06-SEP-16	R3539922
1,1,2,2-Tetrachloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,1,2-Trichloroethane	<1.1		1.1	ug/m3		06-SEP-16	R3539922
1,1,2-Trichloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,1-Dichloroethane	<0.81		0.81	ug/m3		06-SEP-16	R3539922
1,1-Dichloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,1-Dichloroethene	<0.79		0.79	ug/m3		06-SEP-16	R3539922
1,1-Dichloroethene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2,4-Trichlorobenzene	<1.5		1.5	ug/m3		06-SEP-16	R3539922
1,2,4-Trichlorobenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2,4-Trimethylbenzene	<0.98		0.98	ug/m3		06-SEP-16	R3539922
1,2,4-Trimethylbenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2-Dibromoethane	<1.5		1.5	ug/m3		06-SEP-16	R3539922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-2 SA02							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:41							
Matrix: AA							
Canister EPA TO-15							
1,2-Dibromoethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2-Dichlorobenzene	<1.2		1.2	ug/m3		06-SEP-16	R3539922
1,2-Dichlorobenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2-Dichloroethane	<0.81		0.81	ug/m3		06-SEP-16	R3539922
1,2-Dichloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,2-Dichloropropane	<0.92		0.92	ug/m3		06-SEP-16	R3539922
1,2-Dichloropropane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,3,5-Trimethylbenzene	<0.98		0.98	ug/m3		06-SEP-16	R3539922
1,3,5-Trimethylbenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,3-Butadiene	<0.44		0.44	ug/m3		06-SEP-16	R3539922
1,3-Butadiene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,3-Dichlorobenzene	<1.2		1.2	ug/m3		06-SEP-16	R3539922
1,3-Dichlorobenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,4-Dichlorobenzene	<1.2		1.2	ug/m3		06-SEP-16	R3539922
1,4-Dichlorobenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
1,4-Dioxane	<0.72		0.72	ug/m3		06-SEP-16	R3539922
1,4-Dioxane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
2-Hexanone	<4.1		4.1	ug/m3		06-SEP-16	R3539922
2-Hexanone	<1.0		1.0	ppb(V)		06-SEP-16	R3539922
4-Ethyltoluene	<0.98		0.98	ug/m3		06-SEP-16	R3539922
4-Ethyltoluene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Acetone	7.9		1.2	ug/m3		06-SEP-16	R3539922
Acetone	3.31		0.50	ppb(V)		06-SEP-16	R3539922
Allyl chloride	<0.63		0.63	ug/m3		06-SEP-16	R3539922
Allyl chloride	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Benzene	<0.64		0.64	ug/m3		06-SEP-16	R3539922
Benzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Benzyl chloride	<1.0		1.0	ug/m3		06-SEP-16	R3539922
Benzyl chloride	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Bromodichloromethane	<1.3		1.3	ug/m3		06-SEP-16	R3539922
Bromodichloromethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Bromoform	<2.1		2.1	ug/m3		06-SEP-16	R3539922
Bromoform	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Bromomethane	<0.78		0.78	ug/m3		06-SEP-16	R3539922
Bromomethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Carbon Disulfide	<0.62		0.62	ug/m3		06-SEP-16	R3539922
Carbon Disulfide	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Carbon Tetrachloride	<1.3		1.3	ug/m3		06-SEP-16	R3539922
Carbon Tetrachloride	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Chlorobenzene	<0.92		0.92	ug/m3		06-SEP-16	R3539922
Chlorobenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Chloroethane	<0.53		0.53	ug/m3		06-SEP-16	R3539922
Chloroethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Chloroform	<0.98		0.98	ug/m3		06-SEP-16	R3539922
Chloroform	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Chloromethane	1.20		0.41	ug/m3		06-SEP-16	R3539922
Chloromethane	0.58		0.20	ppb(V)		06-SEP-16	R3539922
cis-1,2-Dichloroethene	<0.79		0.79	ug/m3		06-SEP-16	R3539922
cis-1,2-Dichloroethene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
cis-1,3-Dichloropropene	<0.91		0.91	ug/m3		06-SEP-16	R3539922
cis-1,3-Dichloropropene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-2 SA02							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:41							
Matrix: AA							
Canister EPA TO-15							
Cyclohexane	1.23		0.69	ug/m3		06-SEP-16	R3539922
Cyclohexane	0.36		0.20	ppb(V)		06-SEP-16	R3539922
Dibromochloromethane	<1.7		1.7	ug/m3		06-SEP-16	R3539922
Dibromochloromethane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Dichlorodifluoromethane	2.41		0.99	ug/m3		06-SEP-16	R3539922
Dichlorodifluoromethane	0.49		0.20	ppb(V)		06-SEP-16	R3539922
Ethyl acetate	<0.72		0.72	ug/m3		06-SEP-16	R3539922
Ethyl acetate	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Ethylbenzene	<0.87		0.87	ug/m3		06-SEP-16	R3539922
Ethylbenzene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Freon 113	<1.5		1.5	ug/m3		06-SEP-16	R3539922
Freon 113	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Freon 114	<1.4		1.4	ug/m3		06-SEP-16	R3539922
Freon 114	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Hexachlorobutadiene	<2.1		2.1	ug/m3		06-SEP-16	R3539922
Hexachlorobutadiene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Isooctane	<0.93		0.93	ug/m3		06-SEP-16	R3539922
Isooctane	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Isopropyl alcohol	<2.5		2.5	ug/m3		06-SEP-16	R3539922
Isopropyl alcohol	<1.0		1.0	ppb(V)		06-SEP-16	R3539922
m&p-Xylene	<1.7		1.7	ug/m3		06-SEP-16	R3539922
m&p-Xylene	<0.40		0.40	ppb(V)		06-SEP-16	R3539922
Methyl ethyl ketone	<0.59		0.59	ug/m3		06-SEP-16	R3539922
Methyl ethyl ketone	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Methyl isobutyl ketone	<0.82		0.82	ug/m3		06-SEP-16	R3539922
Methyl isobutyl ketone	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Methylene chloride	<0.69		0.69	ug/m3		06-SEP-16	R3539922
Methylene chloride	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
MTBE	<0.72		0.72	ug/m3		06-SEP-16	R3539922
MTBE	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
n-Heptane	2.29		0.82	ug/m3		06-SEP-16	R3539922
n-Heptane	0.56		0.20	ppb(V)		06-SEP-16	R3539922
n-Hexane	4.24		0.70	ug/m3		06-SEP-16	R3539922
n-Hexane	1.20		0.20	ppb(V)		06-SEP-16	R3539922
o-Xylene	<0.87		0.87	ug/m3		06-SEP-16	R3539922
o-Xylene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Propylene	<0.34		0.34	ug/m3		06-SEP-16	R3539922
Propylene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Styrene	<0.85		0.85	ug/m3		06-SEP-16	R3539922
Styrene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Tetrachloroethylene	<1.4		1.4	ug/m3		06-SEP-16	R3539922
Tetrachloroethylene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Tetrahydrofuran	<0.59		0.59	ug/m3		06-SEP-16	R3539922
Tetrahydrofuran	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Toluene	1.26		0.75	ug/m3		06-SEP-16	R3539922
Toluene	0.34		0.20	ppb(V)		06-SEP-16	R3539922
trans-1,2-Dichloroethene	<0.79		0.79	ug/m3		06-SEP-16	R3539922
trans-1,2-Dichloroethene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
trans-1,3-Dichloropropene	<0.91		0.91	ug/m3		06-SEP-16	R3539922
trans-1,3-Dichloropropene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Trichloroethylene	<1.1		1.1	ug/m3		06-SEP-16	R3539922

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L1819107-2 SA02							
Sampled By: Zahra Pirani on 24-AUG-16 @ 08:41							
Matrix: AA							
Canister EPA TO-15							
Trichloroethylene	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Trichlorofluoromethane	1.9		1.1	ug/m3		06-SEP-16	R3539922
Trichlorofluoromethane	0.34		0.20	ppb(V)		06-SEP-16	R3539922
Vinyl acetate	<1.8		1.8	ug/m3		06-SEP-16	R3539922
Vinyl acetate	<0.50		0.50	ppb(V)		06-SEP-16	R3539922
Vinyl bromide	<0.87		0.87	ug/m3		06-SEP-16	R3539922
Vinyl bromide	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Vinyl chloride	<0.51		0.51	ug/m3		06-SEP-16	R3539922
Vinyl chloride	<0.20		0.20	ppb(V)		06-SEP-16	R3539922
Surrogate: 4-Bromofluorobenzene	99.7		50-150	%		06-SEP-16	R3539922
Canister Information							
Pressure on Receipt	-4.9		-30	in Hg	31-AUG-16	31-AUG-16	R3538207
Canister ID	06000-0367				31-AUG-16	31-AUG-16	R3538207
Regulator ID	CS1200-0018				31-AUG-16	31-AUG-16	R3538207
Batch Proof ID	160808.119				31-AUG-16	31-AUG-16	R3538207

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Sample Parameter Qualifier Key:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CAN-DATA-WT	Canister	Canister Information	EPA TO-15A
TO15-GCMS-WT	Canister	Canister EPA TO-15	EPA TO-15

This analysis is performed using procedures adapted from EPA Method TO-15. Air samples are collected into cleaned evacuated canisters. A volume of air sample is transferred from the canister to a preconcentrator system where the analytes are trapped & focused. The analytes are then thermally desorbed into a GC-MSD for analysis. Test results are not blank corrected unless indicated by a qualifier.

Canister samples will be retained for 7 calendar days after final report. If you require a longer canister storage time, please contact your account manager.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L1819107 Report Date: 06-SEP-16

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CAN-DATA-WT	**Canister**							
Batch R3538207								
WG2379206-1 MB								
Pressure on Receipt			-29.8		in Hg			31-AUG-16
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-4 DUP		**L1819107-2**						
1,1,1-Trichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,1,2,2-Tetrachloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,1,2-Trichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,1-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,1-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2,4-Trichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2,4-Trimethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2-Dibromoethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2-Dichloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,2-Dichloropropane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,3,5-Trimethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,3-Butadiene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,3-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,4-Dichlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
1,4-Dioxane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
2-Hexanone		<1.0	<1.0	RPD-NA	ppb(V)	N/A	30	06-SEP-16
4-Ethyltoluene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Acetone		3.31	3.34		ppb(V)	0.9	30	06-SEP-16
Allyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Benzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Benzyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Bromodichloromethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Bromoform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Bromomethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Carbon Disulfide		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Carbon Tetrachloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Chlorobenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-4 DUP		**L1819107-2**						
Chloroethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Chloroform		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Chloromethane		0.58	0.59		ppb(V)	0.7	30	06-SEP-16
cis-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
cis-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Cyclohexane		0.36	0.41		ppb(V)	13	30	06-SEP-16
Dibromochloromethane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Dichlorodifluoromethane		0.49	0.50		ppb(V)	2.4	30	06-SEP-16
Ethyl acetate		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Ethylbenzene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Freon 113		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Freon 114		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Hexachlorobutadiene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Isooctane		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Isopropyl alcohol		<1.0	<1.0	RPD-NA	ppb(V)	N/A	30	06-SEP-16
m&p-Xylene		<0.40	<0.40	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Methyl ethyl ketone		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Methyl isobutyl ketone		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Methylene chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
MTBE		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
n-Heptane		0.56	0.62		ppb(V)	10	30	06-SEP-16
n-Hexane		1.20	1.30		ppb(V)	7.6	30	06-SEP-16
o-Xylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Propylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Styrene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Tetrachloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Tetrahydrofuran		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Toluene		0.34	0.38		ppb(V)	12	30	06-SEP-16
trans-1,2-Dichloroethene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
trans-1,3-Dichloropropene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Trichloroethylene		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Trichlorofluoromethane		0.34	0.35		ppb(V)	1.0	30	06-SEP-16
Vinyl acetate		<0.50	<0.50		ppb(V)			06-SEP-16

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-4 DUP		**L1819107-2**						
Vinyl acetate		<0.50	<0.50	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Vinyl bromide		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
Vinyl chloride		<0.20	<0.20	RPD-NA	ppb(V)	N/A	30	06-SEP-16
WG2380141-2 LCS								
1,1,1-Trichloroethane			95.5		%		70-130	02-SEP-16
1,1,2,2-Tetrachloroethane			89.8		%		70-130	02-SEP-16
1,1,2-Trichloroethane			97.5		%		70-130	02-SEP-16
1,1-Dichloroethane			97.9		%		70-130	02-SEP-16
1,1-Dichloroethene			103.5		%		70-130	02-SEP-16
1,2,4-Trichlorobenzene			76.1		%		70-130	02-SEP-16
1,2,4-Trimethylbenzene			82.4		%		70-130	02-SEP-16
1,2-Dibromoethane			95.2		%		70-130	02-SEP-16
1,2-Dichlorobenzene			82.1		%		70-130	02-SEP-16
1,2-Dichloroethane			112.6		%		70-130	02-SEP-16
1,2-Dichloropropane			97.7		%		70-130	02-SEP-16
1,3,5-Trimethylbenzene			84.6		%		70-130	02-SEP-16
1,3-Butadiene			96.8		%		70-130	02-SEP-16
1,3-Dichlorobenzene			80.3		%		70-130	02-SEP-16
1,4-Dichlorobenzene			80.5		%		70-130	02-SEP-16
1,4-Dioxane			84.7		%		70-130	02-SEP-16
2-Hexanone			109.7		%		70-130	02-SEP-16
4-Ethyltoluene			86.3		%		70-130	02-SEP-16
Acetone			97.3		%		70-130	02-SEP-16
Allyl chloride			98.4		%		70-130	02-SEP-16
Benzene			103.7		%		70-130	02-SEP-16
Benzyl chloride			71.9		%		70-130	02-SEP-16
Bromodichloromethane			90.2		%		70-130	02-SEP-16
Bromoform			74.5		%		70-130	02-SEP-16
Bromomethane			103.1		%		70-130	02-SEP-16
Carbon Disulfide			101.6		%		70-130	02-SEP-16
Carbon Tetrachloride			94.7		%		70-130	02-SEP-16
Chlorobenzene			86.9		%		70-130	02-SEP-16
Chloroethane			90.5		%		70-130	02-SEP-16
Chloroform			108.2				70-130	

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-2 LCS								
Chloroform			108.2		%		70-130	02-SEP-16
Chloromethane			99.6		%		70-130	02-SEP-16
cis-1,2-Dichloroethene			106.5		%		70-130	02-SEP-16
cis-1,3-Dichloropropene			95.2		%		70-130	02-SEP-16
Cyclohexane			111.9		%		70-130	02-SEP-16
Dibromochloromethane			90.9		%		70-130	02-SEP-16
Dichlorodifluoromethane			114.5		%		70-130	02-SEP-16
Ethyl acetate			82.1		%		70-130	02-SEP-16
Ethylbenzene			84.3		%		70-130	02-SEP-16
Freon 113			97.0		%		70-130	02-SEP-16
Freon 114			88.0		%		70-130	02-SEP-16
Hexachlorobutadiene			81.2		%		70-130	02-SEP-16
Isooctane			102.7		%		70-130	02-SEP-16
Isopropyl alcohol			94.5		%		70-130	02-SEP-16
m&p-Xylene			83.8		%		70-130	02-SEP-16
Methyl ethyl ketone			114.8		%		70-130	02-SEP-16
Methyl isobutyl ketone			101.8		%		70-130	02-SEP-16
Methylene chloride			100.3		%		70-130	02-SEP-16
MTBE			100.1		%		70-130	02-SEP-16
n-Heptane			104.2		%		70-130	02-SEP-16
n-Hexane			103.9		%		70-130	02-SEP-16
o-Xylene			86.8		%		70-130	02-SEP-16
Propylene			111.9		%		70-130	02-SEP-16
Styrene			82.3		%		70-130	02-SEP-16
Tetrachloroethylene			81.6		%		70-130	02-SEP-16
Tetrahydrofuran			104.2		%		70-130	02-SEP-16
Toluene			100.3		%		70-130	02-SEP-16
trans-1,2-Dichloroethene			98.7		%		70-130	02-SEP-16
trans-1,3-Dichloropropene			93.0		%		70-130	02-SEP-16
Trichloroethylene			100.5		%		70-130	02-SEP-16
Trichlorofluoromethane			94.7		%		70-130	02-SEP-16
Vinyl acetate			112.3		%		70-130	02-SEP-16
Vinyl bromide			100.3		%		70-130	02-SEP-16

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-2 LCS								
Vinyl chloride			98.3		%		70-130	02-SEP-16
WG2380141-3 LCSD		**WG2380141-2**						
1,1,1-Trichloroethane		95.5	91.0		%	4.8	25	02-SEP-16
1,1,2,2-Tetrachloroethane		89.8	87.6		%	2.5	25	02-SEP-16
1,1,2-Trichloroethane		97.5	96.0		%	1.6	25	02-SEP-16
1,1-Dichloroethane		97.9	94.6		%	3.5	25	02-SEP-16
1,1-Dichloroethene		103.5	98.0		%	5.5	25	02-SEP-16
1,2,4-Trichlorobenzene		76.1	72.8		%	4.5	25	02-SEP-16
1,2,4-Trimethylbenzene		82.4	81.3		%	1.3	25	02-SEP-16
1,2-Dibromoethane		95.2	88.9		%	6.9	25	02-SEP-16
1,2-Dichlorobenzene		82.1	78.7		%	4.2	25	02-SEP-16
1,2-Dichloroethane		112.6	109.7		%	2.6	25	02-SEP-16
1,2-Dichloropropane		97.7	95.1		%	2.7	25	02-SEP-16
1,3,5-Trimethylbenzene		84.6	82.8		%	2.1	25	02-SEP-16
1,3-Butadiene		96.8	92.4		%	4.7	25	02-SEP-16
1,3-Dichlorobenzene		80.3	81.4		%	1.4	25	02-SEP-16
1,4-Dichlorobenzene		80.5	78.1		%	3.0	25	02-SEP-16
1,4-Dioxane		84.7	73.9		%	14	25	02-SEP-16
2-Hexanone		109.7	110.2		%	0.4	25	02-SEP-16
4-Ethyltoluene		86.3	80.7		%	6.7	25	02-SEP-16
Acetone		97.3	91.6		%	6.0	25	02-SEP-16
Allyl chloride		98.4	93.7		%	4.9	25	02-SEP-16
Benzene		103.7	97.2		%	6.5	25	02-SEP-16
Benzyl chloride		71.9	70.1		%	2.5	25	02-SEP-16
Bromodichloromethane		90.2	87.9		%	2.6	25	02-SEP-16
Bromoform		74.5	73.2		%	1.8	25	02-SEP-16
Bromomethane		103.1	99.4		%	3.6	25	02-SEP-16
Carbon Disulfide		101.6	96.9		%	4.7	25	02-SEP-16
Carbon Tetrachloride		94.7	89.8		%	5.3	25	02-SEP-16
Chlorobenzene		86.9	84.9		%	2.3	25	02-SEP-16
Chloroethane		90.5	87.4		%	3.5	25	02-SEP-16
Chloroform		108.2	100.7		%	7.2	25	02-SEP-16
Chloromethane		99.6	85.9		%	15	25	02-SEP-16

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-3 LCSD		**WG2380141-2**						
cis-1,2-Dichloroethene		106.5	102.4		%	3.9	25	02-SEP-16
cis-1,3-Dichloropropene		95.2	91.0		%	4.6	25	02-SEP-16
Cyclohexane		111.9	106.8		%	4.7	25	02-SEP-16
Dibromochloromethane		90.9	86.8		%	4.6	25	02-SEP-16
Dichlorodifluoromethane		114.5	114.0		%	0.5	25	02-SEP-16
Ethyl acetate		82.1	82.8		%	0.9	25	02-SEP-16
Ethylbenzene		84.3	83.0		%	1.5	25	02-SEP-16
Freon 113		97.0	93.5		%	3.7	25	02-SEP-16
Freon 114		88.0	86.0		%	2.3	25	02-SEP-16
Hexachlorobutadiene		81.2	79.5		%	2.1	25	02-SEP-16
Isooctane		102.7	97.2		%	5.5	25	02-SEP-16
Isopropyl alcohol		94.5	90.2		%	4.7	25	02-SEP-16
m&p-Xylene		83.8	81.0		%	3.4	25	02-SEP-16
Methyl ethyl ketone		114.8	104.6		%	9.3	25	02-SEP-16
Methyl isobutyl ketone		101.8	103.0		%	1.1	25	02-SEP-16
Methylene chloride		100.3	94.1		%	6.4	25	02-SEP-16
MTBE		100.1	93.7		%	6.6	25	02-SEP-16
n-Heptane		104.2	98.6		%	5.5	25	02-SEP-16
n-Hexane		103.9	99.6		%	4.2	25	02-SEP-16
o-Xylene		86.8	82.9		%	4.5	25	02-SEP-16
Propylene		111.9	109.9		%	1.8	25	02-SEP-16
Styrene		82.3	79.9		%	3.0	25	02-SEP-16
Tetrachloroethylene		81.6	78.7		%	3.6	25	02-SEP-16
Tetrahydrofuran		104.2	99.96		%	4.1	25	02-SEP-16
Toluene		100.3	96.3		%	4.1	25	02-SEP-16
trans-1,2-Dichloroethene		98.7	91.2		%	7.9	25	02-SEP-16
trans-1,3-Dichloropropene		93.0	90.7		%	2.5	25	02-SEP-16
Trichloroethylene		100.5	93.6		%	7.1	25	02-SEP-16
Trichlorofluoromethane		94.7	91.9		%	3.1	25	02-SEP-16
Vinyl acetate		112.3	104.5		%	7.2	25	02-SEP-16
Vinyl bromide		100.3	96.7		%	3.7	25	02-SEP-16
Vinyl chloride		98.3	92.8		%	5.7	25	02-SEP-16
WG2380141-1 MB								

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-1 MB								
1,1,1-Trichloroethane			<0.20		ppb(V)		0.2	02-SEP-16
1,1,2,2-Tetrachloroethane			<0.20		ppb(V)		0.2	02-SEP-16
1,1,2-Trichloroethane			<0.20		ppb(V)		0.2	02-SEP-16
1,1-Dichloroethane			<0.20		ppb(V)		0.2	02-SEP-16
1,1-Dichloroethene			<0.20		ppb(V)		0.2	02-SEP-16
1,2,4-Trichlorobenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,2,4-Trimethylbenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,2-Dibromoethane			<0.20		ppb(V)		0.2	02-SEP-16
1,2-Dichlorobenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,2-Dichloroethane			<0.20		ppb(V)		0.2	02-SEP-16
1,2-Dichloropropane			<0.20		ppb(V)		0.2	02-SEP-16
1,3,5-Trimethylbenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,3-Butadiene			<0.20		ppb(V)		0.2	02-SEP-16
1,3-Dichlorobenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,4-Dichlorobenzene			<0.20		ppb(V)		0.2	02-SEP-16
1,4-Dioxane			<0.20		ppb(V)		0.2	02-SEP-16
2-Hexanone			<1.0		ppb(V)		1	02-SEP-16
4-Ethyltoluene			<0.20		ppb(V)		0.2	02-SEP-16
Acetone			<0.50		ppb(V)		0.5	02-SEP-16
Allyl chloride			<0.20		ppb(V)		0.2	02-SEP-16
Benzene			<0.20		ppb(V)		0.2	02-SEP-16
Benzyl chloride			<0.20		ppb(V)		0.2	02-SEP-16
Bromodichloromethane			<0.20		ppb(V)		0.2	02-SEP-16
Bromoform			<0.20		ppb(V)		0.2	02-SEP-16
Bromomethane			<0.20		ppb(V)		0.2	02-SEP-16
Carbon Disulfide			<0.20		ppb(V)		0.2	02-SEP-16
Carbon Tetrachloride			<0.20		ppb(V)		0.2	02-SEP-16
Chlorobenzene			<0.20		ppb(V)		0.2	02-SEP-16
Chloroethane			<0.20		ppb(V)		0.2	02-SEP-16
Chloroform			<0.20		ppb(V)		0.2	02-SEP-16
Chloromethane			<0.20		ppb(V)		0.2	02-SEP-16
cis-1,2-Dichloroethene			<0.20		ppb(V)		0.2	02-SEP-16
cis-1,3-Dichloropropene			<0.20		ppb(V)		0.2	02-SEP-16

Quality Control Report

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TO15-GCMS-WT	**Canister**							
Batch R3539922								
WG2380141-1 MB								
Cyclohexane			<0.20		ppb(V)		0.2	02-SEP-16
Dibromochloromethane			<0.20		ppb(V)		0.2	02-SEP-16
Dichlorodifluoromethane			<0.20		ppb(V)		0.2	02-SEP-16
Ethyl acetate			<0.20		ppb(V)		0.2	02-SEP-16
Ethylbenzene			<0.20		ppb(V)		0.2	02-SEP-16
Freon 113			<0.20		ppb(V)		0.2	02-SEP-16
Freon 114			<0.20		ppb(V)		0.2	02-SEP-16
Hexachlorobutadiene			<0.20		ppb(V)		0.2	02-SEP-16
Isooctane			<0.20		ppb(V)		0.2	02-SEP-16
Isopropyl alcohol			<1.0		ppb(V)		1	02-SEP-16
m&p-Xylene			<0.40		ppb(V)		0.4	02-SEP-16
Methyl ethyl ketone			<0.20		ppb(V)		0.2	02-SEP-16
Methyl isobutyl ketone			<0.20		ppb(V)		0.2	02-SEP-16
Methylene chloride			<0.20		ppb(V)		0.2	02-SEP-16
MTBE			<0.20		ppb(V)		0.2	02-SEP-16
n-Heptane			<0.20		ppb(V)		0.2	02-SEP-16
n-Hexane			<0.20		ppb(V)		0.2	02-SEP-16
o-Xylene			<0.20		ppb(V)		0.2	02-SEP-16
Propylene			<0.20		ppb(V)		0.2	02-SEP-16
Styrene			<0.20		ppb(V)		0.2	02-SEP-16
Tetrachloroethylene			<0.20		ppb(V)		0.2	02-SEP-16
Tetrahydrofuran			<0.20		ppb(V)		0.2	02-SEP-16
Toluene			<0.20		ppb(V)		0.2	02-SEP-16
trans-1,2-Dichloroethene			<0.20		ppb(V)		0.2	02-SEP-16
trans-1,3-Dichloropropene			<0.20		ppb(V)		0.2	02-SEP-16
Trichloroethylene			<0.20		ppb(V)		0.2	02-SEP-16
Trichlorofluoromethane			<0.20		ppb(V)		0.2	02-SEP-16
Vinyl acetate			<0.50		ppb(V)		0.5	02-SEP-16
Vinyl bromide			<0.20		ppb(V)		0.2	02-SEP-16
Vinyl chloride			<0.20		ppb(V)		0.2	02-SEP-16
Surrogate: 4-Bromofluorobenzene			82.0		%		50-150	02-SEP-16

Quality Control Report

Workorder: L1819107 Report Date: 06-SEP-16

Client: CH2M HILL, INC
540 12 Ave SW
Calgary AB T2R 0H4
Contact: Suzanne Byrne

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

60 NORTHLAND ROAD, UNIT 1
WATERLOO, ON N2V 2B8
Phone: (519) 886-6910
Fax: (519) 886-9047
Toll Free: 1-800-668-9878

ALS Environmental

L1819107-COFC

AIR QUALITY CHAIN OF CUSTODY FORM - Ca

Note: All TAT Quoted is in **business days** which exclude statutory holidays and weekends. TAT of samples received past 3:00 pm or Saturday / Sunday begin the next day.

DATE REQUIRED — SERVICE REQUESTED

- 10 day (regular) ☒
- Rush 5 day (50%) ☐
- Rush 5 day (100%) ☐
- Rush 2 day (200%) ☐
- Rush 1 day (300%) - Enquire ☐

All rush work requires lab approval before sample submission

COMPANY NAME	CH2M
OFFICE	540, 12 Ave SW, Calgary AB, T2R 0H4
PROJECT MANAGER	Suzanne Byrne 403-807-6133
PROJECT #	661198
PHONE	403-807-6133
FAX	—
ACCOUNT #	—
QUOTATION #	Q58128
PO #	—

REPORT FORMAT/DISTRIBUTION

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EMAIL 2 zahra.pirani@ch2m.com
suzanne.byrne@ch2m.com
heather.conquergood@ch2m.com

ANALYSIS REQUEST

SAMPLING INFORMATION

Sample Date/Time: Date (dd-mmm-yy)	Time (24hr) (hh:mm)	Canister or Tube ID# (e.g. 06000-XXXX or G0XXXXXX SVI)	Regulator Serial # CS1200-XXXX or GXX	Matrix Type	SAMPLE DESCRIPTION TO APPEAR ON REPORT	TUBE AIR VOLUME - L ☒ or m³ ☐ (Canister)	EPA TO-15 method VOC analysis	STARTING PRESSURE - Pre-Sampling ("Hg)	ENDING PRESSURE - Post Sampling ("Hg)	COLLECTION TIME (HRS)	Field Conditions (Rain/Wind/Dust/Odour) Field PID Reading
24-Aug-16	08:15	06000-0216	CS1200-0024	AA	SA01	6	XX	-27	-5	0.5	hydrocarbon odour
24-Aug-16	08:41	06000-0367	CS1200-0018	AA	SA02	6	XX	-27	-5	0.5	hydrocarbon odour

SPECIAL INSTRUCTIONS/COMMENTS

This Chain of Custody Form is only to be used for Air Quality Samples

Matrix Type: Soil Gas Vapour = SG; Indoor Air = IA; Ambient Air = AA; Industrial Hygiene = IH

SAMPLED BY: Zahra Pirani	DATE & TIME Aug 24/16 9:15	RECEIVED BY: Amy Gallant	DATE & TIME Aug 25/16 11:25
RELINQUISHED BY: Raymond Li	DATE & TIME Aug 25/16 11:25 am	RECEIVED BY:	DATE & TIME

Notes

1. Quote number must be provided to ensure proper pricing

2. TAT may vary dependent on complexity of analysis and lab workload at time of submission. Please contact the lab to confirm TATs.

3. Any known or suspected hazards relating to a sample must be noted on the chain of custody in comments section.

REV6-2015

Attachment 2
Sampling Locations

EARTH MATTERS

September 2016

ATTACHMENT 2
SUMMA CANISTER SAMPLING LOCATIONS

TERVITA SILVERBERRY LANDFILL AMENDMENT APPLICATION PROJECT

661198

- Summa Canister Sampling Location
- Resource Road
- Road
- Railway
- Project Footprint

SCALE: 1:15,000

0 100 200 300 400
Metres

(All Locations Approximate)

ch2m

UTM Zone 10N

Project Footprint: Tervita 2016; Summa Canister Sampling Locations: CH2M 2016; Roads: IHS Inc. 2016; Railways: NRCan 2012; Hydrography: NRCan 2007-2011; Regional Districts: BC MFLNRO 2007, City/Town/Villages: IHS Inc. 2015; Indian Reserves: Government of Canada 2016; First Nations Settlements: IHS Inc. 2015; Imagery Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community.

Although there is no reason to believe that there are any errors associated with the data used to generate this product or in the product itself, users of these data are advised that errors in the data may be present.

Mapped By: JRO | Checked By: HC

\\ch2mhill\common\Shares\CNR\GIS_Proj2\VECA\661198\MAP_FILES\AIR\20160913_MAP_CH2M_Rev0_AirMonitoring.mxd

Attachment 3
Field Notes

ch2m:

By Raymond Li and Zahra Pirani Date Aug 23/16

Sheet No. 1 of 4

Project No. 661198

Subject Silverberry Air Monitoring ~~Sampling~~

Cell 7 (Uncovered) is laid out in a grid ⊗ = monitoring point

LL	MM	NN	OO	PP	QQ	RR	TT	UU	VV	WW	XX
											31
											30
											29
											28
		⊗				⊗				⊗	27
											26
											25
											24
											23
											22
											21
											20
		⊗				⊗				⊗	19
											18
											17
											16
											15
											14
											13
											12
		⊗				⊗				⊗	11
											10
											9
											8
											7
											6
											5
											4
		⊗				⊗				⊗	3
											2
											1

FM-1W

ch2m:

By Raymond Li & Zahra Pirani Date Aug 23/16

Sheet No. 2 of 4

Project No. 661198

Subject Silverberry Air Monitoring

LOCATION	NORTHING / EASTING	READING	TIME
27-WW	612829	~~6276644~~ 6276641	4:01 pm
	CO_2 - 0.1	CH_4 = 0	
	O_2 - 20.1	H_2S = 0	for subsequent
	Bal - 79.9	CO = 0	readings, if not recorded,
			means zero for that
			parameter.
27-RR	612828	6276685	4:03 pm
	CO_2 - 0.1	(eg)	
	O_2 - 19.9	CH_4, H_2S, CO = 0	
	Bal - 80.0		
27-NN	612833	6276723	4:05 pm
	CO_2 - 0.1		
	O_2 - 19.9		
	Bal - 80.0		
19-NN	612762	6276740	4:08 pm
	CO_2 - 0.1		
	O_2 - 20.0		
	Bal - 79.9		
19-RR	612753	6276705	4:10 pm
	CO_2 0.1		
	O_2 - 20.0		
	Bal - 79.9		

ch2m:SM

By Zahra Pirani/Li Raymond Date Aug 23/11

Sheet No. 3 of 4

Project No. 661198

Subject Silverberry Air monitoring

LOCATION	Northing/Easting/Reading	Time
19-WW	612748 6276637	4:15pm
	CO_2 – 0.1	
	O_2 – 20.2	
	Bal – 79.7	
11-WW	612675 6276642	4:20pm
	CO_2 – 0.1	
	O_2 – 20.3	
	Bal – 79.7	
11-RR	612676 6276665	4:22pm
	CO_2 – 0.1	
	O_2 – 20.3	
	Bal – 79.6	
11-NN	~~600~~ 612678 6276697	425pm
	CO_2 – 0.1	
	O_2 – 20.4	
	Bal – 79.6	
3-NN	612608 6276713	430pm
	CO_2 – 0.1	
	O_2 – 20.3	
	Bal – 79.6	

ch2m:

By Zahra Rani/Raymond Li Date Aug 23/16

Sheet No. 4 of 4

Project No. 661198

Subject Silverberry air monitoring

3 - RR 612603 6276677 4:32pm

CO_2 0.1

O_2 20.4

Bal 79.5

3 - WW 612594 6276630 4:35pm

CO_2 - 0.1

O_2 - 20.4

Bal - 79.5

FM-1W

ch2m SM

By Zahra Rian Date Aug 23/16
Sheet No. 1 of 1
Project No. 661198

Subject ~~Silverberry air~~ sampling

Sample SA01 612.817, 6276755 (northing/easting)

flow cont.	canister	vacuum integ. test
CS1200-0024	06000-0366	27 in Hg

time start = 815 am
time end = 8:45 am

end pressure = 5 in Hg

at 857 am, GEM 5000+ CO_2 = 0.1%
O_2 = 20.9%
CH_4 = 0
H_2S = 0
CO = 0
Balance = 79%

GEM 2000+ ⇒ O_2 = 20.1%
CO_2, CO, H_2S, CH_4 = 0
Bal = 79.9%

Sample SA02 612606, 6276721 (northing/easting)

flow cont.	canister	vaccum int
CS1200-0018	06000-0367	-27 in Hg

time start = 0841
time end = 911
end pressure = 5 in Hg

GEM 5000+ ⇒ CO_2 = 0.1%
O_2 = 20.8%
Bal = 79.1%
H_2S, CO, CH_4 = 0

GEM 2000+ ⇒ CO_2 = 0
O_2 = 20.1%
Bal = 79.9%
H_2S, CO, CH_4 = 0

FM-1W

Appendix 2B
Silverberry Landfill A-08-88-20W6
Air Monitoring Survey

TERVITA EARTH MATTERS

FINAL REPORT

Prepared For:
Tervita Corporation

Silverberry Landfill A-08-88-20W6
Air Monitoring Survey

COMPLETION DATE
May 11, 2017
PROJECT
NORM GAMMA RADIATION SCREENING SURVEY

TABLE OF CONTENTS

Tervita Corporation
N.O.R.M. Air Monitoring Survey

A-08-88-20W6 - Silverberry Landfill
May 11, 2017

I. BACKGROUND INFORMATION:

Tervita NORM Services was requested by Tervita Corporation to conduct a Naturally Occurring Radioactive Material (NORM) air monitoring survey of the Silverberry Landfill. The purpose of the survey was to determine if airborne NORM contamination was present; and the degree to which it would affect workers and their daily operations. The NORM survey was completed by a certified Radiation Safety Officer (RSO) on May 11, 2017.

Although the concentration of Naturally Occurring Radioactive Material (NORM) in most natural substances is low, higher concentrations can arise as the result of oil and gas production activities. For example, if Radium is present in the formation, production activities can cause Radium to precipitate out of produced waters, concentrating as scales and sludge internal to process equipment. Radium scales can easily become airborne creating a significant radiation inhalation hazard. The radioactive half-life of Radium is 1600 years and, consequently, it can represent a long-term health hazard to personnel and the environment.

Another typical source of NORM is Radon gas. Radon has a half-life of 3.8 days and quickly decays into Lead (^{210}Pb), which is a thin film or dust that builds up on the inner walls of process equipment and piping.^{210}Pb can easily become airborne creating an inhalation hazard if not contained. As ^{210}Pb emits low energy gamma radiation, NORM screening surveys of gas processing facilities must be performed on a flowing gas stream. The concentration of Radon gas is only an indication there may be a ^{210}Pb build up within the process equipment as its presence is dependent on residency time and flows within the equipment.

In an environmental setting such as a landfill, Radon gas emissions are generated through biological decay of organic matter which can increase with the presence of petroleum and radon-bearing constituents. Radon gas generally enters the atmosphere through the surface of the landfill or vents in the landfill cover. The emissions can be inhibited when partitioned in the solids, liquid and organic matter which allows for more time for radioactive decay to occur in the subsurface. Based on a study conducted in 2011, in Canada, the average outdoor environmental concentration of Radon gas is 24 Bq/m^3.

Unprotected overexposure to Radium and Radium daughter contaminated dusts is associated with an increased risk of lung cancer and leukemia. Radium will not clear

from the body significantly over time. For this reason, all exposures should be kept below recognized exposure standards for the general public and unnecessary exposure to radiation should be kept as low as reasonably achievable (ALARA).

II. INSTRUMENTATION:

The NORM survey was conducted using a calibrated Ludlum 3-97 General Purpose Survey Meter which incorporates both an internal 1"x1" sodium iodide (Na-I) scintillator and an external 44-9 Geiger-Mueller (G-M) pancake probe. Function tests and stabilization of the instruments were conducted utilizing a Cesium 137 check source prior to taking survey measurements.

The air monitoring was conducted using AirChek XR5000 air pumps with flow rates calibrated using a Bios Defender 510-M flow monitor. An Environmental Instruments Canada TM372 sample counter was used to analyze the filter discs for airborne NORM particulates post-sample.

III. METHODOLOGY:

Once calibrated, the AirChek XR5000 air pumps were placed in three locations on the perimeter of the landfill (Southwest corner, Southeast corner and North side); and set to draw a collective $1m^3$ of air through 0.8µm filter discs for 133 minutes. The filter discs were then counted using the Environmental Instruments Canada TM372 sample counter. Samples were counted immediately after the initial run time and then counted 5 days post-sample; after the decay of all Short Lived Radon Daughters "SLRD" has occurred. This ensures there are no false positives recorded due to the presence of Radon gas in the atmosphere.

The survey work was conducted in accordance with procedures outlined in the Canadian Guidelines for the Management of Naturally Occurring Radioactive Material, published by Health Canada, Revised 2011.

IV. REGULATIONS AND GUIDELINES:

The Canadian Nuclear Safety Commission (CNSC) has legislative control over nuclear cycle materials and man-made radio nuclides. Naturally Occurring Radioactive Material (NORM) is exempt from CNSC legislation except for the import, export, and transportation of the material. The jurisdiction over use and radiation exposure to NORM is the responsibility of each Canadian province and territory.

The Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials is published by Health Canada, and was prepared by the Canadian NORM Working Group by the Federal Provincial Territorial Radiation Protection Committee

(FPTRPC). The FPTRPC is a Canadian intergovernmental committee established to support federal, provincial, and territorial protection agencies in carrying out their respective mandates. The basic principal of the guideline is to protect workers, the public, and the environment from situations where NORM has been technologically enhanced or concentrated as a result of industrial activities.

The Health Canada NORM guideline establishes a NORM Investigation Threshold and NORM Management Threshold. The NORM Investigation Threshold is an incremental dose of 0.3 mSv/yr. If the potential NORM exposure levels are above 0.3 mSv/yr, then NORM Management is required. The Guidelines also provide Unconditional Derived Release Limits for NORM waste of 0.3 Bq/g and Unconditional Derived Release Limits for fixed surface contamination on equipment of 1.0 Bq/cm^2 averaged over a 100 cm^2 area. All loose surface contamination must be removed.

V. SURVEY RESULTS:

The average environmental background was measured at 90 nSv/hr (nano Sieverts per hour) and 60 CPM (counts per minute). These background radiation levels are indicative of typical background radiation levels.

As seen in Table 1, the initial sample count, also known as the 10 minute count (DPM), was found to be slightly above background readings however, after 5 days the samples were measured below background. This decrease over the 5 day period is indicative of the presence of radon gas. With a short half-life of 3.8 days, the radon gas is constantly decaying leaving behind Short Lived Radon Daughters (SLRD). These SLRD are detected on the initial sample count however, the lack of activity on the final count is evidence that the SLRD have completely decayed over the 5 day period. The result of Radon concentration (Bq/m^3) found from each filter can also be found in Table 1. Based on air monitoring results there is no evidence of airborne NORM particles.

Based on the survey results, at the measured dose rates, the workers are not at risk of being exposed to gamma radiation in excess of the Dose Constraint of 0.3mSv/a as outlined in the Health Canada – Canadian Guidelines for the Management of Naturally Occurring Radioactive Material “NORM”.

VI. CONCLUSIONS AND RECOMMENDATIONS:

1. Appropriate NORM management and safe work procedures should be in place and followed by all employees who may potentially come in contact with NORM contamination from opening or working on NORM impacted equipment.
2. The external gamma radiation dose levels detected would result in exposure levels to workers that are below Health Canada’s Canadian NORM guidelines of 0.3 mSv/a. As a result, there is no need to implement an employee dose

management program or restrict worker access to the identified NORM contaminated equipment, providing it remains sealed until it can be decontaminated.

Table 1 – Sample Data

CALIBRATION	AIR CHEK XR PUMP S/N#		
	#1- 35381	#2- 35367	#3- 35364
Test 1	2.5288	2.4968	2.5230
Test 2	2.4929	2.4907	2.4876
Test 3	2.5245	2.5131	2.4876
Test 4	2.5183	2.5152	2.4953
Test 5	2.4374	2.5103	2.5120
Test 6	2.4535	2.5147	2.5245
Test 7	2.5415	2.5157	2.5089
Test 8	2.5068	2.5187	2.4985
Test 9	2.5114	2.4876	2.5157
Test 10	2.5267	2.4991	2.5150
Average L/min	2.5042	2.5062	2.5068
Elapsed Time (minutes)	133	133	133
Total Volume (litres)	333.05594	333.32327	333.40573
Pump Location	SW of Landfill	SE of Landfill	N of Landfill

TM372 COUNTER	
Function Test	2866
10 Minute Background Count	6
5 Day Function Test	2805
5 day Background Count	5

AIR CHEK XR PUMP S/N#	#1- 35381	#2- 35367	#3- 35364
10 Minute Count (DPM)	7	15	13
5 day - 10 minute Count (DPM)	3	2	4
Detector Efficiency (De)	0.43	0.43	0.43
Fraction of Sample (Fd)	0.28	0.28	0.28
10 Minute Count (R)	3	2	4
Volume (m^3)	0.333	0.333	0.333
Cr(Bq/m^3) = R/60xDexFdxV	0.0017	0.0013	0.0027

In closing, Tervita NORM Services sincerely appreciates the opportunity to complete this survey on behalf of Tervita Energy Services. If you have any questions or require further clarification on any details of this report, please contact Tervita NORM Services at (403) 724-7041.

Prepared By:

Andrea Snodgrass
Radiation Safety Officer

Reviewed By:

Cale Borschneck
Project Manager

Submitted By:
Tervita NORM Services

Appendix 3
2018 Surface Water Discharge Report - Silverberry Landfill, Block A - 18-88-20 W6M

February 25, 2019
Project No. 19-017-TSS

Via E-mail: pnelson@tervita.com
Original Will Remain on File

Tervita Corporation
1600, 140 - 10th Avenue SE
Calgary, Alberta
T2G 0R1

ATTN: Peter Nelson
Environmental and Regulatory Advisor

RE: 2018 Surface Water Discharge Report
Silverberry Landfill
Block A 08-088-20-W6M, British Columbia

Dear Mr. Nelson:

Nichols Environmental (Canada) Ltd. is pleased to present this summary report of the 2018 Surface Water Discharge to Tervita Corporation (Tervita) for the Silverberry Landfill. This facility is at a location legally described as Block A 08-088-20-W6M, approximately 45 km northwest of Fort St. John, British Columbia (herein referred to as the "Site"). Figure 1 (attached) shows the location of the Site relative to the surrounding area.

BACKGROUND

The facility is located within the Peace River Regional District, northwest of the City of Fort St. John, British Columbia. The Site consists of the Tervita Silverberry Landfill whose facilities are located to the north and east of the Tervita Silverberry Treatment, Recovery and Disposal (TRD) facility, with which it shares central access.

Tervita's Silverberry Landfill facility was granted an operating permit (No. 17150) on October 18, 2002, pursuant to the Waste Management Act which has since been appealed and is now the *Environmental Management Act*. The permit was last amended on September 1, 2017.

The Silverberry Landfill accepts solid hazardous wastes in accordance with the Hazardous Waste Regulation of the Environmental Management Act and the operating permit and approved operational plan. The Tervita Silverberry Landfill is also the only facility in British Columbia licensed to accept naturally occurring radioactive material (NORM) that exceeds federal and provincial guidelines.

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The stormwater pond on the Site is shared between the Landfill and the Hazardous Soil Treatment Facility, and it collects surface waters from across the Site and directs flow toward the stormwater pond located in the northwest corner of the facility. All collected surface waters are retained in the stormwater pond, which is sampled prior to discharge to the environment. The location of the stormwater pond in relation the Site is presented on Figure 2.

The adjoining TRD facility activities consist of the treatment, storage, and recovery of oilfield wastes such as sludges, wastewater, pigging waste, drilling sump material, contaminated debris, and crude oil. On-site facilities which may pose a potential source of environmental impact include the aboveground storage tank (AST) containment area, flare stack, and all processing, terminal, and treatment areas. Leachate collected from the landfill is also disposed of by the Silverberry TRD.

Nichols Environmental has completed the Surface Water Discharge Reports for the Site since 2014. Based on the laboratory analysis provided by Tervita in 2017, it was Nichols Environmental's opinion that there were no deleterious effects to the environment from the surface water discharge.

ASSESSMENT GUIDELINES

Regulatory Framework

The analytical results are presented in the context of the British Columbia Ministry of Environment and Climate Change Strategy (BC MOECCS) Contaminated Sites Regulations (BC CSR 1997). The most recent amendment (B.C. Reg. 196/2017) to the BC CSR was issued in November 2017 and is reflected in this assessment. The BC CSR was developed to provide a system to ensure that contaminated soil, surface water, sediments and groundwater are cleaned up to scientifically based standards for sites in British Columbia.

Under the BC CSR, there are two types of remediation standards for a particular site; Numerical Standards, and Risk-Based Standards. The Numerical Standards refer to concentrations of given substances in soil or groundwater for a particular land use or a particular land use and site-specific exposure pathway. Generic Numerical Standards for some substances are applied to a site based on the applicable land use of that site, while Matrix Numerical Standards are applied for some substances in soil, taking into account various site-specific factors such as proximity to receiving waters, likelihood of human ingestion, and use of land for livestock rearing. The second type of remediation standard is the site-specific risk-based standard, which involves the generation of a standard for a specific site based on a risk assessment protocol by BC MOECCS.

The above remediation criteria may be used as benchmarks to evaluate the need for further investigation, remediation or to guide in the establishment of land-use restrictions. The water use pathways required to be assessed for applicability to the Site include the Drinking Water (DW) pathway, the Marine/Estuarine Aquatic Life pathway (MW), the Irrigation pathway (IW), the Livestock pathway (LW), and the Freshwater Aquatic Life pathway (FW).

The analytical are also discussed in the context of the BC MOECCS' Hazardous Waste Regulations, (HWR) which addresses the proper handling and disposal of hazardous wastes under the Environmental Management Act. Schedule 1.2 of the HWR outlines effluent standards for Hazardous Waste Facilities for discharges to the environment.

Water Use Assessment

The Site is situated within an area of predominately natural land use with some surrounding oil and gas and forestry related activities. There are no adjacent agricultural land uses, but agricultural activities are present to the northeast of the Site, and the Site is within the provincial Agriculture Land Reserve (ALR).

Several lakes were noted within a 10-km radius of the Site including two unnamed lakes (approximately 4.5 km east), as well as several oxbow lakes located to the north along the Blueberry River system. Two small unnamed creeks are located to the immediate north and west of the Site and are tributaries to the Blueberry River, located approximately 6.5 km to the north.

The topography of the Site is generally flat, with a local area slope generally to the northwest toward the Blueberry River system. A surface water collection ditch is present across the Site and to the east, south, and west of the TRD's processing infrastructure, through which stormwater and melt water are directed to the stormwater pond on the west perimeter of the Site. Based on previous assessments, groundwater flow direction is to the north by northwest.

Based on the current land uses, all water use pathways would be operative with the exception of the marine/estuarine aquatic life (MW) pathway.

RESULTS

Based on information provided by Tervita, 17,440 m^3 of surface water discharged during the 2018 reporting year.

Nichols Environmental reviewed the laboratory analysis completed on samples collected from the stormwater pond by Tervita personnel. Samples were collected on April 24, May 10, May 18, July 16, July 30, and September 21, 2018.

Surface water samples collected from the stormwater pond were submitted for select laboratory analysis of metals, nutrients, and water quality, petroleum hydrocarbons (PHCs), trout bioassay, polychlorinated biphenyls (PCBs), organic halides, and oil and grease. The results of these analyses are attached and discussed below.

Surface Water Analysis - Petroleum Hydrocarbons

The results of the PHC and oil and grease analyses reported all concentrations below the laboratory's method detection limits (MDLs) and below the standards, where applicable. The results of the PHC and oil and grease analyses are presented in Table 1 (attached).

Surface Water Analysis - Organics

The results of the April 24, 2018 analyses indicated that PCBs, dioxins/furans, and organic halides concentrations were below their respective applicable standards (where available). The results of the organics analyses are presented in Table 2.

Surface Water Analysis - Metals

The results of the metals analyses indicated that all of the analysed parameters were below their respective standards, where available. The results of the metals analyses are presented in Table 3.

Surface Water Analysis - Nutrients, Water Quality, and Trout Bioassay

Chloride concentrations were elevated above the BC CSR IW standard of 100 mg/L during the July 16, 2018 sampling event (469 mg/L) . However, chloride concentrations were below the applicable standard in the subsequent sampling events on July 30 and September 21, 2018, prior to the October 2018 discharge events. All other nutrient and water quality results were below their respective applicable standards, where available.

The results of the trout bioassay reported that the endpoints for mortality could not be reached (LC50 > 100), indicating that no effect occurred. The results of the nutrients, water quality, and trout bioassay analyses are presented in Table 4.

Copies of the final signed surface water laboratory reports are attached.

CONCLUSIONS

Nichols Environmental has completed the 2018 Surface Water Discharge Report for the Silverberry Landfill at Block A 08-088-20-W6M, British Columbia. The field and analytical results are summarized as follows:

- In total, 17,440 m^3 of water was discharged from the Site in 2018;

- Surface water samples were collected from the stormwater pond on April 24, May 10, May 18, July 16, July 30, and September 21, 2018 and submitted for laboratory analysis of select PHCs, oil and grease, metals, nutrients and water quality, phenols, PCBs, organic halides, and a trout bioassay;

- All analytical results were compared to the BC CSR standards for the DW, IW, LW, and FW pathways as well as the BC HWR Effluent Standards for Hazardous Waste Facilities for discharges to the environment;

- Chloride concentration in the stormwater pond sample collected on July 16, 2018 exceeded the BC CSR IW standard. However, chloride concentrations were below the applicable BC CSR standard in subsequent sampling events on July 30 and September 21, 2018, prior to discharging in October 2018;

- All remaining concentrations were reported below their respective laboratory MDLs and/or BC MOECCS standards, where available. The results of the trout bioassay indicated that there was no effect; and

- It is the opinion of Nichols Environmental that there were no deleterious effects on the environment due to surface water discharge from the Silverberry Landfill in 2018.

LIMITATIONS

In conducting the 2018 Surface Water Discharge Report at the Site and in rendering our conclusions on the potential presence or level of contamination, Nichols Environmental (Canada) Ltd. gives the benefit of its best judgment based on its experience and in accordance with generally accepted professional standards for this type of investigation. Our conclusions are limited by the following:

- Nichols Environmental did not visit the Site for sample collection. Sample collection was completed by Tervita personnel with the laboratory results being provided to Nichols Environmental for the purpose of preparing this report. As such, we cannot comment on the sampling methodology and QA/QC program utilized by Tervita; and

- The sampling area was limited to the sample locations outlined in Figure 2.

This report is intended to provide information to reduce, but not necessarily eliminate, uncertainty regarding the potential for contamination of a property. This report has been prepared for the exclusive use of Tervita Corporation for the purpose of assessing the current environmental conditions that may be present at the Site. Any uses which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Nichols Environmental (Canada) Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

CLOSURE

We trust this meets your current requirements. If you have any questions, please contact our office at 780-484-3377 at your convenience.

Yours truly,
NICHOLS ENVIRONMENTAL (CANADA) LTD.

Justin Keeping, T.T.
Environmental Technologist

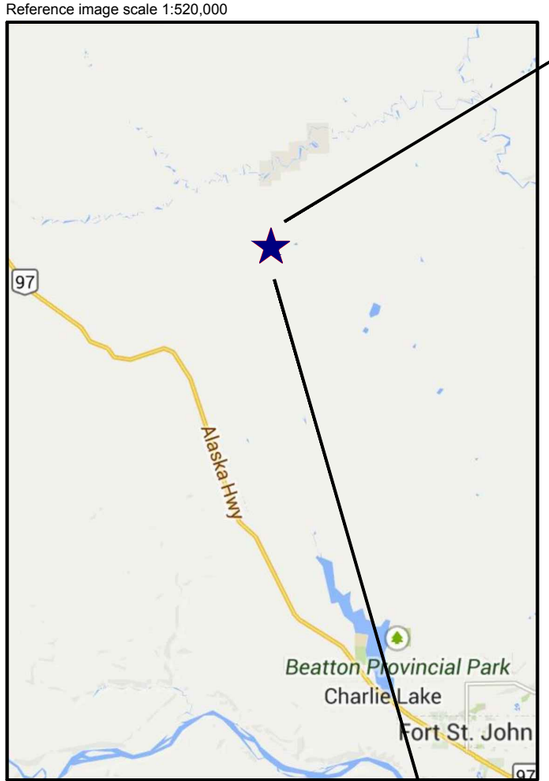
Reviewed by:

Leah Baer, P.Eng.
Environmental Engineer

JK/LB/sam

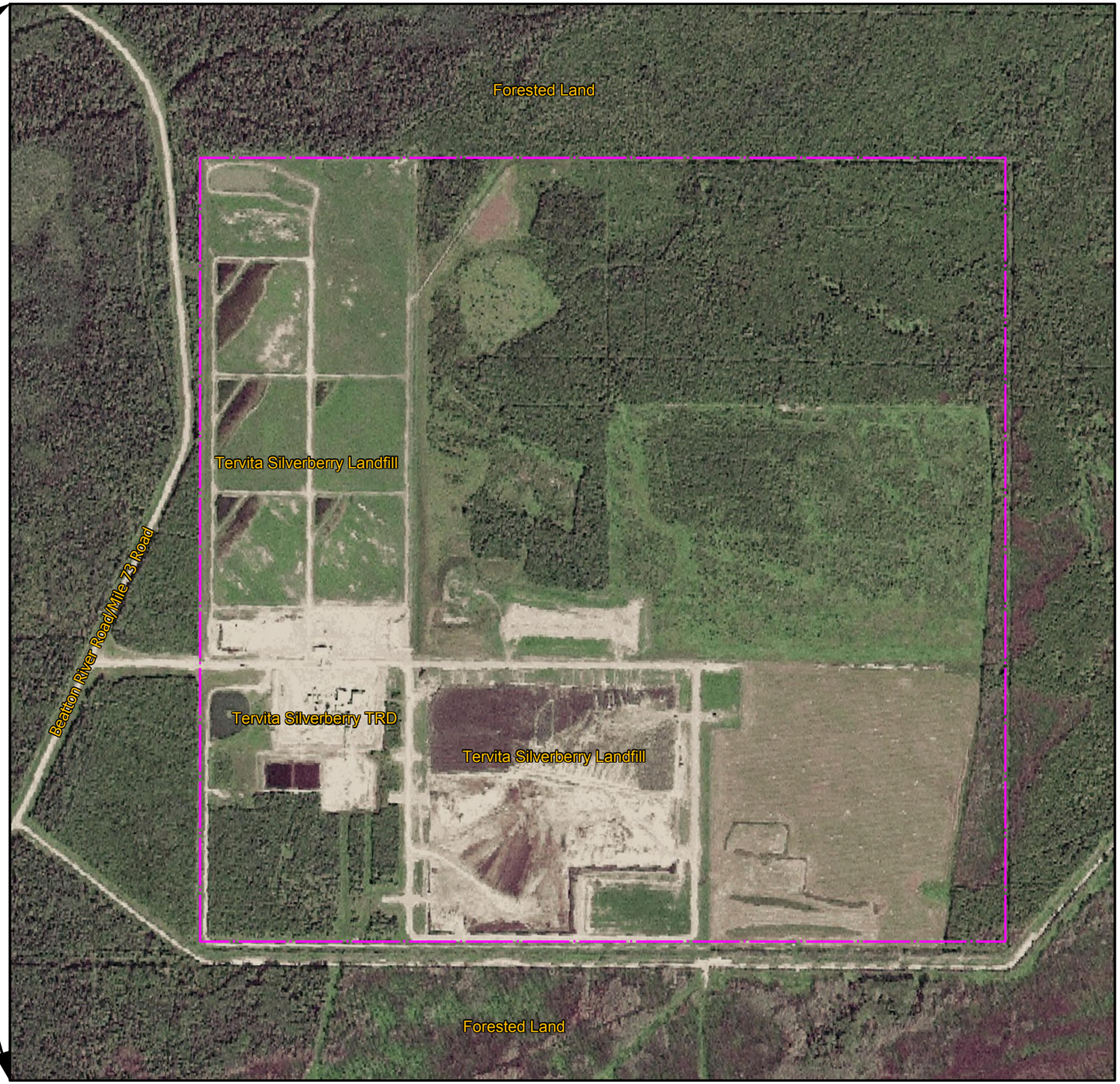
Attachments

Reference image scale 1:520,000



Legend:

Approximate Site Boundary



2016 Air Photo Source: Abacus Datagraphics Ltd.

NICHOLS ENVIRONMENTAL (CANADA) LTD.

-85 0 85 170 255m

CLIENT

Tervita Corporation

PROJECT

2018 Surface Water Monitoring Report
Silverberry Landfill
Block A 08-088-20-W6M
British Columbia

DRAWING TITLE

Site Location and Surrounding Land Use

BASE/SITE PLAN PROVIDED BY

NLR/AE Consultants

REVISION DATE

Feburary 2019

SCALE	APPROVED
1:9,000	JK/LB

PROJECT NO.

19-017-TSS

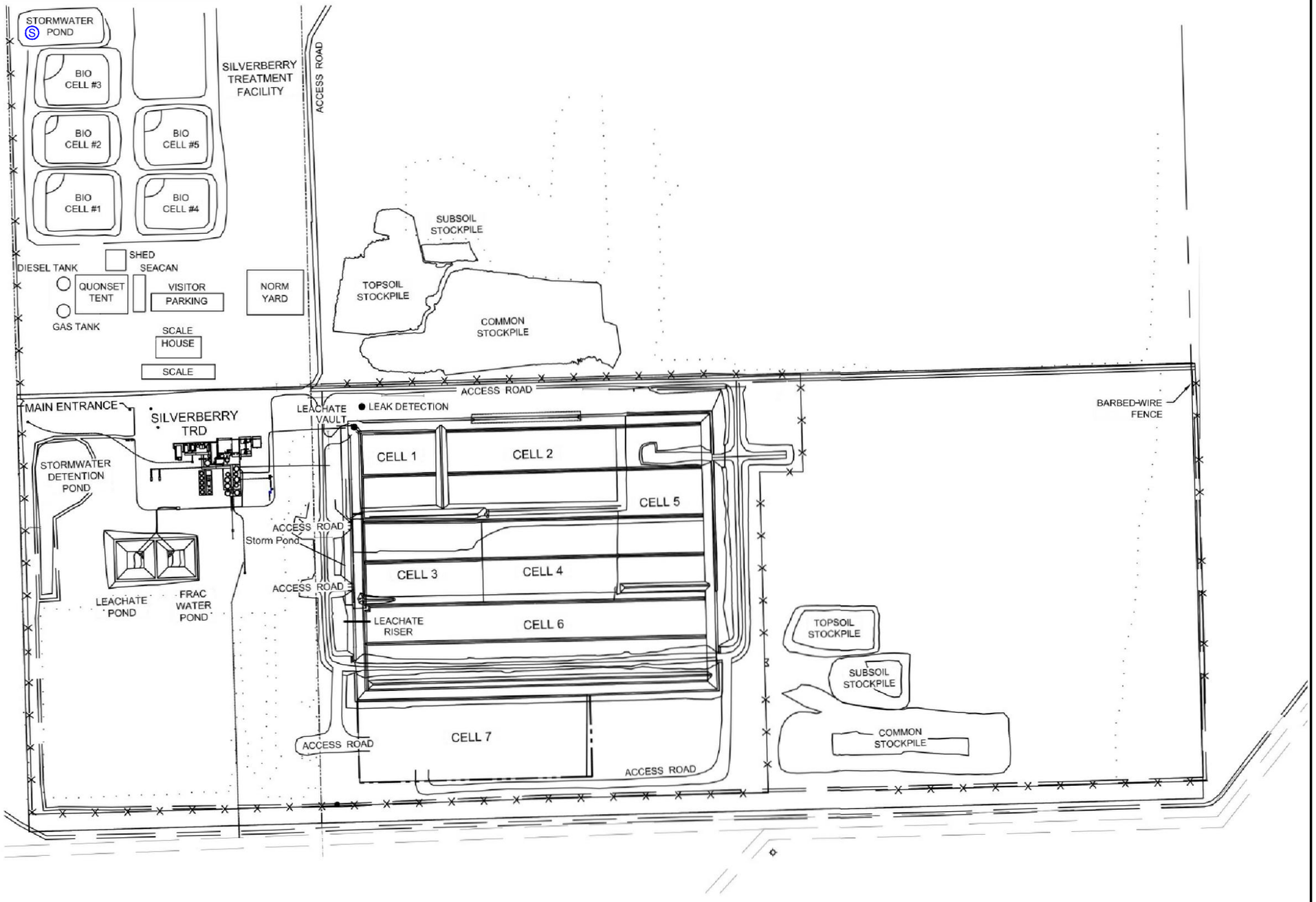
DRAWING NO.

Figure 1

\\FS1\Data\Jobs\2019\19-017-TSS\Drawings\19-017-TSS.dwg Original drawing in colour. Black and white copies may not interpret properly.

Legend:

Ⓢ Surface Water Sample



NICHOLS ENVIRONMENTAL (CANADA) LTD.

45 0 45 90 135m

CLIENT
Tervita Corporation

PROJECT
2018 Surface Water Monitoring Report
Silverberry Landfill
Block A 08-088-20-W6M
British Columbia

DRAWING TITLE
Site Detail

BASE/SITE PLAN PROVIDED BY
NLR/AE Consultants

REVISION DATE
Feburary 2019

SCALE	APPROVED
1:4,500	JK/LB

PROJECT NO.
19-017-TSS

DRAWING NO.
Figure 2

Nichols Environmental (Canada) Ltd.

TABLE: 1

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - PETROLEUM HYDROCARBONS

PROJECT#: 19-017-TSS
CLIENT: Tervita Corporation
PROJECT: 2018 Surface Water Discharge Report
SITE: Silverberry Landfill
LOCATION: Block A 08-088-20 W6M, British Columbia

	BC Standards							
	Land Use	Benzene	Toluene	Ethylbenzene	Xylenes	Styrene	MTBE	Oil & Grease
BC CSR Standards*	Freshwater Aquatic Life	400	5	2,000	300	720	34,000	--
	Marine/Estuarine Aquatic Life	1,000	2,000	2,500	300	720	4,400	---
	Irrigation	----	----	----	----	----	----	----
	Livestock	-----	-----	-----	-----	-----	11,000	-----
	Drinking Water	5	60	140.0	90	800	95	------
BC HWR Standards**	Effluent Standards	-------	-------	-------	-------	-------	-------	10,000

		Benzene	Toluene	Ethylbenzene	Xylenes	Styrene	MTBE	Oil & Grease
Land Use		5	5	140.0	90	720	95	10,000
Sample ID	Date							
Storm Pond	24-Apr-2018	NM	NM	NM	NM	NM	NM	6,000
	16-Jul-2018	<0.5	<0.45	<0.5	<0.75	<0.5	<0.5	<5,000
	21-Sep-2018	<0.5	<0.45	<0.5	<0.75	<0.5	<0.5	<5,000

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 196/2017 - Schedule 3.2)
**Hazardous Waste Regulation (HWR) B.C. Reg. 63/88, includes amendments up to B.C. Reg. 195/2017 - Schedule 1.2
(All concentrations in µg/L = ppb, unless noted)

MTBE = Methyl tertiary butyl ether
VPH_w = Volatile petroleum hydrocarbons with the exception of benzene, toluene, ethylbenzene and xylenes.
$VH_{w\ 6\text{-}10}$ = Included volatile petroleum hydrocarbons.
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 2

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - ORGANICS

PROJECT#: 19-017-TSS
CLIENT: Tervita Corporation
PROJECT: 2018 Surface Water Discharge Report
SITE: Silverberry Landfill
LOCATION: Block A 08-088-20 W6M, British Columbia

Sample ID	Storm Pond	BC CSR Standards*				BC HWR Standards**
Date	24-Apr-18	AW	IW	LW	DW	Effluent
Dioxins/Furans (pg/L)						
2,3,7,8-TCDD	<1	-	--	---	----	-----
1,2,3,7,8,-PeCDD	<2	-	--	---	----	-----
1,2,3,4,7,8,-HxCDD	<2	-	--	---	----	-----
1,2,3,6,7,8-HxCDD	<2	-	--	---	----	-----
1,2,3,7,8,9-HxCDD	<2	-	--	---	----	-----
1,2,3,4,6,7,8-HpCDD	<3	-	--	---	----	-----
OCDD	<4	-	--	---	----	-----
Total-TCDD	<1	-	--	---	----	-----
Total-PeCDD	<2	-	--	---	----	-----
Total-HxCDD	<2	-	--	---	----	-----
Total-HpCDD	<3	-	--	---	----	-----
2,3,7,8-TCDF	<1	-	--	---	----	-----
1,2,3,7,8-PeCDF	<2	-	--	---	----	-----
2,3,4,7,8-PeCDF	<2	-	--	---	----	-----
1,2,3,4,7,8-HxCDF	<2	-	--	---	----	-----
1,2,3,6,7,8-HxCDF	<2	-	--	---	----	-----
1,2,3,7,8,9-HxCDF	<2	-	--	---	----	-----
2,3,4,6,7,8-HxCDF	<2	-	--	---	----	-----
1,2,3,4,6,7,8-HpCDF	<3	-	--	---	----	-----
1,2,3,4,7,8,9-HpCDF	<3	-	--	---	----	-----
OCDF	<4	-	--	---	----	-----
Total-TcDF	<1	-	--	---	----	-----
Total-PeCDF	<2	-	--	---	----	-----
Total-HxCDF	<2	-	--	---	----	-----
Total Dioxin TEQ (i-TEQ)	<2.63					
Total Furans (i-TEQ)	<2.06					
PCDD/PCFD Toxic Equivalent	<4.70	-	--	---	----	15
Chlorinated Phenols						
Phenols	<1					
PCBs						
Aroclor 1016	<0.1	-	---	----	-----	------
Aroclor 1221	<0.1	-	---	----	-----	------
Aroclor 1232	<0.1	-	---	----	-----	------
Aroclor 1242	<0.1	-	---	----	-----	------
Aroclor 1248	<0.1	-	---	----	-----	------
Aroclor 1254	<0.1	-	---	----	-----	------
Aroclor 1260	<0.1	-	---	----	-----	------
Aroclor 1262	<0.1	-	---	----	-----	------
Aroclor 1268	<0.1	-	---	----	-----	------
Total PCBs	<0.1	-	---	----	-----	5
Organic Halides						
Extractable Organic Halides	<200	-	---	----	-----	100

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 196/2017 - Schedule 3.2)
**Hazardous Waste Regulation (HWR) B.C. Reg. 63/88, includes amendments up to B.C. Reg. 195/2017 - Schedule 1.2
(All concentrations in ug/L = ppb, unless noted)
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 3

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - METALS

PROJECT#: 19-017-TSS
CLIENT: Tervita Corporation
PROJECT: 2018 Surface Water Discharge Report
SITE: Silverberry Landfill
LOCATION: Block A 08-088-20 W6M, British Columbia

BC Standards																	
Land Use		Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium***	Chromium (Total)	Chromium (III)	Chromium (VI)	Cobalt	Copper***	Cyanide^{SAD}	Fluoride***	Iron	Lead***
BC CSR Standards*	Freshwater Aquatic Life	--	90	50	10,000	2	12,000	3.5	--	90	10	40	70	--	3,000	--	60
	Marine/Estuarine Aquatic Life	---	2,500	125	5,000	1,000	---	15	---	560	15	---	20	---	15,000	---	20
	Irrigation	5,000	----	100	----	100	500	5	----	5	8	50	200	----	1,000	5,000	200
	Livestock	5,000	-----	25	-----	100	5,000	80	-----	50	50	1,000	300	-----	1,000	-----	100
	Drinking Water	9,500	6	10	1,000	8	5,000	5	------	6,000	50	1	1,500	200	1,500	6,500	10
BC HWR Standards**	Effluent Standards	500	250	100	1,000	-------	10,000	50	500	-------	100	100	100	-------	-------	-------	100

				Aluminum	Antimony	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium (Total)	Chromium (III)	Chromium (VI)	Cobalt	Copper	Cyanide^{SAD}	Fluoride	Iron	Lead
Land Use				500	6	10	1,000	2	500	3.5	500	5	8	1	70	200	1,000	5,000	10
Sample ID	Date	pH	$CaCO_3$ (mg/L)																
Storm Pond	24-Apr-2018	7.16	NM	20.0	<0.2	0.4	32	<0.1	26	<0.01	7.8	<0.5	<10	<0.1	1	<4	110	120	<0.1
	16-Jul-2018	2.06	225	15.3	0.25	1.13	113	<0.1	45	0.0232	0.14	NM	NM	0.35	2.77	NM	NM	127	0.126
	21-Sep-2018	8.00	186	492	0.2	1.1	115	<0.1	40	0.0166	0.75	NM	NM	0.25	2.18	NM	NM	364	0.317

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 196/2017 - Schedule 3.2)

**Hazardous Waste Regulation (HWR) B.C. Reg. 63/88, includes amendments up to B.C. Reg. 195/2017 - Schedule 1.2

(All concentrations in µg/L = ppb, unless noted)

*** = Hardness Dependent, See Guidelines for Guidance
^{pH} = pH Dependent, See Guidelines for Guidance
^{SAD} = Strong Acid Dissociable
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 3

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - METALS

PROJECT#: 19-017-TSS
CLIENT: Tervita Corporation
PROJECT: 2018 Surface Water Discharge Report
SITE: Silverberry Landfill
LOCATION: Block A 08-088-20 W6M, British Columbia

		BC Standards												
Land Use		Lithium	Manganese	Mercury	Molybdenum	Nickel***	Selenium	Silver***	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc***
BC CSR Standards*	Freshwater Aquatic Life	--	--	0.25	10000	1100	20	15	3	--	1,000	85	--	900
	Marine/Estuarine Aquatic Life	---	---	1.0	---	83	---	15	---	---	---	---	---	100
	Irrigation	2,500	200	1.0	10-30	200	20	---	----	----	----	10	100	pH
	Livestock	5,000	-----	2.0	50	1,000	30	----	-----	-----	-----	200	100	2,000
	Drinking Water	8	1,500	1.0	250	80	10	20	------	2,500	------	20	20	3,000
BC HWR Standards**	Effluent Standards	-------	500	1.0	500	500	50	-------	-------	500	-------	-------	-------	200

				Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium	Silver	Thallium	Tin	Titanium	Uranium	Vanadium	Zinc
Land Use				8	200	0.25	50	80	10	15	3	500	1,000	10	20	200
Sample ID	Date	pH	$CaCO_3$ (mg/L)													
Storm Pond	24-Apr-2018	7.16	NM	1	<5	0.028	<1.0	1.4	<0.2	<0.01	<0.05	<0.1	2.7	<0.5	0.2	3
	16-Jul-2018	2.06	225	6.1	16.5	0.0063	1.07	3.49	0.449	<0.01	<0.01	<0.1	5.15	0.575	<0.5	1.1
	21-Sep-2018	8.00	186	5.6	19.3	<0.005	0.913	3.06	0.297	<0.01	<0.01	<0.1	59.9	0.593	1.73	2.9

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 196/2017 - Schedule 3.2)
**Hazardous Waste Regulation (HWR) B.C. Reg. 63/88, includes amendments up to B.C. Reg. 195/2017 - Schedule 1.2
(All concentrations in µg/L = ppb, unless noted)

*** = Hardness Dependent, See Guidelines for Guidance
pH = pH Dependent, See Guidelines for Guidance
WAD = Weak Acid Dissociable
crops = Use 20 ug/L for continuous application on crops or use 50 ug/L for intermittent application on crops.
NM = Not Measured
--- = No Value Provided in Guidelines

Nichols Environmental (Canada) Ltd.

TABLE: 4

TITLE: GENERIC NUMERICAL STANDARDS FOR WATER - NUTRIENTS/QUALITY

PROJECT#: 19-017-TSS
CLIENT: Tervita Corporation
PROJECT: 2018 Surface Water Discharge Report
SITE: Silverberry Landfill
LOCATION: Block A 08-088-20 W6M, British Columbia

BC Standards											
BC Standards		Ammonia[pH]	BOD (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	TSS (mg/L)	Trout Bioassay (LC50)
BC CSR Standards*	Freshwater Aquatic Life	11,300	--	--	1,500	--	--	--	1,280	--	--
	Marine/Estuarine Aquatic Life	20,000	---	---	100	---	---	---	1,000	---	---
	Irrigation	----	----	----	100	----	----	----	----	----	----
	Livestock	-----	-----	1,000	600	-----	-----	-----	1,000	-----	-----
	Drinking Water	------	------	------	250	------	------	200	500	------	------
BC HWR Standards**	Effluent Standards	2,000	20	-------	-------	-------	-------	-------	-------	-------	100

				Ammonia	BOD (mg/L)	Calcium (mg/L)	Chloride (mg/L)	Magnesium (mg/L)	Potassium (mg/L)	Sodium (mg/L)	Sulphate (mg/L)	TSS (mg/L)	Trout Bioassay (LC50)
Land Use				2,000	20	1,000	100	---	---	200	500	----	100
Sample ID	Date	pH	$CaCO_3$ (mg/L)										
Storm Pond	24-Apr-2018	7.60	37.4	59	<4	15.4	NM	4.2	3	1.5	NM	184	>100
	10-May-2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	28	NM
	18-May-2018	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	5	NM
	16-Jul-2018	2.06	225	NM	NM	63	469	16.5	6.06	13	77.6	10.9	NM
	30-Jul-2018	8.14	NM	NM	NM	NM	77.9	NM	NM	NM	NM	NM	NM
	21-Sep-2018	8.00	186	NM	NM	48.4	68.4	15.7	5.48	11.2	74.7	5.6	NM

BOLD = Applicable Standard
BOLD = Parameter Exceeds Recommended Standard

*Contaminated Sites Regulation (CSR), Generic Numerical Water Standards (B.C. Reg. 375/96, includes amendments up to B.C. Reg. 196/2017 - Schedule 3.2)
**Hazardous Waste Regulation (HWR) B.C. Reg. 63/88, includes amendments up to B.C. Reg. 195/2017 - Schedule 1.2
(All concentrations in µg/L = ppb, unless noted)
[pH] = pH Dependent, See Guidelines for Guidance
NM = Not Measured
--- = No Value Provided in Guidelines

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Report Transmission Cover Page

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Contact	Company	Address
Accounts Payable	**Tervita Corporation**	500, 140 - 10 Avenue SE Calgary, AB T2G 0R1 Phone: (403) 234-6412 Fax: (403) 261-5612 Email: accountspayable@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Invoice

Contact	Company	Address
Lisa Jordan	**Tervita Corporation**	10215 100 ST Fort St. John, BC V1J 3Y8 Phone: (250) 827-6834 Fax: Email: lijordan@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COC / COA
Email - Single Report	PDF	Invoice

Notes To Clients:

- Apr 30, 2018 - Sample 1266553-1; 6071931: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-2; 6071932: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-3; 6071933: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-4; 6071934: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-5; 6071939: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- May 29, 2018 - Dioxin analysis was performed by a subcontract laboratory. See attached 7 page report 181206.

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Analytical Report

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1266553-1	1266553-2	1266553-3
Sample Date	Apr 24, 2018	Apr 24, 2018	Apr 24, 2018
Sample Time	13:00	13:00	13:00
Sample Location			
Sample Description	Strorm Pond / Surface / 4.9 C	Bio Cell 1 / Surface / 4.9 C	Bio Cell 3 / Surface / 4.9 C
Matrix	Water	Water	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Biochemical Oxygen Demand	5 Day	mg/L	<4	<4	<4	4
Phenol		mg/L	<0.001	<0.001	<0.001	0.001
Oil and Grease	Total	mg/L	6	<5	<5	5
pH adjustment	adjustment required		No	No	No	
Inorganic Nonmetallic Parameters						
Ammonia - N		mg/L	0.059	0.151	0.058	0.025
Ammonium/Ammonia Preservation			Yes	Yes	Yes	
Chromium (VI)	Dissolved	mg/L	<0.01	<0.01	<0.01	0.01
Cyanide	Weak Acid Dissociable	mg/L	<0.004	0.004	<0.004	0.004
Metals Dissolved						
Silicon	Dissolved	mg/L	0.79	0.46	0.30	0.05
Sulfur	Dissolved	mg/L	8.2	4.4	3.2	0.3
Aluminum	Dissolved	mg/L	0.020	0.010	0.011	0.002
Antimony	Dissolved	mg/L	<0.0002	<0.0002	<0.0002	0.0002
Arsenic	Dissolved	mg/L	0.0004	<0.0002	<0.0002	0.0002
Barium	Dissolved	mg/L	0.032	0.022	0.016	0.001
Beryllium	Dissolved	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Bismuth	Dissolved	mg/L	<0.0005	<0.0005	<0.0005	0.0005
Boron	Dissolved	mg/L	0.026	0.011	0.021	0.002
Cadmium	Dissolved	mg/L	<0.00001	0.00001	<0.00001	0.00001
Chromium	Dissolved	mg/L	<0.0005	<0.0005	<0.0005	0.0005
Cobalt	Dissolved	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Copper	Dissolved	mg/L	0.001	<0.001	<0.001	0.001
Lead	Dissolved	mg/L	<0.0001	<0.0001	<0.0001	0.0001
Lithium	Dissolved	mg/L	0.001	<0.001	<0.001	0.001
Molybdenum	Dissolved	mg/L	<0.001	<0.001	<0.001	0.001
Nickel	Dissolved	mg/L	0.0014	0.0008	<0.0005	0.0005
Selenium	Dissolved	mg/L	<0.0002	<0.0002	<0.0002	0.0002
Silver	Dissolved	mg/L	<0.00001	<0.00001	<0.00001	0.00001
Strontium	Dissolved	mg/L	0.052	0.031	0.018	0.001
Thallium	Dissolved	mg/L	<0.00005	<0.00005	<0.00005	0.00005
Tin	Dissolved	mg/L	<0.001	<0.001	<0.001	0.001
Titanium	Dissolved	mg/L	0.0027	0.0005	<0.0005	0.0005
Uranium	Dissolved	mg/L	<0.0005	<0.0005	<0.0005	0.0005
Vanadium	Dissolved	mg/L	0.0002	0.0001	<0.0001	0.0001
Zinc	Dissolved	mg/L	0.003	0.003	0.002	0.001
Subsample	Field Filtered		Lab Filtered	Lab Filtered	Lab Filtered	

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Analytical Report

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1266553-1	1266553-2	1266553-3
Sample Date	Apr 24, 2018	Apr 24, 2018	Apr 24, 2018
Sample Time	13:00	13:00	13:00
Sample Location			
Sample Description	Strorm Pond / Surface / 4.9 C	Bio Cell 1 / Surface / 4.9 C	Bio Cell 3 / Surface / 4.9 C
Matrix	Water	Water	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Metals Total						
Mercury	Total	mg/L	0.000028	<0.000005	<0.000005	0.000005
Chromium	Total	mg/L	0.0078	0.0009	0.0009	0.0005
Physical and Aggregate Properties						
Solids	Total Suspended	mg/L	184	17	12	2
Routine Water						
pH			7.16	6.97	6.86	
Temperature of observed pH		°C	21.4	21.6	21.3	
Calcium	Dissolved	mg/L	15.4	9.0	6.3	0.2
Magnesium	Dissolved	mg/L	4.2	2.2	1.9	0.2
Sodium	Dissolved	mg/L	1.5	0.9	0.5	0.4
Potassium	Dissolved	mg/L	3.0	2.4	1.9	0.4
Iron	Dissolved	mg/L	0.12	0.03	0.03	0.01
Manganese	Dissolved	mg/L	<0.005	0.036	0.041	0.005
Fluoride		mg/L	0.11	<0.05	<0.05	0.05
Chlorinated Phenols - Water						
Monochlorophenols		µg/L	<0.1	<0.1	<0.1	0.1
Dichlorophenols		µg/L	<0.1	<0.1	<0.1	0.1
Trichlorophenols		µg/L	<0.1	<0.1	<0.1	0.1
Tetrachlorophenols		µg/L	<0.1	<0.1	<0.1	0.1
Pentachlorophenol		µg/L	<0.1	<0.1	<0.1	0.1
Total Chlorophenols		µg/L	<0.1	<0.1	<0.1	0.1
Chlorinated Phenols - Water - Surrogate Recovery						
2,4,6-Tribromophenol	PCP - Surrogate	%	68	88	87	50-140
Polychlorinated Biphenyls - Water						
Aroclor 1016		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1221		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1232		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1242		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1248		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1254		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1260		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1262		µg/L	<0.1	<0.1	<0.1	0.1
Aroclor 1268		µg/L	<0.1	<0.1	<0.1	0.1
Total PCBs		µg/L	<0.1	<0.1	<0.1	0.1
Polychlorinated Biphenyls - Water - Surrogate						
Decachlorobiphenyl	Surrogate	%	80	86	88	50-140
Subcontracted Analysis						
Subcontractor Report Id	Hydroqual		17181005	17181005	17181005	

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Analytical Report

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1266553-1	1266553-2	1266553-3	
Sample Date	Apr 24, 2018	Apr 24, 2018	Apr 24, 2018	
Sample Time	13:00	13:00	13:00	
Sample Location				
Sample Description	Strorm Pond / Surface / 4.9 C	Bio Cell 1 / Surface / 4.9 C	Bio Cell 3 / Surface / 4.9 C	
Matrix	Water	Water	Water	
Analyte	**Units**	**Results**	**Results**	**Results**	Nominal Detection Limit
Subcontracted Analysis - Continued					
Subcontractor Report Id Pacific Rim		181206	181206	181206	
Organic Halides					
Extractable Organic Halides	mg/L	<0.2	<0.2	<0.2	0.2

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	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1266553-4	1266553-5	
Sample Date	Apr 24, 2018	Apr 24, 2018	
Sample Time	13:00	13:00	
Sample Location			
Sample Description	Bio Cell 4 / Surface / 4.9 C	Bio Cell 5 / Surface / 4.9 C	
Matrix	Water	Water	

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Aggregate Organic Constituents						
Oil and Grease	Total	mg/L	8	<5		5
pH adjustment	adjustment required		No	No		
Metals Dissolved						
Silicon	Dissolved	mg/L	0.48	0.63		0.05
Sulfur	Dissolved	mg/L	3.3	3.3		0.3
Aluminum	Dissolved	mg/L	0.008	0.022		0.002
Antimony	Dissolved	mg/L	<0.0002	<0.0002		0.0002
Arsenic	Dissolved	mg/L	<0.0002	<0.0002		0.0002
Barium	Dissolved	mg/L	0.022	0.028		0.001
Beryllium	Dissolved	mg/L	<0.0001	<0.0001		0.0001
Bismuth	Dissolved	mg/L	<0.0005	<0.0005		0.0005
Boron	Dissolved	mg/L	0.014	0.019		0.002
Cadmium	Dissolved	mg/L	<0.00001	<0.00001		0.00001
Chromium	Dissolved	mg/L	<0.0005	<0.0005		0.0005
Cobalt	Dissolved	mg/L	<0.0001	<0.0001		0.0001
Copper	Dissolved	mg/L	0.001	0.001		0.001
Lead	Dissolved	mg/L	<0.0001	<0.0001		0.0001
Lithium	Dissolved	mg/L	<0.001	<0.001		0.001
Molybdenum	Dissolved	mg/L	<0.001	<0.001		0.001
Nickel	Dissolved	mg/L	0.0007	0.0008		0.0005
Selenium	Dissolved	mg/L	<0.0002	<0.0002		0.0002
Silver	Dissolved	mg/L	<0.00001	<0.00001		0.00001
Strontium	Dissolved	mg/L	0.033	0.030		0.001
Thallium	Dissolved	mg/L	<0.00005	<0.00005		0.00005
Tin	Dissolved	mg/L	<0.001	<0.001		0.001
Titanium	Dissolved	mg/L	0.0005	0.0022		0.0005
Uranium	Dissolved	mg/L	<0.0005	<0.0005		0.0005
Vanadium	Dissolved	mg/L	<0.0001	0.0002		0.0001
Zinc	Dissolved	mg/L	0.002	0.002		0.001
Subsample	Field Filtered		Lab Filtered	Lab Filtered		
Metals Total						
Mercury	Total	mg/L	<0.000005	0.000008		0.000005
Physical and Aggregate Properties						
Solids	Total Suspended	mg/L	4	72		2
Routine Water						
pH			7.03	7.06		
Temperature of observed pH		°C	21.3	21.2		
Calcium	Dissolved	mg/L	9.0	8.9		0.2

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	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1266553-4	1266553-5	
Sample Date	Apr 24, 2018	Apr 24, 2018	
Sample Time	13:00	13:00	
Sample Location			
Sample Description	Bio Cell 4 / Surface / 4.9 C	Bio Cell 5 / Surface / 4.9 C	
Matrix	Water	Water	

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Routine Water - Continued						
Magnesium	Dissolved	mg/L	2.4	2.6		0.2
Sodium	Dissolved	mg/L	0.7	0.6		0.4
Potassium	Dissolved	mg/L	2.7	3.2		0.4
Iron	Dissolved	mg/L	0.04	0.08		0.01
Manganese	Dissolved	mg/L	<0.005	<0.005		0.005
Chloride	Dissolved	mg/L	1.8	1.5		0.4
Sulfate (SO4)	Dissolved	mg/L	9.9	10		0.9
Mono-Aromatic Hydrocarbons - Water						
Benzene		mg/L	<0.001	<0.001		0.001
Ethylbenzene		mg/L	<0.001	<0.001		0.001
Toluene		mg/L	<0.0005	<0.0005		0.0005
Total Xylenes (m,p,o)		mg/L	<0.001	<0.001		0.001

Approved by:

Kaitlyn Anderson, B. Sc., P. Chem
Consulting Scientist

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Quality Control

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Aggregate Organic Constituents

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Biochemical Oxygen	mg/L	0.55	-4	4	yes
Phenol	mg/L	0	-0.002	0.002	yes
Date Acquired: April 27, 2018					

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Phenol	mg/L	0.002	0.003	10	0.002	yes
Date Acquired: April 27, 2018						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Oil and Grease	mg/L	40	37	43	yes
Date Acquired: April 25, 2018					
Biochemical Oxygen	mg/L	160	140	228	yes
Phenol	mg/L	0.073	0.069	0.079	yes
Date Acquired: April 27, 2018					
Phenol	mg/L	0.014	0.013	0.017	yes
Date Acquired: April 27, 2018					

Chlorinated Phenols - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
2-Chlorophenol	ng/mL	0	-0.2	0.2	yes
3-Chlorophenol	ng/mL	0	-0.2	0.2	yes
4-Chlorophenol	ng/mL	0	-0.2	0.2	yes
4-Chloro-3-methylphenol	ng/mL	0	-0.2	0.2	yes
2,3-Dichlorophenol	ng/mL	0	-0.2	0.2	yes
2,6-Dichlorophenol	ng/mL	0	-0.2	0.2	yes
2,4 & 2,5-Dichlorophenol	ng/mL	0	-0.2	0.2	yes
3,4-Dichlorophenol	ng/mL	0	-0.2	0.2	yes
3,5-Dichlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,4-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,5-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,6-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
2,4,5-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
2,4,6-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
3,4,5-Trichlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,4,5-Tetrachlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,4,6-Tetrachlorophenol	ng/mL	0	-0.2	0.2	yes
2,3,5,6-Tetrachlorophenol	ng/mL	0	-0.2	0.2	yes
Monochlorophenols	ng/mL	0	-0.2	0.2	yes
Dichlorophenols	ng/mL	0	-0.2	0.2	yes
Trichlorophenols	ng/mL	0	-0.2	0.2	yes
Tetrachlorophenols	ng/mL	0	-0.2	0.2	yes
Pentachlorophenol	ng/mL	0	-0.2	0.2	yes
Date Acquired: April 27, 2018					

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
2-Chlorophenol	ng/mL	91.30	80	120	yes
3-Chlorophenol	ng/mL	96.95	80	120	yes

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Quality Control

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Chlorinated Phenols - Water - Continued

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
4-Chlorophenol	ng/mL	107.71	80	120	yes
4-Chloro-3-methylphenol	ng/mL	83.50	80	120	yes
2,3-Dichlorophenol	ng/mL	83.76	80	120	yes
2,6-Dichlorophenol	ng/mL	89.70	80	120	yes
2,4 & 2,5-Dichlorophenol	ng/mL	89.65	80	120	yes
3,4-Dichlorophenol	ng/mL	81.00	80	120	yes
3,5-Dichlorophenol	ng/mL	88.23	80	120	yes
2,3,4-Trichlorophenol	ng/mL	82.80	80	120	yes
2,3,5-Trichlorophenol	ng/mL	85.50	80	120	yes
2,3,6-Trichlorophenol	ng/mL	87.60	80	120	yes
2,4,5-Trichlorophenol	ng/mL	97.90	80	120	yes
2,4,6-Trichlorophenol	ng/mL	90.00	80	120	yes
3,4,5-Trichlorophenol	ng/mL	91.50	80	120	yes
2,3,4,5-Tetrachlorophenol	ng/mL	87.10	80	120	yes
2,3,4,6-Tetrachlorophenol	ng/mL	93.80	80	120	yes
2,3,5,6-Tetrachlorophenol	ng/mL	81.70	80	120	yes
Pentachlorophenol	ng/mL	94.50	80	120	yes
Date Acquired:	April 27, 2018				

Chlorinated Phenols - Water - Surrogate Recovery

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
2,4,6-Tribromophenol	%	91.421	50	140	yes
Date Acquired:	April 27, 2018				

Inorganic Nonmetallic Parameters

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Cyanide	mg/L	0	-0.002	0.002	yes
Date Acquired:	May 02, 2018				
Ammonium - N	mg/L	0.007	-0.051	0.051	yes
Chromium (VI)	mg/L	0	-0.01	0.01	yes
Cyanide	mg/L	0	-0.002	0.002	yes
Date Acquired:	May 02, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Ammonium - N	mg/L	12.0	12.2	10	0.100	yes
Chromium (VI)	mg/L	<0.01	<0.01	10	0.00	yes
Date Acquired:	April 26, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Ammonium - N	mg/L	6.93	6.310	7.690	yes
Chromium (VI)	mg/L	0.14	0.13	0.15	yes
Cyanide	mg/L	0.075	0.067	0.087	yes
Date Acquired:	May 02, 2018				
Ammonium - N	mg/L	3.02	2.765	3.185	yes
Chromium (VI)	mg/L	0.05	0.04	0.06	yes

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Quality Control

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Inorganic Nonmetallic Parameters - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Cyanide	mg/L	0.016	0.013	0.018	yes
Date Acquired:	May 02, 2018				
Ammonium - N	mg/L	0.789	0.727	0.853	yes
Date Acquired:	April 26, 2018				

Metals Dissolved

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Silicon	mg/L	0.0012187	-0.04	0.05	yes
Sulfur	mg/L	0.0229496	-0.3	0.2	yes
Aluminum	µg/L	0.282631	-2	2	yes
Antimony	µg/L	0.000926148	-0.2	0.2	yes
Arsenic	µg/L	0.00349652	-0.2	0.2	yes
Barium	µg/L	0.0249013	-1	1	yes
Beryllium	µg/L	0.00208533	-0.0	0.1	yes
Bismuth	µg/L	0.00430942	-1.5	1.5	yes
Boron	µg/L	0.580315	-2	2	yes
Cadmium	µg/L	-0.000618785	-0.01	0.01	yes
Chromium	µg/L	0.00297257	-0.3	0.3	yes
Cobalt	µg/L	7.84777e-005	-0.1	0.1	yes
Copper	µg/L	0.0564373	-1	1	yes
Lead	µg/L	0.00385752	-0.1	0.1	yes
Lithium	µg/L	0.0236783	-1	1	yes
Molybdenum	µg/L	0.0547027	-1	1	yes
Nickel	µg/L	0.00975452	-0.5	0.5	yes
Selenium	µg/L	-0.00153505	-0.2	0.2	yes
Silver	µg/L	0.000295428	-0.10	0.10	yes
Strontium	µg/L	0.00889716	-1	1	yes
Thallium	µg/L	5.71834e-005	-0.05	0.05	yes
Tin	µg/L	-0.173441	-1	1	yes
Titanium	µg/L	-0.0224033	-0.5	0.5	yes
Uranium	µg/L	0.00196984	-0.5	0.5	yes
Vanadium	µg/L	-0.00109393	-0.1	0.1	yes
Zinc	µg/L	0.745371	-0	2	yes
Date Acquired:	April 27, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Silicon	mg/L	9.03	9.11	10	0.01	yes
Sulfur	mg/L	249	254	10	0.1	yes
Aluminum	µg/L	<4	<4	10	11	yes
Antimony	µg/L	<0.4	<0.4	10	0.4	yes
Arsenic	µg/L	<0.4	<0.4	10	0.4	yes
Barium	µg/L	23	23	10	2	yes
Beryllium	µg/L	<0.2	<0.2	10	0.2	yes
Bismuth	µg/L	<1	<1	10	1.1	yes

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Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Metals Dissolved - Continued

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Boron	µg/L	340	350	10	4	yes
Cadmium	µg/L	0.2	0.2	10	0.02	yes
Chromium	µg/L	<1	<1	10	1.1	yes
Cobalt	µg/L	0.6	0.6	10	0.2	yes
Copper	µg/L	<2	<2	10	2	yes
Lead	µg/L	<0.2	<0.2	10	0.2	yes
Lithium	µg/L	159	161	10	2	yes
Molybdenum	µg/L	<2	<2	10	2	yes
Nickel	µg/L	9.0	9.0	10	1.1	yes
Selenium	µg/L	0.9	1	10	0.4	yes
Silver	µg/L	<0.02	<0.02	10	0.22	yes
Strontium	µg/L	1710	1730	10	2	yes
Thallium	µg/L	<0.1	<0.1	10	0.11	yes
Tin	µg/L	<2	<2	10	2	yes
Titanium	µg/L	<1	<1	10	1.1	yes
Uranium	µg/L	30.0	31.1	10	1.1	yes
Vanadium	µg/L	<0.2	<0.2	10	0.2	yes
Zinc	µg/L	<2	<2	10	2	yes

Date Acquired: April 27, 2018

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	950	917	1067	yes
Antimony	µg/L	40.1	35.2	43.0	yes
Arsenic	µg/L	40.2	36.7	43.3	yes
Barium	µg/L	199	186	210	yes
Beryllium	µg/L	18.4	17.3	22.1	yes
Bismuth	µg/L	107	95.7	114.3	yes
Boron	µg/L	383	344	434	yes
Cadmium	µg/L	2.02	1.86	2.25	yes
Chromium	µg/L	99.6	92.2	110.2	yes
Cobalt	µg/L	20.3	18.5	21.7	yes
Copper	µg/L	202	189	214	yes
Lead	µg/L	20.5	18.4	22.0	yes
Lithium	µg/L	187	175	223	yes
Molybdenum	µg/L	206	187	226	yes
Nickel	µg/L	101	94.3	106.5	yes
Selenium	µg/L	40.3	35.8	43.0	yes
Silver	µg/L	20.1	18.40	22.00	yes
Strontium	µg/L	200	180	216	yes
Thallium	µg/L	10.3	9.30	11.10	yes
Tin	µg/L	204	180	220	yes
Titanium	µg/L	101	92.4	110.4	yes
Uranium	µg/L	101	92.7	107.5	yes
Vanadium	µg/L	19.8	18.0	22.0	yes
Zinc	µg/L	202	183	219	yes

Date Acquired: April 27, 2018

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Company:	Tervita				

Metals Dissolved - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aluminum	µg/L	50	45	55	yes
Antimony	µg/L	2.0	1.8	2.3	yes
Arsenic	µg/L	2.0	1.8	2.2	yes
Barium	µg/L	10	9	11	yes
Beryllium	µg/L	1.0	0.9	1.1	yes
Bismuth	µg/L	5.0	4.1	5.5	yes
Boron	µg/L	20	18	22	yes
Cadmium	µg/L	0.11	0.09	0.11	yes
Chromium	µg/L	4.8	4.5	5.5	yes
Cobalt	µg/L	1.0	0.9	1.1	yes
Copper	µg/L	10	9	11	yes
Lead	µg/L	1.0	0.9	1.1	yes
Lithium	µg/L	10	9	11	yes
Molybdenum	µg/L	10	9	10	yes
Nickel	µg/L	4.9	4.4	5.5	yes
Selenium	µg/L	2.0	1.7	2.2	yes
Silver	µg/L	1.00	0.84	1.08	yes
Strontium	µg/L	10	9	11	yes
Thallium	µg/L	0.49	0.45	0.55	yes
Tin	µg/L	10	9	11	yes
Titanium	µg/L	5.0	4.5	5.5	yes
Uranium	µg/L	5.2	4.5	5.5	yes
Vanadium	µg/L	1.0	0.9	1.1	yes
Zinc	µg/L	10	9	11	yes
Date Acquired:	April 27, 2018				
Silicon	mg/L	10.0	8.98	10.78	yes
Sulfur	mg/L	147	138.5	155.3	yes
Date Acquired:	April 27, 2018				
Silicon	mg/L	2.05	1.88	2.24	yes
Sulfur	mg/L	10.1	9.2	11.0	yes
Date Acquired:	April 27, 2018				
Silicon	mg/L	0.21	0.18	0.22	yes
Sulfur	mg/L	3.0	2.8	3.3	yes
Date Acquired:	April 27, 2018				

Metals Total

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Mercury	µg/L	0.0003847	-0.038000	0.070000	yes
Chromium	µg/L	0.0188351	-0.7	0.3	yes
Date Acquired:	April 26, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Mercury	mg/L	<0.000005	<0.000005	10	0.000030	yes
Chromium	µg/L	7.8	6.8	15	1.1	yes
Date Acquired:	April 26, 2018					

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Metals Total - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Chromium	µg/L	30.2	26.5	33.7	yes
Date Acquired: April 26, 2018					
Chromium	µg/L	98.0	90.0	110.0	yes
Date Acquired: April 26, 2018					
Mercury	mg/L	0.000100	0.000070	0.000130	yes
Chromium	µg/L	28.9	27.0	33.0	yes
Date Acquired: April 26, 2018					
Mercury	mg/L	0.000021	0.000006	0.000036	yes
Chromium	µg/L	4.9	4.6	5.4	yes
Date Acquired: April 26, 2018					

Mono-Aromatic Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Benzene	ng	0	-1	1	yes
Ethylbenzene	ng	0	-1	1	yes
m,p-Xylene	ng	0	-1	1	yes
o-Xylene	ng	0	-1	1	yes
Toluene	ng	0	-1.0	1.0	yes
Total Xylenes (m,p,o)	ng	0	-1	1	yes
Dibromofluoromethane	%	97.58	70.00	130.00	yes
Toluene-d8	%	99.04	70.00	130.00	yes
4-Bromofluorobenzene	%	91.64	70.00	130.00	yes
Date Acquired: April 30, 2018					

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	ng	102.00	80	120	yes
Ethylbenzene	ng	88.00	80	120	yes
Toluene	ng	100.00	80	120	yes
Total Xylenes (m,p,o)	ng	83.33	80	120	yes
Dibromofluoromethane	%	102.38	70	130	yes
Toluene-d8	%	101.54	70	130	yes
4-Bromofluorobenzene	%	94.10	70	130	yes
Date Acquired: April 30, 2018					
Benzene	ng	91.40	80	120	yes
Ethylbenzene	ng	94.80	80	120	yes
m,p-Xylene	ng	90.20	80	120	yes
o-Xylene	ng	91.60	80	120	yes
Toluene	ng	90.20	80	120	yes
Total Xylenes (m,p,o)	ng	90.67	80	120	yes
Dibromofluoromethane	%	102.30	70	130	yes
Toluene-d8	%	98.52	70	130	yes
4-Bromofluorobenzene	%	93.50	70	130	yes
Date Acquired: April 30, 2018					

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC

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Company:	Tervita				

Mono-Aromatic Hydrocarbons - Water - Continued

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Benzene	µg/L	<1	<1	25	5	yes
Ethylbenzene	µg/L	<1	<1	30	5	yes
Toluene	µg/L	<0.5	<0.5	25	5.0	yes
Total Xylenes (m,p,o)	µg/L	<1	<1	30	5	yes
Dibromofluoromethane	%	92	92	15		yes
Toluene-d8	%	110	120	15		yes
4-Bromofluorobenzene	%	88	86	15		yes
Date Acquired: April 30, 2018						

Matrix Spike	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Benzene	µg/L	87	75	125	yes
Ethylbenzene	µg/L	91	70	130	yes
m,p-Xylene	µg/L	90	70	130	yes
o-Xylene	µg/L	93	70	130	yes
Toluene	µg/L	87	75	125	yes
Total Xylenes (m,p,o)	µg/L	91	70	130	yes
Dibromofluoromethane	%	96	70	130	yes
Toluene-d8	%	105	70	130	yes
4-Bromofluorobenzene	%	104	70	130	yes
Date Acquired: April 30, 2018					

Organic Halides

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Extractable Organic Halides	mg/L	<0.2	<0.2	5	0.6	yes
Date Acquired: April 30, 2018						

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Extractable Organic Halides	mg/L	2.1	1.9	20	0.2	yes
Date Acquired: April 30, 2018						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Organic Chloride	mg/L	31.9	29.8	32.8	yes
Date Acquired: April 30, 2018					

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Solids	mg/L	362	338	10	2	yes
Date Acquired: April 29, 2018						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Solids	mg/L	198	179	205	yes
Date Acquired: April 29, 2018					
Solids	mg/L	19	13	24	yes
Date Acquired: April 29, 2018					

Polychlorinated Biphenyls - Water

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Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Polychlorinated Biphenyls - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Aroclor 1016	µg/mL	0	-0.3	0.3	yes
Aroclor 1221	µg/mL	0	-0.3	0.3	yes
Aroclor 1232	µg/mL	0	-0.3	0.3	yes
Aroclor 1242	µg/mL	0	-0.3	0.3	yes
Aroclor 1248	µg/mL	0	-0.3	0.3	yes
Aroclor 1254	µg/mL	0	-0.3	0.3	yes
Aroclor 1260	µg/mL	0	-0.3	0.3	yes
Aroclor 1262	µg/mL	0	-0.3	0.3	yes
Aroclor 1268	µg/mL	0	-0.3	0.3	yes
Date Acquired:	April 27, 2018				

Calibration Check	Units	% Recovery	Lower Limit	Upper Limit	Passed QC
Aroclor 1260	µg/mL	100.00	80	120	yes
Date Acquired:	April 27, 2018				

Polychlorinated Biphenyls - Water - Surrogate

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Decachlorobiphenyl	%	85	50	140	yes
Date Acquired:	April 27, 2018				

Routine Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
Calcium	mg/L	0.000984114	-0.2	0.2	yes
Magnesium	mg/L	-0.00400328	-0.1	0.1	yes
Sodium	mg/L	0.0246862	-0.4	0.4	yes
Potassium	mg/L	0.0139145	-0.4	0.4	yes
Iron	mg/L	-0.000879081	-0.01	0.01	yes
Manganese	mg/L	-2.90144e-005	-0.004	0.004	yes
Chloride	mg/L	0.18	-0.4	0.4	yes
Fluoride	mg/L	0	-0.05	0.05	yes
Date Acquired:	April 27, 2018				

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
pH		6.53	6.53	0	0.10	yes
Calcium	mg/L	278	282	10	0.6	yes
Magnesium	mg/L	79.2	80.0	10	0.7	yes
Sodium	mg/L	188	189	10	1.2	yes
Potassium	mg/L	4.9	5.1	10	1.2	yes
Iron	mg/L	1.7	1.7	10	0.05	yes
Manganese	mg/L	1.21	1.22	10	0.010	yes
Chloride	mg/L	108000	112000	10	0.5	yes
Date Acquired:	April 27, 2018					

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
pH		9.14	8.90	9.44	yes
Calcium	mg/L	246	230.0	260.0	yes

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Company:	Tervita				

Routine Water - Continued

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Magnesium	mg/L	96.8	92.3	102.0	yes
Sodium	mg/L	245	233.3	257.3	yes
Potassium	mg/L	245	229.0	259.0	yes
Iron	mg/L	9.62	8.91	10.20	yes
Manganese	mg/L	2.38	2.240	2.540	yes
Fluoride	mg/L	10.0	9.56	10.58	yes
Date Acquired:	April 27, 2018				
pH		6.88	6.78	6.96	yes
Calcium	mg/L	50.9	44.9	56.9	yes
Magnesium	mg/L	19.6	17.9	22.0	yes
Sodium	mg/L	50.9	47.7	55.5	yes
Potassium	mg/L	50.0	45.8	55.8	yes
Iron	mg/L	2.05	1.89	2.25	yes
Manganese	mg/L	0.505	0.468	0.552	yes
Chloride	mg/L	81.9	74.9	86.9	yes
Fluoride	mg/L	4.98	4.66	5.30	yes
Date Acquired:	April 27, 2018				
Calcium	mg/L	5.4	4.6	5.7	yes
Magnesium	mg/L	2.0	1.8	2.2	yes
Sodium	mg/L	5.3	4.7	5.7	yes
Potassium	mg/L	5.2	4.5	5.5	yes
Iron	mg/L	0.22	0.19	0.24	yes
Manganese	mg/L	0.054	0.048	0.058	yes
Chloride	mg/L	14.9	13.3	16.5	yes
Fluoride	mg/L	0.51	0.44	0.56	yes
Date Acquired:	April 27, 2018				

Volatile Petroleum Hydrocarbons - Water

Blanks	Units	Measured	Lower Limit	Upper Limit	Passed QC
VHw6-10	ng	0	-50	50	yes
Date Acquired:	April 30, 2018				

Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
VHw6-10	µg/L	<50	<50	25		yes
VPHw (VHw6-10 minus	µg/L	<50	<50	25		yes
Date Acquired:	April 30, 2018					

Exova
#1 8822-100 Street
Fort St. John, British Columbia
V1J 3W9, Canada

T: +1 (250) 785-2731
F: +1 (250) 785-7092
E: FortStJohn@exova.com
W: www.exova.com

Methodology and Notes

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Alkalinity, pH, and EC in water	APHA	*	pH - Electrometric Method, 4500-H+ B	Apr 26, 2018	Exova Edmonton
Ammonium-N in Water	APHA	*	Automated Phenate Method, 4500-NH3 G	Apr 26, 2018	Exova Edmonton
Anions (Routine) by Ion Chromatography	APHA	*	Ion Chromatography with Chemical Suppression of Eluent Cond., 4110 B	Apr 27, 2018	Exova Edmonton
BOD in water	APHA	*	5 Day, 5210 B	Apr 26, 2018	Exova Edmonton
BTEX-VPH - Water (MS) (FSJ)	BCELM	*	Volatile Hydrocarbons in Water by GC/FID, VH Water	Apr 30, 2018	Exova Fort St. John
Chloride in Water	APHA	*	Automated Ferricyanide Method, 4500-Cl- E	Apr 27, 2018	Exova Edmonton
Chromium (VI) in water	APHA	*	Colorimetric Method, 3500-Cr B	Apr 26, 2018	Exova Edmonton
Cyanide (Weak Acid Dissociable) in water	APHA	*	Weak Acid Dissociable Cyanide, 4500-CN- I	May 2, 2018	Exova Edmonton
EOX in water	EPA	*	Extractable Organic Halides (EOX) In Solids, 9023	Apr 30, 2018	Exova Edmonton
Mercury (Total) in water	US EPA	*	Determination of Hg in Sediment by Cold Vapor Atomic Absorption Spec, 245.5	Apr 27, 2018	Exova Edmonton
Metals ICP-MS (Dissolved) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Apr 27, 2018	Exova Edmonton
Metals ICP-MS (Total) in water	US EPA	*	Determination of Trace Elements in Waters and Wastes by ICP-MS, 200.8	Apr 26, 2018	Exova Edmonton
Metals Trace (Dissolved) in water	APHA	*	Inductively Coupled Plasma (ICP) Method, 3120 B	Apr 27, 2018	Exova Edmonton
Oil and Grease in water	US EPA	*	n-Hexane Extractable Material and Silica Gel Treated n-Hexane Extractable Material by Extraction and Gravimetry, 1664	Apr 26, 2018	Exova Edmonton
PCB - Water	US EPA	*	Polychlorinated Biphenyls (PCBs) by Gas Chromatography, 8082A	Apr 27, 2018	Exova Calgary
PCP - Water	US EPA	*	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry, 8270	Apr 27, 2018	Exova Calgary
Phenol in water	APHA	*	Direct Photometric Method, 5530 D	Apr 27, 2018	Exova Edmonton
Solids Suspended (Total, Fixed and Volatile)	APHA	*	Total Suspended Solids Dried at 103-105'C, 2540 D	Apr 29, 2018	Exova Edmonton
Sublet to Hydroqual	Ext. Lab		See attached test report,	May 9, 2018	Nautilus Laboratories
Sublet to Pacific Rim Labs	Ext. Lab		See attached test report,	May 29, 2018	Pacific Rim Laboratories Inc.

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater
APHA/USEPA	Standard Methods For Water/ Environmental Protection Agency
BCELM	B.C. Environmental Laboratory Manual
EPA	Environmental Protection Agency Test Methods - US
Ext. Lab	External Laboratory

Exova
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Methodology and Notes

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1266553**
	500, 140 - 10 Avenue SE	Project Name:	Pond Samples	Control Number:	
	Calgary, AB, Canada	Project Location:	Silverberry Landfill	Date Received:	Apr 25, 2018
	T2G 0R1	LSD:	A-08-088-20W6M	Date Reported:	May 29, 2018
Attn:	Accounts Payable	P.O.:	310-0000010387	Report Number:	2280495
Sampled By:	Lisa Jordan	Proj. Acct. code:			
Company:	Tervita				

US EPA	US Environmental Protection Agency Test Methods

Comments:

- Apr 30, 2018 - Sample 1266553-1; 6071931: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-2; 6071932: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-3; 6071933: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-4; 6071934: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- Apr 30, 2018 - Sample 1266553-5; 6071939: Sample formed an emulsion during oil and grease extraction. Centrifugation was required in order to complete analysis.
- May 29, 2018 - Dioxin analysis was performed by a subcontract laboratory. See attached 7 page report 181206.

Acute Toxicity Test Results

Samples collected April 24, 2018

Final Report

May 9, 2018

Submitted to: **Exova**
Fort St. John, BC

#4, 6125 12 Street SE, Calgary, AB T2H 2K1

SAMPLE INFORMATION

Sample ID/ Internal ID	Dates			Receipt temperature
	Collected	Received	Rainbow trout test initiation	
1266553-1/ 1718-1005-01	24-Apr-18	26-Apr-18 at 0920h	27-Apr-18 at 1140h	9°C
1266553-2/ 1718-1005-02	24-Apr-18	26-Apr-18 at 0920h	27-Apr-18 at 1145h	9°C
1266553-3/ 1718-1005-03	24-Apr-18	26-Apr-18 at 0920h	27-Apr-18 at 1145h	9°C

TEST TYPES

- Rainbow trout 96-h LC50 test

RESULTS

Toxicity test results

Sample ID	Rainbow trout LC50 (% v/v)
1266553-1	>100
1266553-2	>100
1266553-3	>100

LC = Lethal Concentration

QA/QC

QA/QC summary	Rainbow trout
Reference toxicant LC50 (95% CL)	4.2 (3.7-4.6) g/L KCl[1]
Reference toxicant historical mean (2 SD Range)	3.1 (2.3-4.3) g/L KCl
Reference toxicant CV	10.5%
Organism health history	Acceptable
Protocol deviations	None
Water quality range deviations	None
Control performance	Acceptable
Test performance	Valid

[1] Test date, April 5, 2018
LC = Lethal Concentration; CL = Confidence Limit

Report By:
Stephanie Schiffer, MSc
Environmental Scientist

Reviewed By:
Madison Lehti, BSc
Biologist

This report has been prepared by Nautilus Environmental Company Inc. based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party. The results presented here relate only to the samples tested.

APPENDIX A – Summary of test conditions

Table 1. Summary of test conditions: 96-h rainbow trout (*Oncorhynchus mykiss*) survival test.

Test species	*Oncorhynchus mykiss*
Organism source	LSL Fish Hatchery
Organism age	Juvenile
Test type	Static
Test duration	96 hours
Test vessel	22-L plastic pails with polyethylene liners
Test volume	20 L
Test solution depth	Minimum 15 cm
Test concentrations	Five concentrations, plus laboratory control
Test replicates	1 per treatment
Number of organisms	10 per replicate
Control/dilution water	De-chlorinated City of Calgary tap water
Test solution renewal	None
Test temperature	15 ± 1°C
Feeding	None
Light intensity	100 to 500 lux
Photoperiod	16 hours light/8 hours dark
Aeration	6.5 ±1 mL/min/L
Test Measurements	pH, conductivity, dissolved oxygen and temperature were measured at test initiation and test completion; salinity measured at test initiation; evaluated for survival daily
Test protocol	Environment Canada (2000), EPS 1/RM/13, with 2007 &2016 amendments
Statistical software	None
Test endpoints	96-hour LC50
Test acceptability criteria for controls	Survival ≥ 90%
Reference toxicant	Potassium chloride (KCl)

APPENDIX B – Toxicity test data

NAUTILUS ENVIRONMENTAL

Trout Bench Sheet

Method TRD Client NOR239 Reference 1718-1005-01 Chamber 9

Test Log

Day	Date	Time	Initial	Chem. Cart	Daily Data Review
0	2018/04/27	1140 *	AP	1	AP
1	2018/04/28	0800	AM	-	AP
2	~~2018/04/29~~	~~0900~~	JT	-	SS
3	2018/04/30	900	AD/ML	-	LE
4	2018/05/01	~~JT~~ 1050	~~JT~~ AD/ML/HEP	1	JP

* Note: * ; time when the test was loaded with fish

Sample Information

Initial pH:	7.6
Initial EC (µS/cm):	716
Initial DO (mg/L):	8.2
Initial Temp (°C):	19.1
Salinity (ppt):	0
Nets used: yes / (no)	

Sample Pre-Aeration

Aeration rate adjusted to 6.5 +/- 1 mL/min/L: (yes)/no

Preaeration time	0.5 hours	1 hour	1.5 hours	2 hours
DO(mg/L) of 100%	8.4			

DO in mg/L (70% - 100% saturation)**

6.2 mg/L - 8.9 mg/L at 14°C
6.1 mg/L - 8.8 mg/L at 15°C
6.0 mg/L - 8.6 mg/L at 16°C
**corrected for altitude

Test Chemistry and Biology

	Conc. CTL	6	12	25	50	100		
pH (units) (range: 5.5-8.5)								
Day 0	7.8	7.8	7.8	7.8	7.8	7.9		
Day 4	8.2	8.2	8.2	8.3	8.2	~~7.07~~ 7.9 JT		
EC (uS/cm)								
Day 0	565	558	520	474	372	153		
Day 4	570	548	524	479	369	146		
DO (mg/L) (70-100% saturation at test temp.)								
Day 0	8.9	8.9	8.9	8.9	8.9	8.9		
Day 4	8.5	8.5	8.6	8.6	8.5	8.5		
Temperature (°C) (range: 14-16°C)								
Day 0	14	14	14	14	14	14		
Day 4	16	16	16	16	16	16		
Number Alive (In brackets number stressed)								
Day 0	10	10	10	10	10	10		
Day 1	10	10	10	10	10	10		
Day 2	10	10	10	10	10	10		
Day 3	10	10	10	10	10	10		
Day 4	10	10	10	10	10	10		

Validity Criteria: must be ≤ 10% mortality and/or stressed behavior in the control
Unless otherwise noted, behavior is considered to be normal

Control Organism Data

Control Fish	Length (cm)	Weight (g)
1	4.0	0.9
2	3.6	0.7
3	3.7	0.8
4	3.6	0.7
5	3.5	0.6
6	3.6	0.6
7	3.7	0.7
8	3.5	0.5
9	3.6	0.6
10	3.6	0.5

Loading Density (g/L): 0.3 (must be ≤0.5 g/L)
Mean Length (cm): 3.6
Length Range (cm): 3.5-4.0
Mean Weight (g): 0.7 (Must be ≥0.3g)
Weight Range: (g): 0.5-0.9

Test Organism Information

Batch	20180313TR
Source	LSL
Tank #	3
Days Held at 15± 2°C (must be ≥14 days)	45
Percent stock mortality (7 days prior to test, must be ≤2%)	0
Test Volume (L)	20

Comments :

Reviewed By: Ca Date Reviewed: 2018/05/02

NAUTILUS ENVIRONMENTAL

Trout Bench Sheet

Method TRD Client NOR239 Reference 178-100502 Chamber 9

Test Log

Day	Date	Time	Initial	Chem. Cart	Daily Data Review
0	20180412 7	1145 *	AP	1	JP
1	20180413	0800	NL	-	AP
2	20180414	0845	ET	-	SS
3	20180415	0900	NL/ET	-	LE
4	20180416	1050	ET/AD/HL/EP	1	JD

Note: * ; time when the test was loaded with fish

Sample Information

Initial pH:	7.4
Initial EC (µS/cm):	278
Initial DO (mg/L):	8.1
Initial Temp (°C):	19.2
Salinity (ppt):	
Nets used: yes / no	

Sample Pre-Aeration

Aeration rate adjusted to 6.5 +/- 1 mL/min/L: **yes/no**

	0.5 hours	1 hour	1.5 hours	2 hours
Preaeration time				
DO(mg/L) of 100%	8.9			

DO in mg/L (70% - 100% saturation)**

6.2 mg/L - 8.9 mg/L at 14°C
6.1 mg/L - 8.8 mg/L at 15°C
6.0 mg/L - 8.6 mg/L at 16°C
**corrected for altitude

Test Chemistry and Biology

Conc.	CTL	6	12	25	50	100		
pH (units) (range: 5.5-8.5)								
Day 0	7.4	7.7	7.3	7.4	7.5	7.7		
Day 4	8.3	8.3	8.3	8.3	8.1	8.1		
EC (uS/cm)								
Day 0	563	498	516	474	339	110		
Day 4	561	535	516	470	336	94		
DO (mg/L) (70-100% saturation at test temp.)								
Day 0	8.9	8.9	8.9	8.9	8.9	8.9		
Day 4	8.6	8.5	8.4	8.5	8.3	8.5		
Temperature (°C) (range: 14-16°C)								
Day 0	14	14	14	14	14	14		
Day 4	16	16	16	16	16	16		
Number Alive (In brackets number stressed)								
Day 0	10	10	10	10	10	10		
Day 1	10	10	10	10	10	10		
Day 2	10	10	10	10	10	10		
Day 3	10	10	10	10	10	10		
Day 4	10	10	10	10	10	10		

Validity Criteria: must be ≤ 10% mortality and/or stressed behavior in the control
Unless otherwise noted, behavior is considered to be normal

Control Organism Data

Control Fish	Length (cm)	Weight (g)
1	3.4	0.6
2	3.7	0.7
3	3.1	0.3
4	3.6	0.6
5	3.6	0.6
6	3.7	0.7
7	3.2	0.3
8	3.6	0.6
9	3.6	0.7
10	3.4	0.5

Loading Density (g/L): 0.3 (must be ≤0.5 g/L)
Mean Length (cm): 3.5
Length Range (cm): 3.1 - 3.7
Mean Weight (g): 0.6 (Must be ≥0.3g)
Weight Range: (g): 0.3 - 0.7

Test Organism Information

Batch	20883BTR
Source	LSL
Tank #	1
Days Held at 15± 2°C (must be ≥14 days)	45
Percent stock mortality (7 days prior to test, must be ≤2%)	0.24
Test Volume (L)	20

Comments :

Reviewed By: Co Date Reviewed: 2018/05/02

NAUTILUS ENVIRONMENTAL

Trout Bench Sheet

Method TRD Client NOR239 Reference 171810515CB Chamber 9

Test Log

Day	Date	Time	Initial	Chem. Cart	Daily Data Review
0	2018/04/24	1143 *	AP	1	JP
1	2018/04/25	0820	AP	-	AP
2	2018/04/29	0846	SJ	-	SS
3	2018/04/30	0900	HL/AP	-	LF
4	2018/05/01	1045	ST/AD/MM/EP	1	JP

Note: * ; time when the test was loaded with fish

Sample Information

Initial pH: 7.3
Initial EC (µS/cm): 70
Initial DO (mg/L): 8.18
Initial Temp (°C): 15.5
Salinity (ppt): 0
Nets used: yes / (no)

Sample Pre-Aeration

Aeration rate adjusted to 6.5 +/- 1 mL/min/L: **yes/no**

	0.5 hours	1 hour	1.5 hours	2 hours
Preaeration time				
DO(mg/L) of 100%	8.9			

DO in mg/L (70% - 100% saturation)**
6.2 mg/L - 8.9 mg/L at 14°C
6.1 mg/L - 8.8 mg/L at 15°C
6.0 mg/L - 8.6 mg/L at 16°C
**corrected for altitude

Test Chemistry and Biology

Conc.	CTL	6	12	25	50	100		
pH (units) (range: **5.5-8.5**)								
Day 0	7.4	7.2	7.3	7.3	7.4	7.3		
Day 4	8.3	8.3	8.3	8.2	8.2	8.3		
EC (uS/cm)								
Day 0	571	549	519	457	351	90		
Day 4	570	546	480	460	347	82		
DO (mg/L) (**70-100% saturation at test temp.**)								
Day 0	8.8	8.9	8.9	8.9	8.9	8.9		
Day 4	8.6	8.5	8.5	8.4	8.3	8.4		
Temperature (°C) (range: **14-16°C**)								
Day 0	14	14	14	14	14	14		
Day 4	16	16	16	16	16	16		
Number Alive (In brackets number stressed)								
Day 0	10	10	10	10	10	10		
Day 1	10	10	10	10	10	10		
Day 2	10	10	10	10	10	10		
Day 3	10	10	10	10	10	10		
Day 4	10	10	10	10	10	10		

Validity Criteria: must be ≤ 10% mortality and/or stressed behavior in the control
Unless otherwise noted, behavior is considered to be normal

Control Organism Data

Control Fish	Length (cm)	Weight (g)
1 ST*	3.6	0.6
2	3.5	0.4
3	3.8	0.7
4	3.6	0.6
5	3.3	0.3
6	3.3	0.3
7	3.4	0.4
8	3.7	0.6
9	3.5	0.6
10	3.5	0.5

Loading Density (g/L): 0.3 (must be ≤0.5 g/L)
Mean Length (cm): 3.5
Length Range (cm): 3.2 - 3.8
Mean Weight (g): 0.5 (Must be ≥0.3g)
Weight Range: (g): 0.3 - 0.7

Test Organism Information

Batch 20180313TP
Source LSL
Tank # 1
Days Held at 15± 2°C 45 (must be ≥14 days)
Percent stock mortality 0.24 (7 days prior to test, must be ≤2%)
Test Volume (L) 20

Comments :

Reviewed By: CA Date Reviewed: 2018/05/02

END OF REPORT

SAMPLE RECEIPT FORM / CHEMICAL ANALYSIS FORM

FILE #: PR181206

CLIENT: Exova
#1 8822 – 100 Street
Fort St. John, BC
V1J 3W9

Phone: (250) 785-2731
Fax: (250) 785-7092
Email: FortStJohn@exova.com

RECEIVED BY: C. Hsieh
CONDITION: Okay, 14.2°C

DATE/TIME: April 30, 2018 (8:55 a.m.)

# of Containers	Sample Type	Sample (Client Codes)	Lab Codes	Test Requested
		PO#: POC110302		
1	Water	1266553-1 Sample Depth: Surface Temp: 4.9 C Sample Description: Storm Pond	PR181206	PCDD/F
1	Water	1266553-2 Sample Depth: Surface Temp: 4.9 C Sample Description: Bio Cell 1	PR181207	PCDD/F
1	Water	1266553-3 Sample Depth: Surface Temp: 4.9 C Sample Description: Bio Cell 3	PR181208	PCDD/F

STORAGE: Stored at 4°C.

ANALYTES: HRGC/HRMS analysis for polychlorinated dibenzo(p)dioxins and dibenzofurans (PCDD/F).

SPECIAL INSTRUCTIONS: None.

METHODOLOGY

Reference Method: PCDD/F: SOP LAB01; EPA Method 1613B

Data summarized in Data Report Attached

Report sent to: Client Services Date: May 29, 2018

Comments: Results relate only to items tested.

Digitally signed by David Hope
DN: c=CA, st=BC, l=Surrey, o=Pacific Rim Laboratories Inc., cn=David Hope, email=dave@pacificrimlabs.com
Date: 2018.05.29 09:49:36 -07'00'

David Hope PChem, CEO

DATA REPORT

Client:	Exova - Fort St. John	**Contact:**	Client Services
Client ID:	1266553-1	**Date Extracted:**	11-May-18
PRL ID:	PR181206	**Date Analysed:**	27-May-18

DIOXINS			Surrogate	I-TEQs		WHO-TEQs (2005)	
	Conc.	DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDD	ND	1	54	ND	1	ND	1
Total TCDD	ND	1					
1,2,3,7,8-PeCDD	ND	2	102	ND	1	ND	2
Total PeCDD	ND	2					
1,2,3,4,7,8-HxCDD	ND	2	70	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDD	ND	2	80	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDD	ND	2	-	ND	0.2	ND	0.2
Total HxCDD	ND	2					
1,2,3,4,6,7,8-HpCDD	ND	3	82	ND	0.03	ND	0.03
Total HpCDD	ND	3					
OCDD	ND	4	74	ND	0.004	ND	0.0012
		Total Dioxin TEQ		**0.00**	**2.63**	**0.00**	**3.63**

FURANS			Surrogate	I-TEQs		WHO-TEQs (2005)	
		DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDF	ND	1	42	ND	0.1	ND	0.1
Total TCDF	ND	1					
1,2,3,7,8-PeCDF	ND	2	64	ND	0.1	ND	0.06
2,3,4,7,8-PeCDF	ND	2	74	ND	1	ND	0.6
Total PeCDF	ND	2					
1,2,3,4,7,8-HxCDF	ND	2	74	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDF	ND	2	74	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDF	ND	2	70	ND	0.2	ND	0.2
2,3,4,6,7,8-HxCDF	ND	2	70	ND	0.2	ND	0.2
Total HxCDF	ND	2					
1,2,3,4,6,7,8-HpCDF	ND	3	68	ND	0.03	ND	0.03
1,2,3,4,7,8,9-HpCDF	ND	3	74	ND	0.03	ND	0.03
Total HpCDF	ND	3					
OCDF	ND	4	-	ND	0.004	ND	0.0012
		Total Furan TEQ		**0.00**	**2.06**	**0.00**	**1.62**

Total PCDD/PCDF Toxic Equivalent	**0.00**	**4.70**	**0.00**	**5.25**

ND - none detected

Form Name: DOC18 Data Report DxW 01-Feb-07 DGH

DATA REPORT

Client:	Exova - Fort St. John	**Contact:**	Client Services
Client ID:	1266553-2	**Date Extracted:**	11-May-18
PRL ID:	PR181207	**Date Analysed:**	27-May-18

DIOXINS			Surrogate	I-TEQs		WHO-TEQs (2005)	
	Conc.	DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDD	ND	1	52	ND	1	ND	1
Total TCDD	ND	1					
1,2,3,7,8-PeCDD	ND	2	110	ND	1	ND	2
Total PeCDD	ND	2					
1,2,3,4,7,8-HxCDD	ND	2	72	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDD	ND	2	76	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDD	ND	2	-	ND	0.2	ND	0.2
Total HxCDD	ND	2					
1,2,3,4,6,7,8-HpCDD	ND	3	82	ND	0.03	ND	0.03
Total HpCDD	ND	3					
OCDD	ND	4	76	ND	0.004	ND	0.0012
		Total Dioxin TEQ		**0.00**	**2.63**	**0.00**	**3.63**

FURANS			Surrogate	I-TEQs		WHO-TEQs (2005)	
		DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDF	ND	1	38	ND	0.1	ND	0.1
Total TCDF	ND	1					
1,2,3,7,8-PeCDF	ND	2	66	ND	0.1	ND	0.06
2,3,4,7,8-PeCDF	ND	2	76	ND	1	ND	0.6
Total PeCDF	ND	2					
1,2,3,4,7,8-HxCDF	ND	2	70	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDF	ND	2	76	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDF	ND	2	72	ND	0.2	ND	0.2
2,3,4,6,7,8-HxCDF	ND	2	76	ND	0.2	ND	0.2
Total HxCDF	ND	2					
1,2,3,4,6,7,8-HpCDF	ND	3	70	ND	0.03	ND	0.03
1,2,3,4,7,8,9-HpCDF	ND	3	72	ND	0.03	ND	0.03
Total HpCDF	ND	3					
OCDF	ND	4	-	ND	0.004	ND	0.0012
		Total Furan TEQ		**0.00**	**2.06**	**0.00**	**1.62**

Total PCDD/PCDF Toxic Equivalent	**0.00**	**4.70**	**0.00**	**5.25**

ND - none detected

Form Name: DOC18 Data Report DxW 01-Feb-07 DGH

DATA REPORT

Client:	Exova - Fort St. John	**Contact:**	Client Services
Client ID:	1266553-3	**Date Extracted:**	11-May-18
PRL ID:	PR181208	**Date Analysed:**	27-May-18

DIOXINS			Surrogate	I-TEQs		WHO-TEQs (2005)	
	Conc.	DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDD	ND	1	60	ND	1	ND	1
Total TCDD	ND	1					
1,2,3,7,8-PeCDD	ND	2	90	ND	1	ND	2
Total PeCDD	ND	2					
1,2,3,4,7,8-HxCDD	ND	2	66	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDD	ND	2	72	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDD	ND	2	-	ND	0.2	ND	0.2
Total HxCDD	ND	2					
1,2,3,4,6,7,8-HpCDD	ND	3	74	ND	0.03	ND	0.03
Total HpCDD	ND	3					
OCDD	ND	4	68	ND	0.004	ND	0.0012
		Total Dioxin TEQ		**0.00**	**2.63**	**0.00**	**3.63**

FURANS			Surrogate	I-TEQs		WHO-TEQs (2005)	
		DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDF	ND	1	46	ND	0.1	ND	0.1
Total TCDF	ND	1					
1,2,3,7,8-PeCDF	ND	2	66	ND	0.1	ND	0.06
2,3,4,7,8-PeCDF	ND	2	76	ND	1	ND	0.6
Total PeCDF	ND	2					
1,2,3,4,7,8-HxCDF	ND	2	66	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDF	ND	2	74	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDF	ND	2	70	ND	0.2	ND	0.2
2,3,4,6,7,8-HxCDF	ND	2	74	ND	0.2	ND	0.2
Total HxCDF	ND	2					
1,2,3,4,6,7,8-HpCDF	ND	3	70	ND	0.03	ND	0.03
1,2,3,4,7,8,9-HpCDF	ND	3	74	ND	0.03	ND	0.03
Total HpCDF	ND	3					
OCDF	ND	4	-	ND	0.004	ND	0.0012
		Total Furan TEQ		**0.00**	**2.06**	**0.00**	**1.62**

Total PCDD/PCDF Toxic Equivalent	**0.00**	**4.70**	**0.00**	**5.25**

ND - none detected

Form Name: DOC18 Data Report DxW 01-Feb-07 DGH

QC REPORT - BLANK

Client:	Exova - Fort St. John	**Contact:**	Client Services
Client ID:	BLANK	**Date Extracted:**	11-May-18
PRL ID:	DF180369B	**Date Analysed:**	27-May-18

DIOXINS			Surrogate	I-TEQs		WHO-TEQs (2005)	
	Conc.	DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDD	ND	1	66	ND	1	ND	1
Total TCDD	ND	1					
1,2,3,7,8-PeCDD	ND	2	134	ND	1	ND	2
Total PeCDD	ND	2					
1,2,3,4,7,8-HxCDD	ND	2	86	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDD	ND	2	94	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDD	ND	2	-	ND	0.2	ND	0.2
Total HxCDD	ND	2					
1,2,3,4,6,7,8-HpCDD	ND	3	98	ND	0.03	ND	0.03
Total HpCDD	ND	3					
OCDD	ND	4	98	ND	0.004	ND	0.0012
		Total Dioxin TEQ		**0.00**	**2.63**	**0.00**	**3.63**

FURANS			Surrogate	I-TEQs		WHO-TEQs (2005)	
		DL	Recoveries	(ND=0)	(ND=DL)	(ND=0)	(ND=DL)
Congeners	pg/L	pg/L	%	pg/L	pg/L	pg/L	pg/L
2,3,7,8-TCDF	ND	1	52	ND	0.1	ND	0.1
Total TCDF	ND	1					
1,2,3,7,8-PeCDF	ND	2	90	ND	0.1	ND	0.06
2,3,4,7,8-PeCDF	ND	2	90	ND	1	ND	0.6
Total PeCDF	ND	2					
1,2,3,4,7,8-HxCDF	ND	2	82	ND	0.2	ND	0.2
1,2,3,6,7,8-HxCDF	ND	2	88	ND	0.2	ND	0.2
1,2,3,7,8,9-HxCDF	ND	2	86	ND	0.2	ND	0.2
2,3,4,6,7,8-HxCDF	ND	2	82	ND	0.2	ND	0.2
Total HxCDF	ND	2					
1,2,3,4,6,7,8-HpCDF	ND	3	94	ND	0.03	ND	0.03
1,2,3,4,7,8,9-HpCDF	ND	3	94	ND	0.03	ND	0.03
Total HpCDF	ND	3					
OCDF	ND	4	-	ND	0.004	ND	0.0012
		Total Furan TEQ		**0.00**	**2.06**	**0.00**	**1.62**

Total PCDD/PCDF Toxic Equivalent	**0.00**	**4.70**	**0.00**	**5.25**

ND - none detected

Form Name: DOC18 Data Report DxW 01-Feb-07 DGH

Acronyms used in reporting dioxins and furans:

TCDD = Tetrachlorodibenzo-*p*-dioxin
PeCDD = Pentachlorodibenzo-*p*-dioxin
HxCDD = Hexachlorodibenzo-*p*-dioxin
HpCDD = Heptachlorodibenzo-*p*-dioxin
OCDD = Octachlorodibenzo-*p*-dioxin

TCDF = Tetrachlorodibenzofuran
PeCDF = Pentachlorodibenzofuran
HxCDF = Hexachlorodibenzofuran
HpCDF = Heptachlorodibenzofuran
OCDF = Octachlorodibenzofuran

Acceptable recoveries for surrogates	**EPA 1613**	
	Min (%)	**Max (%)**
$^{13}C_{12}$ -2,3,7,8-TCDD	25	164
$^{13}C_{12}$ -1,2,3,7,8-PeCDD	25	181
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDD	32	141
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDD	28	130
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDD	23	140
$^{13}C_{12}$ -OCDD	17	157
$^{13}C_{12}$ -2,3,7,8-TCDF	24	169
$^{13}C_{12}$ -1,2,3,7,8-PeCDF	24	185
$^{13}C_{12}$ -2,3,4,7,8-PeCDF	21	178
$^{13}C_{12}$ -1,2,3,4,7,8-HxCDF	26	152
$^{13}C_{12}$ -1,2,3,6,7,8-HxCDF	26	123
$^{13}C_{12}$ -1,2,3,7,8,9-HxCDF	29	147
$^{13}C_{12}$ -2,3,4,6,7,8-HxCDF	28	136
$^{13}C_{12}$ -1,2,3,4,6,7,8-HpCDF	28	143
$^{13}C_{12}$ -1,2,3,4,7,8,9-HpCDF	26	138

Exova
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Canada, V1J 3W9

T: (250) 785-2731
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E: FortStJohn@exova.com
W: www.exova.com

Exova

External Sublet Request

Lot: 1266553
Number of Samples: 3
Printed Date: Apr 25, 2018

Sublet Requested to:

Attn: Patrick Pond
Pacific Rim Laboratories Inc.
103
19575 - 55A Avenue
Surrey, BC V3S 8P8
Tel: (604) 532-8711
Fax: (604) 532-8712

Exova Contact: Questions can be directed to Exova Fort St. John Client Services at (250) 785-2731.

Email Results to: FortStJohn@exova.com

Mail Invoice to: 2395 Speakman Dr.,
Mississauga, ON L5K 1B3, Canada
E: accpayable.americas@exova.com

Due Date: ~~May 10, 2018~~

PO#: POC110302

The PO # Must be Recorded on all invoices.

Sample Id	Sample Date	Sample Descriptors	Service	Service Name
1266553 - 1 PR181206	Apr 24, 2018	Sample depth: Surface Temp: Received: 4.9 C Sample Description: Strorm Pond	DFW	Dioxins and furans in water
1266553 - 2 PR18067	Apr 24, 2018	Sample depth: Surface Temp: Received: 4.9 C Sample Description: Bio Cell 1	DFW	Dioxins and furans in water
1266553 - 3 PR181208	Apr 24, 2018	Sample depth: Surface Temp: Received: 4.9 C Sample Description: Bio Cell 3	DFW	Dioxins and furans in water

8:55. 30 Apr 18. CH
14.2°C

****If rush surcharge is required to meet due date, contact Exova prior to processing.**
****Samples received are regular priority unless otherwise indicated on paperwork.**

Special Instructions: _____

_____

Relinquished by: _____ ***Received by:*** _____

Company: _____ ***Company:*** _____

Date: _____ ***Date:*** _____

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Environmental Sample Information Sheet

Note: Proper completion of this form is required in order to proceed with analysis

Please indicate any potentially hazardous samples

Page of Control #

Lot: 1266553 COC

Project Information

Project ID	
Project Name	Pond samples
Project Location	Silverberry Landfill
Legal Location	A-08-088-20W6M
PO/AFE#	310-0000013257
Proj. Acct.Code	n/a

Billing Information:

Company	Tervita Corporation
Address	500,140-10th Ave, SE
	Calgary, AB T2P 0R1
Attention	Lisa Jordan
Phone	250-827-6834
Cell	250-261-4429
Fax	
E-mail	lijordan@tervita.com
Agreement ID	
Copy of Report	

Copy of Report To:

Company	
Address	
Attention	lisa Jordan
Phone	250-827-6834
Cell	
Fax	
E-mail	lijordan@tervita.com
	tmoguire@tervita.com
Copy of Invoice	lijordan@tervita.com

RUSH Priority

Upon filling out this section, client accepts that surcharges will be applied to the analysis

Date Required | As Indicated | All Analysis

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples

Signature

Sample Custody (please print)

Sampled by: Lisa Jordan

Company: Tervita

I authorize Exova to proceed with the work indicated on this form:

Date: Initial:

Report Results								
	X	E-Mail		Online	X	PDF	X	QA/QC Report
		Mail		Fax		Excel		

Special Instructions/Comments (please include contact information including ph. # if different from above).

Indicate Regulatory Requirements below

Sample Identification	Location	Depth in cm m	Date/Time sampled	Matrix	Sampling method	Number of Containers	See attached.	Enter tests above (√ relevant samples below)
1 Storm Pond	A-08-088-20	Surface	4/24/2018 1pm	Liquid	Poor		X	X
2 Bio Cell 1	A-08-088-20	Surface	4/24/2018 1pm	Liquid	Poor		X	X
3 Bio Cell 3	A-08-088-20	Surface	4/24/2018 1pm	Liquid	Poor		X	X
4 Bio Cell 4	A-08-088-20	Surface	4/24/2018 1pm	Liquid	Poor		X	X
5 Bio Cell 5	A-08-088-20	Surface	4/24/2018 1pm	Liquid	Poor		X	X
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								

This section for Lab use only

Date/Time stamp: April 25 7am

Indicate below any deficiencies in the condition of samples:

- Were Exova supplies used?
- Was there any damage to the shipping container?
- Were the containers packaged well?
- Were the expected number of samples received (document below)?
- Are samples within recommended holding times/temp?

Shipping: COD Y/N

Cooler temp: 4.9

and size of coolers received:

Delivery Method: cooler box

Waybill:

Received by: KS

Exova
#1 8822-100 Street
Fort St. John, British Columbia
V1J 3W9, Canada

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F: +1 (250) 785-7092
E: FortStJohn@exova.com
W: www.exova.com

Report Transmission Cover Page

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1270072**
	10215 100 ST	Project Name:	Pond Samples	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry Landfill	Date Received:	May 10, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 15, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2285813
Sampled By:	Kevin Moore	Proj. Acct. code:			
Company:	Tervita				

Contact	Company	Address
Accounts Payable	**Tervita Corporation**	500, 140 - 10 Avenue SE Calgary, AB T2G 0R1 Phone: (403) 234-6412 Fax: (403) 261-5612 Email: accountspayable@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Invoice

Contact	Company	Address
Jackie LaFleur	**Tervita Corporation**	10215 100 ST Fort St. John, BC V1J 3Y8 Phone: (250) 827-6852 Fax: (250) 827-6836 Email: jlafleur@tervita.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Lisa Jordan	**Tervita Corporation**	10215 100 ST Fort St. John, BC V1J 3Y8 Phone: (250) 827-6834 Fax: Email: lijordan@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COC / COA
Email - Single Report	PDF	Invoice

Notes To Clients:

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Exova

Analytical Report

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1270072**
	10215 100 ST	Project Name:	Pond Samples	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry Landfill	Date Received:	May 10, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 15, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2285813
Sampled By:	Kevin Moore	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1270072-1	1270072-2
Sample Date	May 10, 2018	May 10, 2018
Sample Time	15:17	15:17
Sample Location		
Sample Description	Storm Pond / Surface / 20 C / A-08-088-20	Bio Cell 5 / Surface / 20 C / A-08-088-20
Matrix	Water	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties						
Solids	Total Suspended	mg/L	28	6		2

Approved by:

Kaitlyn Anderson, B. Sc., P. Chem
Consulting Scientist

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

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Quality Control

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1270072**
	10215 100 ST	Project Name:	Pond Samples	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry Landfill	Date Received:	May 10, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 15, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2285813
Sampled By:	Kevin Moore	Proj. Acct. code:			
Company:	Tervita				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Solids	mg/L	28	28	10	2	yes
Date Acquired: May 14, 2018						

Control Sample	Units	Measured	Lower Limit	Upper Limit	Passed QC
Solids	mg/L	186	179	205	yes
Date Acquired: May 14, 2018					
Solids	mg/L	13	13	24	yes
Date Acquired: May 14, 2018					

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W: www.exova.com

Methodology and Notes

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1270072**
	10215 100 ST	Project Name:	Pond Samples	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry Landfill	Date Received:	May 10, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 15, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2285813
Sampled By:	Kevin Moore	Proj. Acct. code:			
Company:	Tervita				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Solids Suspended (Total, Fixed and Volatile)	APHA	*	Total Suspended Solids Dried at 103-105'C, 2540 D	May 14, 2018	Exova Edmonton

** Reference Method Modified*

References

APHA Standard Methods for the Examination of Water and Wastewater

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www.exova.com

Project Information

Project ID	
Project Name	Pond Samples
Project Location	Silverberry Landfill
Legal Location	A-08-088-20W6M
PO/AFE#	310-0000013257
Proj. Acct.Code	n/a

Billing Information:

Company	Tervita Corporation
Address	500,140-10th Ave, SE
	Calgary, AB T2P 0R1
Attention	Lisa Jordan
Phone	250-827-6834
Cell	250-261-4429
Fax	
E-mail	lijordan@tervita.com
Agreement ID	
Copy of Report	

Copy of Report To:

Company	
Address	
Attention	lisa Jordan
Phone	250-827-6834
Cell	
Fax	
E-mail	lijordan@tervita.com
	tmcguire@tervita.com
Copy of invoice	lijordan@tervita.com

RUSH Priority

Upon filling out this section, client accepts that surcharges will be applied to the analysis

Date Required		ASAP	
As Indicated		All Analysis	

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples

Signature

Sample Custody (please print)

Sampled by: Kevin Moore

Company Tervita

I authorize Exova to proceed with the work indicated on this form:

Date: 5/10/18 Initial: JL

Report Results								
	X	E-Mail		Online	X	PDF	X	QA/QC Report
		Mail		Fax		Excel		

Special Instructions/Comments (please include contact information including ph. # if different from above).

Indicate Regulatory Requirements below

	Sample Identification	Location	Depth in cm m	Date/Time sampled	Matrix	Sampling method	Number of Containers	Total Suspended Solids	Enter tests above (√ relevant samples below)
1	Storm Pond	A-08-088-20	Surface	5/10/2018 15:17	Liquid	Pour	1	X	
2	Bio cell 5	A-08-088-20	Surface	5/10/2018 15:17	Liquid	Pour	1	X	
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

This section for Lab use only

Date/Time stamp:

MAY 10 4:43PM

Indicate below any deficiencies in the condition of samples:

	Were Exova supplies used?
	Was there any damage to the shipping container?
	Were the containers packaged well?
	Were the expected number of samples received (document below)?
	Are samples within recommended holding times/temp?

Environmental Sample Information Sheet

Note: Proper completion of this form is required in order to proceed with analysis

Please indicate any potentially hazardous samples

Lot: 1270072 COC

Shipping: COD Y/N

Cooler temp: 20

and size of coolers received:

Delivery Method: Hand

Waybill:

Received by: HM

Page of Control #

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Report Transmission Cover Page

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1272046**
	10215 100 ST	Project Name:	Storm Pond	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry landfill	Date Received:	May 18, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 23, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2288516
Sampled By:	Ted McGuire	Proj. Acct. code:			
Company:	Tervita				

Contact	Company	Address
Accounts Payable	**Tervita Corporation**	500, 140 - 10 Avenue SE Calgary, AB T2G 0R1 Phone: (403) 234-6412 Fax: (403) 261-5612 Email: accountspayable@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Invoice

Contact	Company	Address
Jackie LaFleur	**Tervita Corporation**	10215 100 ST Fort St. John, BC V1J 3Y8 Phone: (250) 827-6852 Fax: (250) 827-6836 Email: jlafleur@tervita.com

Delivery	Format	Deliverables
Email - Single Report	PDF	Invoice

Contact	Company	Address
Lisa Jordan	**Tervita Corporation**	10215 100 ST Fort St. John, BC V1J 3Y8 Phone: (250) 827-6834 Fax: Email: lijordan@tervita.com

Delivery	Format	Deliverables
Email - Merge Reports	PDF	COC / Test Report
Email - Single Report	PDF	COC / COA
Email - Single Report	PDF	Invoice

Notes To Clients:

Exova
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V1J 3W9, Canada

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E: FortStJohn@exova.com
W: www.exova.com

Exova

Analytical Report

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1272046**
	10215 100 ST	Project Name:	Storm Pond	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry landfill	Date Received:	May 18, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 23, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2288516
Sampled By:	Ted McGuire	Proj. Acct. code:			
Company:	Tervita				

Reference Number	1272046-1
Sample Date	May 18, 2018
Sample Time	13:30
Sample Location	
Sample Description	SBLF Storm Pond / Surface / 22 C / A-08-088-20
Matrix	Water

Analyte		Units	Results	Results	Results	Nominal Detection Limit
Physical and Aggregate Properties						
Solids	Total Suspended	mg/L	5			2

Approved by:

Mathieu Simoneau
Operations Manager

Data have been validated by Analytical Quality Control and Exova's Integrated Data Validation System (IDVS).
Generation and distribution of the report, and approval by the digitized signature above, are performed through a secure and controlled automatic process.

Exova
#1 8822-100 Street
Fort St. John, British Columbia
V1J 3W9, Canada

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E: FortStJohn@exova.com
W: www.exova.com

Quality Control

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1272046**
	10215 100 ST	Project Name:	Storm Pond	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry landfill	Date Received:	May 18, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 23, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2288516
Sampled By:	Ted McGuire	Proj. Acct. code:			
Company:	Tervita				

Physical and Aggregate Properties

Client Sample Replicates	Units	Replicate 1	Replicate 2	% RSD Criteria	Absolute Criteria	Passed QC
Solids	mg/L	<3	3	10	2	yes
Date Acquired: May 23, 2018						
Control Sample	**Units**	**Measured**	**Lower Limit**	**Upper Limit**		**Passed QC**
Solids	mg/L	204	179	205		yes
Date Acquired: May 23, 2018						
Solids	mg/L	17	13	24		yes
Date Acquired: May 23, 2018						

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Methodology and Notes

Bill To:	Tervita Corporation	Project ID:		Lot ID:	**1272046**
	10215 100 ST	Project Name:	Storm Pond	Control Number:	
	Fort St. John, BC, Canada	Project Location:	Silverberry landfill	Date Received:	May 18, 2018
	V1J 3Y8	LSD:	A-08-088-20W6M	Date Reported:	May 23, 2018
Attn:	Lisa Jordan	P.O.:	310-0000013257	Report Number:	2288516
Sampled By:	Ted McGuire	Proj. Acct. code:			
Company:	Tervita				

Method of Analysis

Method Name	Reference		Method	Date Analysis Started	Location
Solids Suspended (Total, Fixed and Volatile)	APHA	*	Total Suspended Solids Dried at 103-105'C, 2540 D	May 23, 2018	Exova Edmonton

** Reference Method Modified*

References

APHA	Standard Methods for the Examination of Water and Wastewater

Please direct any inquiries regarding this report to our Client Services Group or to the Operations Manager at the coordinates indicated at the top left of this page.
Results relate only to samples as submitted.

Exova Testing Advising Assuring

www.exova.com

Project Information

Project ID	
Project Name	storm pond
Project Location	Silverberry Landfill
Legal Location	A-08-088-20W6M
PO/AFE#	310-0000013257
Proj. Acct.Code	n/a

Billing Information:

Company	Tervita Corporation
Address	500,140-10th Ave, SE
	Calgary, AB T2P 0R1
Attention	Lisa Jordan
Phone	250-827-6834
Cell	250-261-4429
Fax	
E-mail	lijordan@tervita.com
Agreement ID	
Copy of Report	

Copy of Report To:

Company	
Address	
Attention	lisa Jordan
Phone	250-827-6834
Cell	
Fax	
E-mail	lijordan@tervita.com
tmcguire@tervita.com	
Copy of invoice	lijordan@tervita.com

RUSH Priority

Upon filling out this section, client accepts that surcharges will be applied to the analysis

Date Required		
As Indicated		All Analysis

When "ASAP" is requested, turn around will default to a 100% RUSH priority, with pricing and turn around time to match. Please contact the lab prior to submitting RUSH samples

Signature

Sample Custody (please print)

Sampled by: Ted McGuire

Company Tervita

I authorize Exova to proceed with the work indicated on this form:

Date: Initial:

Report Results								
	X	E-Mail		Online	X	PDF	X	QA/QC Report
		Mail		Fax		Excel		

Special Instructions/Comments (please include contact information including ph. # if different from above).

Indicate Regulatory Requirements below

Sample Identification		Location	Depth in cm m	Date/Time sampled	Matrix	Sampling method	Number of Containers	total suspended solids	Enter tests above (√ relevant samples below)
1	SBLF Storm Pond	A-08-088-20	Surface	05/18/18 1:30pm	Water	pour	1	R	
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									

This section for Lab use only

Date/Time stamp:

MAY 18 3:13PM

Indicate below any deficiencies in the condition of samples:

	Were Exova supplies used?
	Was there any damage to the shipping container?
	Were the containers packaged well?
	Were the expected number of samples received (document below)?
	Are samples within recommended holding times/temp?

Environmental Sample Information Sheet

Note: Proper completion of this form is required in order to proceed with analysis

Please indicate any potentially hazardous samples

Lot: 1272046 COC

Control #

Page of

Shipping: COD Y/N

Cooler temp: 22

and size of coolers received:

Delivery Method: Hand

Waybill:

Received by: HM

[redacted]

Tervita Corporation
ATTN: Lisa Jordan
10215 - 100th Street
Fort St. John BC V1J 3T8

Date Received: 17-JUL-18
Report Date: 25-JUL-18 17:33 (MT)
Version: FINAL

Client Phone: 250-261-4429

Certificate of Analysis

Lab Work Order #: L2130359

Project P.O. #:	PO00001148
Job Reference:	STORM POND
C of C Numbers:	15-
Legal Site Desc:	Silverberry LF 24009 A-08-088-20 W6M

[redacted]

[redacted]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2130359-1				
	Description	Water				
	Sampled Date	16-JUL-18				
	Sampled Time	15:30				
	Client ID	STORM POND				
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	225				
	pH (pH)	2.06				
	Total Suspended Solids (mg/L)	10.9				
Anions and Nutrients	Chloride (Cl) (mg/L)	469				
	Sulfate (SO4) (mg/L)	77.6				
Total Metals	Mercury (Hg)-Total (mg/L)	0.0000063				
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0153				
	Antimony (Sb)-Dissolved (mg/L)	0.00025				
	Arsenic (As)-Dissolved (mg/L)	0.00113				
	Barium (Ba)-Dissolved (mg/L)	0.113				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.045				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000232				
	Calcium (Ca)-Dissolved (mg/L)	63.0				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	0.00014				
	Cobalt (Co)-Dissolved (mg/L)	0.00035				
	Copper (Cu)-Dissolved (mg/L)	0.00277				
	Iron (Fe)-Dissolved (mg/L)	0.127				
	Lead (Pb)-Dissolved (mg/L)	0.000126				
	Lithium (Li)-Dissolved (mg/L)	0.0061				
	Magnesium (Mg)-Dissolved (mg/L)	16.5				
	Manganese (Mn)-Dissolved (mg/L)	0.0165				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00107				
	Nickel (Ni)-Dissolved (mg/L)	0.00349				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	6.06				
	Rubidium (Rb)-Dissolved (mg/L)	0.00050				
	Selenium (Se)-Dissolved (mg/L)	0.000449				
	Silicon (Si)-Dissolved (mg/L)	1.62				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	13.0				
	Strontium (Sr)-Dissolved (mg/L)	0.296				
	Sulfur (S)-Dissolved (mg/L)	27.5				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2130359-1				
	Description	Water				
	Sampled Date	16-JUL-18				
	Sampled Time	15:30				
	Client ID	STORM POND				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	0.00515				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000575				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0011				
	Zirconium (Zr)-Dissolved (mg/L)	0.000496				
Aggregate Organics	Oil and Grease (mg/L)	<5.0				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	84.6				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	99.3				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2130359-1
Matrix Spike	Boron (B)-Dissolved	MS-B	L2130359-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2130359-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2130359-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2130359-1
Matrix Spike	Molybdenum (Mo)-Dissolved	MS-B	L2130359-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2130359-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2130359-1
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2130359-1
Matrix Spike	Sulfate (SO4)	MS-B	L2130359-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

OGG-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2010), EPA1664A

The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Reference Information

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

15-

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2130359 Report Date: 25-JUL-18

Client: Tervita Corporation
10215 - 100th Street
Fort St. John BC V1J 3T8
Contact: Lisa Jordan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-VA	**Water**							
Batch R4135891								
WG2827569-2 LCS								
Chloride (Cl)			99.4		%		90-110	19-JUL-18
WG2827569-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-JUL-18
HG-T-CVAA-VA	**Water**							
Batch R4134888								
WG2828473-2 LCS								
Mercury (Hg)-Total			99.8		%		80-120	20-JUL-18
WG2828473-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	20-JUL-18
MET-D-CCMS-VA	**Water**							
Batch R4138670								
WG2827532-2 LCS								
Aluminum (Al)-Dissolved			96.7		%		80-120	20-JUL-18
Antimony (Sb)-Dissolved			96.2		%		80-120	20-JUL-18
Arsenic (As)-Dissolved			94.2		%		80-120	20-JUL-18
Barium (Ba)-Dissolved			94.9		%		80-120	20-JUL-18
Beryllium (Be)-Dissolved			96.8		%		80-120	20-JUL-18
Bismuth (Bi)-Dissolved			95.2		%		80-120	20-JUL-18
Boron (B)-Dissolved			91.9		%		80-120	20-JUL-18
Cadmium (Cd)-Dissolved			96.2		%		80-120	20-JUL-18
Calcium (Ca)-Dissolved			96.3		%		80-120	20-JUL-18
Cesium (Cs)-Dissolved			98.9		%		80-120	20-JUL-18
Chromium (Cr)-Dissolved			93.1		%		80-120	20-JUL-18
Cobalt (Co)-Dissolved			95.4		%		80-120	20-JUL-18
Copper (Cu)-Dissolved			93.2		%		80-120	20-JUL-18
Iron (Fe)-Dissolved			93.3		%		80-120	20-JUL-18
Lead (Pb)-Dissolved			97.4		%		80-120	20-JUL-18
Lithium (Li)-Dissolved			98.3		%		80-120	20-JUL-18
Magnesium (Mg)-Dissolved			95.0		%		80-120	20-JUL-18
Manganese (Mn)-Dissolved			93.8		%		80-120	20-JUL-18
Molybdenum (Mo)-Dissolved			95.6		%		80-120	20-JUL-18
Nickel (Ni)-Dissolved			94.8		%		80-120	20-JUL-18
Phosphorus (P)-Dissolved			95.8		%		80-120	20-JUL-18
Potassium (K)-Dissolved			96.6		%		80-120	20-JUL-18
Rubidium (Rb)-Dissolved			98.7		%		80-120	20-JUL-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4138670								
WG2827532-2 LCS								
Selenium (Se)-Dissolved			94.0		%		80-120	20-JUL-18
Silicon (Si)-Dissolved			98.9		%		80-120	20-JUL-18
Silver (Ag)-Dissolved			94.5		%		80-120	20-JUL-18
Sodium (Na)-Dissolved			95.2		%		80-120	20-JUL-18
Strontium (Sr)-Dissolved			97.6		%		80-120	20-JUL-18
Sulfur (S)-Dissolved			101.6		%		80-120	20-JUL-18
Tellurium (Te)-Dissolved			98.1		%		80-120	20-JUL-18
Thallium (Tl)-Dissolved			93.8		%		80-120	20-JUL-18
Thorium (Th)-Dissolved			96.8		%		80-120	20-JUL-18
Tin (Sn)-Dissolved			96.9		%		80-120	20-JUL-18
Titanium (Ti)-Dissolved			91.9		%		80-120	20-JUL-18
Tungsten (W)-Dissolved			98.7		%		80-120	20-JUL-18
Uranium (U)-Dissolved			100.3		%		80-120	20-JUL-18
Vanadium (V)-Dissolved			96.4		%		80-120	20-JUL-18
Zinc (Zn)-Dissolved			92.8		%		80-120	20-JUL-18
Zirconium (Zr)-Dissolved			97.8		%		80-120	20-JUL-18
WG2827532-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-JUL-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-JUL-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	20-JUL-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-JUL-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-JUL-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-JUL-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-JUL-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4138670								
WG2827532-1 MB		**NP**						
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-JUL-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-JUL-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-JUL-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-JUL-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-JUL-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-JUL-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-JUL-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-JUL-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-JUL-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-JUL-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-JUL-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-JUL-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-JUL-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	20-JUL-18
OGG-SF-VA	**Water**							
Batch R4139332								
WG2830117-2 LCS								
Oil and Grease			89.7		%		70-130	23-JUL-18
WG2830117-1 MB								
Oil and Grease			<5.0		mg/L		5	23-JUL-18
PH-PCT-VA	**Water**							
Batch R4138812								
WG2829673-2 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	24-JUL-18
SO4-IC-N-VA	**Water**							

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-VA	**Water**							
Batch R4135891								
WG2827569-2 LCS								
Sulfate (SO4)			101.1		%		90-110	19-JUL-18
WG2827569-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-JUL-18
TSS-VA	**Water**							
Batch R4137360								
WG2829262-3 DUP		**L2130359-1**						
Total Suspended Solids		10.9	11.5		mg/L	5.4	20	22-JUL-18
WG2829262-2 LCS								
Total Suspended Solids			99.1		%		85-115	22-JUL-18
WG2829262-1 MB								
Total Suspended Solids			<3.0		mg/L		3	22-JUL-18
VOC7-HSMS-VA	**Water**							
Batch R4122617								
WG2826304-2 LCS								
Benzene			101.7		%		70-130	19-JUL-18
Ethylbenzene			94.7		%		70-130	19-JUL-18
Methyl t-butyl ether (MTBE)			103.8		%		70-130	19-JUL-18
Styrene			93.0		%		70-130	19-JUL-18
Toluene			82.6		%		70-130	19-JUL-18
meta- & para-Xylene			100.4		%		70-130	19-JUL-18
ortho-Xylene			95.3		%		70-130	19-JUL-18
WG2826304-1 MB								
Benzene			<0.00050		mg/L		0.0005	19-JUL-18
Ethylbenzene			<0.00050		mg/L		0.0005	19-JUL-18
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	19-JUL-18
Styrene			<0.00050		mg/L		0.0005	19-JUL-18
Toluene			<0.00045		mg/L		0.00045	19-JUL-18
meta- & para-Xylene			<0.00050		mg/L		0.0005	19-JUL-18
ortho-Xylene			<0.00050		mg/L		0.0005	19-JUL-18

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	16-JUL-18 15:30	24-JUL-18 08:10	0.25	185	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2130359 were received on 17-JUL-18 09:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2130359-COFC

COC Number: 15 -

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	Tervita Corporation	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Lisa Jordan	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4] ☐ / 3 day [P3] ☐ / 2 day [P2] ☐ — EMERGENCY: 1 Business day [E1] ☐ / Same Day, Weekend or Statutory holiday [E0] ☐
Phone:	250-261-4429	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	500, 140-10th Ave, SE	Email 1 or Fax lijordan@tervita.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Calgary , Alberta	Email 2	
Postal Code:	T2G 0R1	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	Analysis Request
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below
Company:	Tervita Corporation	Email 1 or Fax lijordan@tervita.com	
Contact:	Lisa Jordan	Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Storm Pond	Major/Minor Code:	Routing Code:
PO / AFE:	~~305-38077~~ PO#### 1148 WW	Requisitioner:	
LSD:	Silverberry LF 24009 A-08-088-20W6M	Location:	
ALS Lab Work Order # (lab use only)	L2130359	ALS Contact:	Sampler: Ted McGuire

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	See attached	Number of Containers
	Storm Pond	16/7/2018	15:30	Water	R	

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
20.0 C			2		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
			[illegible]	July 17/18	9:00 hrs	JC	JUL 17 2018	11:10PM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

[redacted]

Tervita Corporation
ATTN: Lisa Jordan
10215 - 100th Street
Fort St. John BC V1J 3T8

Date Received: 30-JUL-18
Report Date: 09-AUG-18 14:01 (MT)
Version: FINAL

Client Phone: 250-261-4429

Certificate of Analysis

Lab Work Order #: L2138787

Project P.O. #: PO00001148 - 24009
Job Reference: SILVERBERRY LF STORM POND
C of C Numbers:
Legal Site Desc: A-08-088-20W6M

[redacted]

[redacted]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2138787-1				
	Description	Water				
	Sampled Date	30-JUL-18				
	Sampled Time	15:00				
	Client ID	SBLF STORM POND				
Grouping	**Analyte**					
WATER						
Physical Tests	pH (pH)	8.14				
Anions and Nutrients	Chloride (Cl) (mg/L)	77.9				

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode It is recommended that this analysis be conducted in the field.			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Client: Tervita Corporation
10215 - 100th Street
Fort St. John BC V1J 3T8
Contact: Lisa Jordan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-VA	**Water**							
Batch R4160289								
WG2840219-2 LCS								
Chloride (Cl)			100.0		%		90-110	02-AUG-18
WG2840219-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	02-AUG-18
PH-PCT-VA	**Water**							
Batch R4158929								
WG2840103-2 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	02-AUG-18

Quality Control Report

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	30-JUL-18 15:00	02-AUG-18 14:55	0.25	72	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2138787 were received on 30-JUL-18 16:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2138787-COFC

COC Number: 15 -

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Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	Tervita Corporation	Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Lisa Jordan	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4] ☐ / 3 day [P3] ☐ / 2 day [P2] ☐ — EMERGENCY: 1 Business day [E1] ☐ / Same Day, Weekend or Statutory holiday [E0] ☐
Phone:	250-261-4429	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	500, 140-10th Ave, SE	Email 1 or Fax lijordan@tervita.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Calgary , Alberta	Email 2	
Postal Code:	T2G 0R1	Email 3	
Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution	
	Copy of Invoice with Report ☑ YES ☐ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	Tervita Corporation	Email 1 or Fax lijordan@tervita.com	
Contact:	Lisa Jordan	Email 2	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#:
Job #:	Silverberry LF Storm Pond	Major/Minor Code:	Routing Code:
PO / AFE:	PO00001148 - 24009	Requisitioner:	
LSD:	A-08-088-20W6M	Location:	

ALS Lab Work Order # (lab use only): L2138787 — ALS Contact: — Sampler: Ted McGuire

Analysis Request — Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	PH	Chlorides	Number of Containers
	SBLF Storm Pond	30/7/2018	15:00	Water	R	R	2

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
20				6	3

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date: 7-30-18	Time:	Received by: Geoff	Date: July 30/18	Time: 16:45	Received by: JC	Date: AUG - 1 2018	Time: 1:10pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

[redacted]

Tervita Corporation
ATTN: Lisa Jordan
10215 - 100th Street
Fort St. John BC V1J 3T8

Date Received: 21-SEP-18
Report Date: 02-OCT-18 17:59 (MT)
Version: FINAL

Client Phone: 250-261-4429

Certificate of Analysis

Lab Work Order #: L2169058

Project P.O. #: PO00001148 - 24009
Job Reference: STORM POND
C of C Numbers:
Legal Site Desc: A-08-088-20W6M

[redacted]

[redacted]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2169058-1				
	Description	Water				
	Sampled Date	21-SEP-18				
	Sampled Time	13:00				
	Client ID	STORM POND				
Grouping	**Analyte**					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	186				
	pH (pH)	8.00				
	Total Suspended Solids (mg/L)	5.6				
Anions and Nutrients	Chloride (Cl) (mg/L)	68.4				
	Sulfate (SO4) (mg/L)	74.7				
Total Metals	Mercury (Hg)-Total (mg/L)	<0.0000050				
Dissolved Metals	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.492				
	Antimony (Sb)-Dissolved (mg/L)	0.00020				
	Arsenic (As)-Dissolved (mg/L)	0.00110				
	Barium (Ba)-Dissolved (mg/L)	0.115				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.040				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000166				
	Calcium (Ca)-Dissolved (mg/L)	48.4				
	Cesium (Cs)-Dissolved (mg/L)	0.000059				
	Chromium (Cr)-Dissolved (mg/L)	0.00075				
	Cobalt (Co)-Dissolved (mg/L)	0.00025				
	Copper (Cu)-Dissolved (mg/L)	0.00218				
	Iron (Fe)-Dissolved (mg/L)	0.364				
	Lead (Pb)-Dissolved (mg/L)	0.000317				
	Lithium (Li)-Dissolved (mg/L)	0.0056				
	Magnesium (Mg)-Dissolved (mg/L)	15.7				
	Manganese (Mn)-Dissolved (mg/L)	0.0193				
	Molybdenum (Mo)-Dissolved (mg/L)	0.000913				
	Nickel (Ni)-Dissolved (mg/L)	0.00306				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	5.48				
	Rubidium (Rb)-Dissolved (mg/L)	0.00114				
	Selenium (Se)-Dissolved (mg/L)	0.000297				
	Silicon (Si)-Dissolved (mg/L)	1.62				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	11.2				
	Strontium (Sr)-Dissolved (mg/L)	0.254				
	Sulfur (S)-Dissolved (mg/L)	23.6				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2169058-1				
	Description	Water				
	Sampled Date	21-SEP-18				
	Sampled Time	13:00				
	Client ID	STORM POND				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	0.0599				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000593				
	Vanadium (V)-Dissolved (mg/L)	0.00173				
	Zinc (Zn)-Dissolved (mg/L)	0.0029				
	Zirconium (Zr)-Dissolved (mg/L)	0.00216				
Aggregate Organics	Oil and Grease (mg/L)	<5.0				
Volatile Organic Compounds	Benzene (mg/L)	<0.00050				
	Ethylbenzene (mg/L)	<0.00050				
	Methyl t-butyl ether (MTBE) (mg/L)	<0.00050				
	Styrene (mg/L)	<0.00050				
	Toluene (mg/L)	<0.00045				
	ortho-Xylene (mg/L)	<0.00050				
	meta- & para-Xylene (mg/L)	<0.00050				
	Xylenes (mg/L)	<0.00075				
	Surrogate: 4-Bromofluorobenzene (SS) (%)	98.5				
	Surrogate: 1,4-Difluorobenzene (SS) (%)	85.0				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2169058-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2169058-1
Matrix Spike	Iron (Fe)-Dissolved	MS-B	L2169058-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2169058-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2169058-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2169058-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2169058-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
CL-IC-N-VA	Water	Chloride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

EC-SCREEN-VA	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-T-CVAA-VA	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

MET-D-CCMS-VA	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

OGG-SF-VA	Water	Oil & Grease by Gravimetric	BCMOE (2010), EPA1664A

The procedure involves an extraction of the entire water sample with hexane. This extract is then evaporated to dryness, and the residue weighed to determine Oil and Grease.

PH-PCT-VA	Water	pH by Meter (Automated)	APHA 4500-H pH Value

This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode

It is recommended that this analysis be conducted in the field.

SO4-IC-N-VA	Water	Sulfate in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TSS-VA	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.

VOC7-HSMS-VA	Water	BTEX/MTBE/Styrene by Headspace GCMS	EPA 5021A/8260C

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Target compound concentrations are measured using mass spectrometry detection.

VOC7/VOC-SURR-MS-VA	Water	VOC7 and/or VOC Surrogates for Waters	EPA 5035A/5021A/8260C
XYLENES-CALC-VA	Water	Sum of Xylene Isomer Concentrations	CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

Reference Information

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2169058 Report Date: 02-OCT-18

Client: Tervita Corporation
10215 - 100th Street
Fort St. John BC V1J 3T8
Contact: Lisa Jordan

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-VA	**Water**							
Batch R4236610								
WG2884944-2 LCS								
Chloride (Cl)			96.8		%		90-110	24-SEP-18
WG2884944-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	24-SEP-18
HG-T-CVAA-VA	**Water**							
Batch R4245392								
WG2888260-2 LCS								
Mercury (Hg)-Total			101.4		%		80-120	27-SEP-18
WG2888260-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	27-SEP-18
MET-D-CCMS-VA	**Water**							
Batch R4247769								
WG2888230-3 DUP		**L2169058-1**						
Aluminum (Al)-Dissolved		0.492	0.567		mg/L	14	20	27-SEP-18
Antimony (Sb)-Dissolved		0.00020	0.00020		mg/L	3.2	20	27-SEP-18
Arsenic (As)-Dissolved		0.00110	0.00107		mg/L	2.8	20	27-SEP-18
Barium (Ba)-Dissolved		0.115	0.111		mg/L	3.1	20	27-SEP-18
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-SEP-18
Boron (B)-Dissolved		0.040	0.039		mg/L	0.3	20	27-SEP-18
Cadmium (Cd)-Dissolved		0.0000166	0.0000158		mg/L	5.0	20	27-SEP-18
Calcium (Ca)-Dissolved		48.4	49.6		mg/L	2.5	20	27-SEP-18
Cesium (Cs)-Dissolved		0.000059	0.000058		mg/L	2.5	20	27-SEP-18
Chromium (Cr)-Dissolved		0.00075	0.00084		mg/L	11	20	27-SEP-18
Cobalt (Co)-Dissolved		0.00025	0.00026		mg/L	2.2	20	27-SEP-18
Copper (Cu)-Dissolved		0.00218	0.00221		mg/L	1.1	20	27-SEP-18
Iron (Fe)-Dissolved		0.364	0.431		mg/L	17	20	27-SEP-18
Lead (Pb)-Dissolved		0.000317	0.000306		mg/L	3.6	20	27-SEP-18
Lithium (Li)-Dissolved		0.0056	0.0055		mg/L	1.0	20	27-SEP-18
Magnesium (Mg)-Dissolved		15.7	15.1		mg/L	3.9	20	27-SEP-18
Manganese (Mn)-Dissolved		0.0193	0.0199		mg/L	2.9	20	27-SEP-18
Molybdenum (Mo)-Dissolved		0.000913	0.000927		mg/L	1.5	20	27-SEP-18
Nickel (Ni)-Dissolved		0.00306	0.00317		mg/L	3.6	20	27-SEP-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-SEP-18
Potassium (K)-Dissolved		5.48	5.70		mg/L	3.9	20	27-SEP-18
Rubidium (Rb)-Dissolved		0.00114	0.00135		mg/L	17	20	27-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4247769								
WG2888230-3 DUP		**L2169058-1**						
Selenium (Se)-Dissolved		0.000297	0.000285		mg/L	4.3	20	27-SEP-18
Silicon (Si)-Dissolved		1.62	1.70		mg/L	4.6	20	27-SEP-18
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-SEP-18
Sodium (Na)-Dissolved		11.2	11.1		mg/L	0.7	20	27-SEP-18
Strontium (Sr)-Dissolved		0.254	0.255		mg/L	0.7	20	27-SEP-18
Sulfur (S)-Dissolved		23.6	24.5		mg/L	3.7	20	27-SEP-18
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	27-SEP-18
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	27-SEP-18
Thorium (Th)-Dissolved		0.00010	0.00011		mg/L	11	20	27-SEP-18
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Uranium (U)-Dissolved		0.000593	0.000609		mg/L	2.7	20	27-SEP-18
Vanadium (V)-Dissolved		0.00173	0.00201		mg/L	15	20	27-SEP-18
Zinc (Zn)-Dissolved		0.0029	0.0030		mg/L	3.9	20	27-SEP-18
WG2888230-2 LCS								
Aluminum (Al)-Dissolved			93.7		%		80-120	27-SEP-18
Antimony (Sb)-Dissolved			97.9		%		80-120	27-SEP-18
Arsenic (As)-Dissolved			95.7		%		80-120	27-SEP-18
Barium (Ba)-Dissolved			90.3		%		80-120	27-SEP-18
Beryllium (Be)-Dissolved			91.6		%		80-120	27-SEP-18
Bismuth (Bi)-Dissolved			92.6		%		80-120	27-SEP-18
Boron (B)-Dissolved			89.2		%		80-120	27-SEP-18
Cadmium (Cd)-Dissolved			94.3		%		80-120	27-SEP-18
Calcium (Ca)-Dissolved			94.8		%		80-120	27-SEP-18
Cesium (Cs)-Dissolved			95.6		%		80-120	27-SEP-18
Chromium (Cr)-Dissolved			96.5		%		80-120	27-SEP-18
Cobalt (Co)-Dissolved			92.3		%		80-120	27-SEP-18
Copper (Cu)-Dissolved			91.0		%		80-120	27-SEP-18
Iron (Fe)-Dissolved			91.9		%		80-120	27-SEP-18
Lead (Pb)-Dissolved			93.8		%		80-120	27-SEP-18
Lithium (Li)-Dissolved			93.8		%		80-120	27-SEP-18
Magnesium (Mg)-Dissolved			96.0		%		80-120	27-SEP-18
Manganese (Mn)-Dissolved			91.5		%		80-120	27-SEP-18
Molybdenum (Mo)-Dissolved			97.4		%		80-120	27-SEP-18

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4247769								
WG2888230-2 LCS								
Nickel (Ni)-Dissolved			90.6		%		80-120	27-SEP-18
Phosphorus (P)-Dissolved			93.1		%		70-130	27-SEP-18
Potassium (K)-Dissolved			93.9		%		80-120	27-SEP-18
Rubidium (Rb)-Dissolved			96.1		%		80-120	27-SEP-18
Selenium (Se)-Dissolved			90.8		%		80-120	27-SEP-18
Silicon (Si)-Dissolved			93.1		%		60-140	27-SEP-18
Silver (Ag)-Dissolved			91.4		%		80-120	27-SEP-18
Sodium (Na)-Dissolved			97.0		%		80-120	27-SEP-18
Strontium (Sr)-Dissolved			99.1		%		80-120	27-SEP-18
Sulfur (S)-Dissolved			98.2		%		80-120	27-SEP-18
Tellurium (Te)-Dissolved			93.9		%		80-120	27-SEP-18
Thallium (Tl)-Dissolved			93.9		%		80-120	27-SEP-18
Thorium (Th)-Dissolved			92.3		%		80-120	27-SEP-18
Tin (Sn)-Dissolved			95.0		%		80-120	27-SEP-18
Tungsten (W)-Dissolved			93.3		%		80-120	27-SEP-18
Uranium (U)-Dissolved			94.3		%		80-120	27-SEP-18
Vanadium (V)-Dissolved			93.0		%		80-120	27-SEP-18
Zinc (Zn)-Dissolved			94.3		%		80-120	27-SEP-18
WG2888230-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	27-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4247769								
WG2888230-1 MB		**NP**						
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	27-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Batch R4249493								
WG2889159-2 LCS								
Aluminum (Al)-Dissolved			98.7		%		80-120	27-SEP-18
Antimony (Sb)-Dissolved			96.9		%		80-120	27-SEP-18
Arsenic (As)-Dissolved			97.6		%		80-120	27-SEP-18
Barium (Ba)-Dissolved			98.9		%		80-120	27-SEP-18
Beryllium (Be)-Dissolved			98.0		%		80-120	27-SEP-18
Bismuth (Bi)-Dissolved			96.1		%		80-120	27-SEP-18
Boron (B)-Dissolved			92.9		%		80-120	27-SEP-18
Cadmium (Cd)-Dissolved			98.0		%		80-120	27-SEP-18
Calcium (Ca)-Dissolved			96.7		%		80-120	27-SEP-18
Cesium (Cs)-Dissolved			94.1		%		80-120	27-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249493								
WG2889159-2 LCS								
Chromium (Cr)-Dissolved			96.5		%		80-120	27-SEP-18
Cobalt (Co)-Dissolved			95.8		%		80-120	27-SEP-18
Copper (Cu)-Dissolved			94.6		%		80-120	27-SEP-18
Iron (Fe)-Dissolved			94.9		%		80-120	27-SEP-18
Lead (Pb)-Dissolved			98.5		%		80-120	27-SEP-18
Lithium (Li)-Dissolved			96.1		%		80-120	27-SEP-18
Magnesium (Mg)-Dissolved			101.2		%		80-120	27-SEP-18
Manganese (Mn)-Dissolved			97.2		%		80-120	27-SEP-18
Molybdenum (Mo)-Dissolved			98.2		%		80-120	27-SEP-18
Nickel (Ni)-Dissolved			94.7		%		80-120	27-SEP-18
Phosphorus (P)-Dissolved			96.3		%		70-130	27-SEP-18
Potassium (K)-Dissolved			99.7		%		80-120	27-SEP-18
Rubidium (Rb)-Dissolved			97.5		%		80-120	27-SEP-18
Selenium (Se)-Dissolved			94.9		%		80-120	27-SEP-18
Silicon (Si)-Dissolved			98.8		%		60-140	27-SEP-18
Silver (Ag)-Dissolved			94.5		%		80-120	27-SEP-18
Sodium (Na)-Dissolved			104.9		%		80-120	27-SEP-18
Strontium (Sr)-Dissolved			97.0		%		80-120	27-SEP-18
Sulfur (S)-Dissolved			99.3		%		80-120	27-SEP-18
Tellurium (Te)-Dissolved			97.7		%		80-120	27-SEP-18
Thallium (Tl)-Dissolved			96.7		%		80-120	27-SEP-18
Thorium (Th)-Dissolved			92.4		%		80-120	27-SEP-18
Tin (Sn)-Dissolved			97.0		%		80-120	27-SEP-18
Tungsten (W)-Dissolved			98.4		%		80-120	27-SEP-18
Uranium (U)-Dissolved			95.6		%		80-120	27-SEP-18
Vanadium (V)-Dissolved			98.0		%		80-120	27-SEP-18
Zinc (Zn)-Dissolved			96.1		%		80-120	27-SEP-18
WG2889159-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249493								
WG2889159-1 MB		**NP**						
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	27-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	27-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249587								
WG2889674-3 DUP		**L2169058-1**						
Aluminum (Al)-Dissolved		0.492	1.13		mg/L	18	20	27-SEP-18
Antimony (Sb)-Dissolved		0.00020	0.00022		mg/L	2.4	20	27-SEP-18
Arsenic (As)-Dissolved		0.00110	0.00117		mg/L	4.3	20	27-SEP-18
Barium (Ba)-Dissolved		0.115	0.107		mg/L	11	20	27-SEP-18
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	27-SEP-18
Boron (B)-Dissolved		0.040	0.043		mg/L	2.2	20	27-SEP-18
Cadmium (Cd)-Dissolved		0.0000166	0.0000191		mg/L	4.9	20	27-SEP-18
Calcium (Ca)-Dissolved		48.4	49.2		mg/L	2.3	20	27-SEP-18
Cesium (Cs)-Dissolved		0.000059	0.000123		mg/L	18	20	27-SEP-18
Chromium (Cr)-Dissolved		0.00075	0.00160		mg/L	14	20	27-SEP-18
Cobalt (Co)-Dissolved		0.00025	0.00031		mg/L	4.2	20	27-SEP-18
Copper (Cu)-Dissolved		0.00218	0.00238		mg/L	2.0	20	27-SEP-18
Iron (Fe)-Dissolved		0.364	0.713		mg/L	3.8	20	27-SEP-18
Lead (Pb)-Dissolved		0.000317	0.000429		mg/L	7.8	20	27-SEP-18
Lithium (Li)-Dissolved		0.0056	0.0062		mg/L	2.5	20	27-SEP-18
Magnesium (Mg)-Dissolved		15.7	15.3		mg/L	0.6	20	27-SEP-18
Manganese (Mn)-Dissolved		0.0193	0.0209		mg/L	0.1	20	27-SEP-18
Molybdenum (Mo)-Dissolved		0.000913	0.000897		mg/L	3.0	20	27-SEP-18
Nickel (Ni)-Dissolved		0.00306	0.00347		mg/L	1.1	20	27-SEP-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	27-SEP-18
Potassium (K)-Dissolved		5.48	5.79		mg/L	0.6	20	27-SEP-18
Rubidium (Rb)-Dissolved		0.00114	0.00202		mg/L	12	20	27-SEP-18
Selenium (Se)-Dissolved		0.000297	0.000341		mg/L	2.0	20	27-SEP-18
Silicon (Si)-Dissolved		1.62	3.08		mg/L	9.2	20	27-SEP-18
Sodium (Na)-Dissolved		11.2	11.4		mg/L	0.2	20	27-SEP-18
Strontium (Sr)-Dissolved		0.254	0.244		mg/L	2.5	20	27-SEP-18
Sulfur (S)-Dissolved		23.6	26.4		mg/L	5.8	20	27-SEP-18
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	27-SEP-18
Thallium (Tl)-Dissolved		<0.000010	0.000018		mg/L	0.4	20	27-SEP-18
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Titanium (Ti)-Dissolved		0.0599	0.0534		mg/L	11	20	27-SEP-18
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	27-SEP-18
Uranium (U)-Dissolved		0.000593	0.000667		mg/L	2.5	20	27-SEP-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249587								
WG2889674-3 DUP		**L2169058-1**						
Vanadium (V)-Dissolved		0.00173	0.00364		mg/L	13	20	27-SEP-18
Zinc (Zn)-Dissolved		0.0029	0.0038		mg/L	3.2	20	27-SEP-18
Zirconium (Zr)-Dissolved		0.00216	0.00190		mg/L	13	20	27-SEP-18
WG2889674-2 LCS								
Aluminum (Al)-Dissolved			101.9		%		80-120	27-SEP-18
Antimony (Sb)-Dissolved			98.5		%		80-120	27-SEP-18
Arsenic (As)-Dissolved			96.7		%		80-120	27-SEP-18
Barium (Ba)-Dissolved			93.6		%		80-120	27-SEP-18
Beryllium (Be)-Dissolved			98.1		%		80-120	27-SEP-18
Bismuth (Bi)-Dissolved			99.4		%		80-120	27-SEP-18
Boron (B)-Dissolved			93.8		%		80-120	27-SEP-18
Cadmium (Cd)-Dissolved			97.2		%		80-120	27-SEP-18
Calcium (Ca)-Dissolved			92.5		%		80-120	27-SEP-18
Cesium (Cs)-Dissolved			98.2		%		80-120	27-SEP-18
Chromium (Cr)-Dissolved			98.0		%		80-120	27-SEP-18
Cobalt (Co)-Dissolved			93.5		%		80-120	27-SEP-18
Copper (Cu)-Dissolved			95.2		%		80-120	27-SEP-18
Iron (Fe)-Dissolved			98.4		%		80-120	27-SEP-18
Lead (Pb)-Dissolved			97.2		%		80-120	27-SEP-18
Lithium (Li)-Dissolved			95.1		%		80-120	27-SEP-18
Magnesium (Mg)-Dissolved			99.6		%		80-120	27-SEP-18
Manganese (Mn)-Dissolved			99.1		%		80-120	27-SEP-18
Molybdenum (Mo)-Dissolved			93.9		%		80-120	27-SEP-18
Nickel (Ni)-Dissolved			98.0		%		80-120	27-SEP-18
Phosphorus (P)-Dissolved			94.8		%		70-130	27-SEP-18
Potassium (K)-Dissolved			101.4		%		80-120	27-SEP-18
Rubidium (Rb)-Dissolved			97.1		%		80-120	27-SEP-18
Selenium (Se)-Dissolved			97.4		%		80-120	27-SEP-18
Silicon (Si)-Dissolved			93.2		%		60-140	27-SEP-18
Silver (Ag)-Dissolved			96.3		%		80-120	27-SEP-18
Sodium (Na)-Dissolved			103.0		%		80-120	27-SEP-18
Strontium (Sr)-Dissolved			99.6		%		80-120	27-SEP-18
Sulfur (S)-Dissolved			97.3		%		80-120	27-SEP-18
Tellurium (Te)-Dissolved			98.0		%		80-120	27-SEP-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249587								
WG2889674-2 LCS								
Thallium (Tl)-Dissolved			96.0		%		80-120	27-SEP-18
Thorium (Th)-Dissolved			96.4		%		80-120	27-SEP-18
Tin (Sn)-Dissolved			95.0		%		80-120	27-SEP-18
Titanium (Ti)-Dissolved			95.5		%		80-120	27-SEP-18
Tungsten (W)-Dissolved			98.3		%		80-120	27-SEP-18
Uranium (U)-Dissolved			97.5		%		80-120	27-SEP-18
Vanadium (V)-Dissolved			97.5		%		80-120	27-SEP-18
Zinc (Zn)-Dissolved			95.0		%		80-120	27-SEP-18
Zirconium (Zr)-Dissolved			94.5		%		80-120	27-SEP-18
WG2889674-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	27-SEP-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	27-SEP-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	27-SEP-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	27-SEP-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4249587								
WG2889674-1 MB		**NP**						
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	27-SEP-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	27-SEP-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	27-SEP-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	27-SEP-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	27-SEP-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	27-SEP-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	27-SEP-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	27-SEP-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	27-SEP-18
OGG-SF-VA	**Water**							
Batch R4251563								
WG2889330-2 LCS								
Oil and Grease			95.3		%		70-130	28-SEP-18
WG2889330-1 MB								
Oil and Grease			<5.0		mg/L		5	28-SEP-18
PH-PCT-VA	**Water**							
Batch R4243489								
WG2884956-2 CRM		**VA-PH7-BUF**						
pH			7.03		pH		6.9-7.1	26-SEP-18
SO4-IC-N-VA	**Water**							
Batch R4236610								
WG2884944-2 LCS								
Sulfate (SO4)			97.4		%		90-110	24-SEP-18
WG2884944-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	24-SEP-18
TSS-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-VA	**Water**							
Batch R4250067								
WG2888638-2 LCS								
Total Suspended Solids			86.9		%		85-115	27-SEP-18
WG2888638-1 MB								
Total Suspended Solids			<3.0		mg/L		3	27-SEP-18
VOC7-HSMS-VA	**Water**							
Batch R4236529								
WG2888279-2 LCS								
Benzene			81.6		%		70-130	27-SEP-18
Ethylbenzene			102.7		%		70-130	27-SEP-18
Methyl t-butyl ether (MTBE)			95.5		%		70-130	27-SEP-18
Styrene			96.2		%		70-130	27-SEP-18
Toluene			96.8		%		70-130	27-SEP-18
meta- & para-Xylene			101.4		%		70-130	27-SEP-18
ortho-Xylene			96.4		%		70-130	27-SEP-18
WG2888279-1 MB								
Benzene			<0.00050		mg/L		0.0005	27-SEP-18
Ethylbenzene			<0.00050		mg/L		0.0005	27-SEP-18
Methyl t-butyl ether (MTBE)			<0.00050		mg/L		0.0005	27-SEP-18
Styrene			<0.00050		mg/L		0.0005	27-SEP-18
Toluene			<0.00045		mg/L		0.00045	27-SEP-18
meta- & para-Xylene			<0.00050		mg/L		0.0005	27-SEP-18
ortho-Xylene			<0.00050		mg/L		0.0005	27-SEP-18

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	21-SEP-18 13:00	26-SEP-18 12:43	0.25	120	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2169058 were received on 21-SEP-18 17:20.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

ALS Environmental

www.alsglobal.com

Chain of Custody (COC) / Analytical Request Form

Canada Toll Free: 1 800 668 9878

L2169058-COFC

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Tervita Corporation
Contact:	Lisa Jordan
Phone:	250-261-4429
	Company address below will appear on the final report
Street:	500, 140-10th Ave, SE
City/Province:	Calgary , Alberta
Postal Code:	T2G 0R1
Invoice To	Same as Report To ☑ YES ☐ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Tervita Corporation
Contact:	Lisa Jordan

Project Information

ALS Account # / Quote #:	
Job #:	~~Random Samples~~ STORM POND
PO / AFE:	PO00001148 - 24009
LSD:	A-08-088-20W6M
ALS Lab Work Order # (lab use only)	L2169058

Report Format / Di...

Select Report Format: ☑ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	lijordan@tervita.com
Email 2	tmcguire@tervita.com
Email 3	

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	lijordan@tervita.com
Email 2	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Contact: **Sampler:** Ted McGuire

...l E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4] ☐ | 3 day [P3] ☐ | 2 day [P2] ☐

EMERGENCY: 1 Business day [E1] ☐ | Same Day, Weekend or Statutory holiday [E0] ☐

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	See Attached	Number of Containers
	Storm Pond	21-Sep-18	1:00pm	water	R	1 kit

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☐ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☒

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
18					

SHIPMENT RELEASE (client use)

Released by: Kevin Moore	Date: 9/21/2018	Time: 1:30pm

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Geoff	Date: Sept 21/18	Time: 17:20

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form.**

Appendix 4
2018 Groundwater Monitoring Program - Silverberry Secure Landfill, Block A 18-88-20 W6M

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

2018 GROUNDWATER MONITORING PROGRAM

SILVERBERRY SECURE LANDFILL
BLOCK A-18-088-20 W6M
MOE PERMIT 17150

Report Prepared for:
TERVITA CORPORATION

Prepared by:
MATRIX SOLUTIONS INC.

Version 1.0
March 2019
Calgary, Alberta

Suite 600, 214 - 11 Ave. SW
Calgary, AB, Canada T2R 0K1
T 403.237.0606 F 403.263.2493
www.matrix-solutions.com

2018 GROUNDWATER MONITORING PROGRAM

SILVERBERRY SECURE LANDFILL

BLOCK A-18-088-20 W6M

MOE PERMIT 17150

Report prepared for Tervita Corporation, March 2019

Andrew Hum, B.Sc.
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VERSION CONTROL

Version	Date	Issue Type	Filename	Description
V0.1	19-Mar-2019	Draft	17507-502 R 2019-03-19 draft V0.1.docx	Issued to client for review
V1.0	29-Mar-2019	Final	17507-502 R 2019-03-29 final V1.0.docx	Updates to Executive Summary, Sections 4.3 and 6, Tables; Issued to client

EXECUTIVE SUMMARY

Tervita Corporation retained Matrix Solutions Inc. to conduct the quarterly groundwater monitoring program at the Silverberry Landfill as required under the *Environmental Management Act* Permit 17150. The Silverberry Landfill is located at Block A-18-088-20 W6M, approximately 45 km northwest of Fort St. John, British Columbia. Potential contaminants of concern identified for the site include general and inorganic parameters, dissolved metals, petroleum hydrocarbons, polycyclic aromatic hydrocarbons, and radioactive isotopes.

In 2018, shallow groundwater beneath the site was interpreted to flow toward the northwest with an estimated horizontal groundwater velocity of < 1 m/year. Groundwater beneath the landfill generally shows recharge conditions.

In 2018, sodium, sulphate, fluoride, and several dissolved metal concentrations exceeded the applicable British Columbia *Environmental Management Act* Contaminated Sites Regulation standards in samples collected from one or more monitoring wells. However, analyte concentrations were comparable to background concentrations.

Overall, shallow groundwater at the landfill does not appear to have been impacted by daily site activities. Future monitoring at well BH-103 will determine if till oxidation is no longer having an effect on groundwater chemistry conditions and whether data from this background well can be considered reflective of natural groundwater conditions at the landfill. A review of the leak detection sample data suggests that the current landfill leachate collection and containment system is operating effectively.

Matrix recommends a reduction in sampling frequency from a quarterly to semi-annual (spring and fall) groundwater monitoring and sampling program in 2019.

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APPENDICES

1 INTRODUCTION

Tervita Corporation retained Matrix Solutions Inc. to conduct the quarterly groundwater monitoring program at the Silverberry Landfill. Quarterly groundwater monitoring at the Silverberry Landfill is a requirement of Sections 5.1, 7.0, 8.1, 8.2, and 9.3 of the *Environmental Management Act* Permit 17150 (Appendix A). Tervita also requested that Matrix collect leachate and leak detection system (LDS) samples as part of the groundwater monitoring program.

This report presents the results of the 2018 quarterly groundwater monitoring program and includes the leachate and pond water quality results for comparison purposes.

The quarterly groundwater monitoring program reporting requirements outlined in Sections 5.1, 7.0, 8.1, 8.2, and 9.3 of the Silverberry Landfill's permit are summarized in the concordance table below (Table A). Table A references the relevant permit requirements and the corresponding sections, figures, tables, and/or appendices that address each requirement.

TABLE A Concordance with the *Environmental Management Act* Permit 17150, Sections 5.1, 7.0, 8.1, 8.2, and 9.3

Permit Section Number	Requirement	Location Herein
Operational Plan		
5.1 (c)	A leachate monitoring and management program	Section 3
5.1 (e)	A groundwater monitoring and management program	Sections 2.3 and 3
Monitoring - Landfill Monitoring		
7.0	Monitoring shall be performed as outlined in the OPERATIONAL PLAN.	Section 3; Appendices A, D, and E
Sampling and Analysis		
8.1	Sampling is to be carried out in accordance with procedures described in the most current edition of "British Columbia Field Sampling Manual" (January 2003, or most recent update), or by suitable alternative procedures as authorized by the Director.	Section 3; Appendices D and E
8.2	Analyses are to be carried out in accordance with procedures described in the "British Columbia Laboratory Manual (2009 Permittee Edition)", or the most recent edition, or by suitable alternative procedures as authorized by the Director.	Section 3; Appendix G
Annual Report		
9.3 (i)	The results of all monitoring programs as specified in this permit. Data interpretation and trend analysis, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified independent professional.	Section 4; Figures 5 to 15; Tables 3 to 7

1.1 Objectives

The objectives of the 2018 groundwater monitoring program were to evaluate shallow groundwater flow conditions and groundwater quality beneath the Silverberry Landfill, and to compare the results to background and/or historical results and regulatory criteria to determine if any changes in these conditions were the result of landfill activities onsite.

1.2 Scope of Work

The 2018 scope of work included the following:

- collecting groundwater samples from all accessible monitoring wells
- collecting leachate and LDS samples from the appropriate collection points during each groundwater monitoring event
- submitting samples to an accredited laboratory for analytical testing
- reviewing and technically assessing the data
- preparing a groundwater monitoring report in accordance with the permit requirements

2 BACKGROUND

2.1 Site Description

The Silverberry Landfill is located at Block A-18-088-20 W6M, approximately 45 km northwest of Fort St. John, British Columbia (Figure 1).The landfill was commissioned by Canadian Crude Separators (now Tervita), with operations starting in October 2002 (Tervita 2013), the completion of Cells 2 and 3 in November 2004, and the completion of Cells 4 and 5 in 2006. The landfill is an engineered secure landfill that accepts non-hazardous solid industrial and oilfield waste from surrounding areas in compliance with the standards for landfills in British Columbia (Province of British Columbia 2018a, 2018b). The Silverberry treatment, recovery, and disposal (TRD) facility is located directly west of the landfill. The landfill incorporates a composite liner system, with a primary top liner consisting of a 60 mil high density polyethylene liner underlain by a 0.6 m thick compacted clay liner (CCL). This system lies above a LDS that is located above a second 0.6 m thick CCL (Tervita 2013).

A leachate collection and removal system is also present. The leachate collection and removal system consists of a series of gravel-filled trenches accompanied by a perforated collection piping system above the liner system overlain by either a 0.6 m permeable granular layer or a geocomposite material across the entire base of the landfill cell (Tervita 2013).

The LDS located between the primary composite liner and the secondary CCL is constructed of a high-flow geonet synthetic drainage medium that is connected to a drainage system that leads to a collection sump.

Surface water is managed to prevent clean surface water from entering the landfill. Water contacting waste within the landfill cells is contained and collected as leachate. Surface water is diverted and collected in the stormwater retention pond located northwest of the bioremediation cells (Tervita 2013). The bioremediation cells are no longer accepting waste.

The site layout is shown on Figure 2 and consists of the following major areas:

- Cells 1 to 7 - function as leachate collection systems for the landfill
- stormwater pond - designed to collect and store rainwater across the landfill
- subsoil and topsoil stockpiles - storage locations for bulk soil materials
- common stockpiles - storage locations for bulk landfill materials
- leachate pond - designed to contain leachate
- frac water pond - designed to contain produced water

The landfill waste acceptance protocol uses a waste approval application that is submitted with appropriate third-party accredited laboratory analyses. The waste stream is approved for disposal by the landfill, and an approval number is issued. The first load from every approval location is tested with random sampling of waste streams entering the facility. The landfill uses a three-dimensional alphanumeric grid locating system with surveyed elevations. Documentation is maintained showing the location of each load. Every load of waste coming to the site must be accompanied by documentation with a corresponding approval number, which serves as a certificate of transportation and disposal.

2.2 Regional Setting

2.2.1 Physiography and Topography

The landfill is situated at an elevation of approximately 755 m above sea level. The landfill topography slopes between 1 and 2% to the northwest toward an unnamed tributary of the Blueberry River, approximately 500 m west, and an ephemeral drainage directly north of the landfill. Blueberry River is located approximately 6 km north of the landfill (Figure 1). Several unnamed tributaries are present within several hundred metres of the landfill with a small tributary extending onto the northeast portion of the site (B.C. ENV 2018). The landfill is situated in close proximity to a surface water divide which separates surface water draining to the Blueberry River from that draining toward the Saint John Creek (Figure 3).

Surface water on the land surrounding the plant follows the surface topography and surface water drainage paths. Natural drainage across the landfill is generally good (NLR/AE 2013). Surface water within the site is controlled by a water management system consisting of a network of onsite ditches, runon and runoff systems, and a surface water (stormwater) pond (Figure 2).

2.2.2 Adjacent Land Use

The landfill is within the agricultural land reserve. Most of the land around the landfill is primarily forested. The closest active facility is the Silverberry TRD facility, located directly west of the landfill and south of the land treatment area (Figure 2).

2.2.3 Regional and Local Geology

Most of the surficial deposits in the landfill area are of glacial origin, with till and stony, silty clay being predominant. A thin, patchy cover of lacustrine material may also be present (Mathews 1978). The local surficial geology is composed of a thin clay unit that overlies a thick clay till unit (HBT 1994). The overlying clay typically has a thickness between 1.5 and 3 m. According to cross-section A-A' and the borehole logs (Figures 4 & 5; Appendix B), the underlying clay till unit may extend to the maximum depth drilled of 20.7 m below ground surface (bgs).

Bedrock in the general area is mapped as the Dunvegan Formation. The Dunvegan Formation is composed of grey sandstone, interbedded with grey to dark siltstone shale, carbonaceous shale, some ironstone bands, and some thin coal seams. The Dunvegan Formation ranges from 152 to 183 m in thickness. The lower 90 to 110 m are characterized by three massive, cross-bedded, cliff-forming beds up to 12 m thick, which in places grade into and are replaced laterally by less massive beds. The upper part of the formation consists of a succession of thin-bedded sandstone and arenaceous shale strata that are transitional into the overlying Kaskapau Formation (Irish 1958). The bedrock beneath the site has been mapped as a bedrock aquifer in the BC Water Resource Atlas (B.C. ENV 2018).

2.2.4 Regional and Local Hydrogeology and Hydrochemistry

Locally, shallow groundwater flow is likely directed to the northwest toward the Blueberry River. However, regional groundwater may flow south toward the Peace River (Figure 1).

The results of previous groundwater monitoring programs indicate that background shallow groundwater total dissolved solid (TDS) concentrations ranged from 1,810 to 4,620 mg/L (NLR/AE 2013). TDS were predominantly composed of calcium, magnesium, and sulphate, with lesser amounts of sodium and bicarbonate. Based on previous investigations, regional hydrochemistry is classified as a calcium/magnesium-sulphate type. Calcium and magnesium typically comprise greater than 70% of the total cation content, while sulphate comprises greater than 70% of the total anion content. Chloride comprises less than 5% of the total anion content (Matrix 2005).

2.2.5 Local Groundwater Users

Four water wells were identified within a 5 km radius of the TRD facility, as documented in the *BC Water Resources Atlas* (B.C. ENV 2018); the wells are listed in Table 1 and presented on Figure 3. One well is located approximately 0.3 km south-southeast of the TRD facility and is used for non-domestic purposes; it is owned by Tervita Coporation. Two other wells are located approximately 2.5 km east of

the TRD facility; they are both used for monitoring purposes and are owned by Leucrotta Exploration Inc. The nearest domestic use well (Well 4; ID 104393) is located approximately 4 km northwest of the TRD and is owned by British Columbia Railway Company. Locations of the water wells were not field verified by Matrix personnel.

2.3 Monitoring Well Network

Regular groundwater monitoring has been conducted at the landfill before and after site commissioning. The current groundwater monitoring well network consists of 14 active monitoring wells located in the landfill area (Figure 2). A brief rationale for the locations of the wells is provided in Table B.

TABLE B Groundwater Monitoring Well Network Rationale

Monitoring Well	Rationale
MW92-1	Deep well hydraulically downgradient and approximately 800 m northwest of the landfill and north of the treatment area; part of a nested pair
MW92-1A	Shallow well hydraulically downgradient and approximately 800 m northwest of the landfill and north of the treatment area; part of a nested pair
MW92-6A	Shallow well hydraulically downgradient and approximately 5 m north of the landfill; adjacent to Cells 2 and 5
MW92-7	Deep well hydraulically downgradient and approximately 500 m northwest of the landfill; part of a nested pair
MW92-7A	Shallow well hydraulically downgradient and approximately 500 m northwest of the landfill; part of a nested pair
03-3	Shallow well hydraulically downgradient and approximately 450 m northwest of the landfill; located adjacent to the treatment area
03-4	Shallow well hydraulically downgradient and approximately 550 m northwest of the landfill; located adjacent to the treatment area; historically dry
03-5	Shallow well hydraulically downgradient and approximately 750 m northwest of the landfill; located adjacent to the treatment area
BH-103	Shallow well hydraulically upgradient and approximately 670 m southeast of the landfill
BH-104(R)	Shallow well hydraulically downgradient and approximately 5 m west of the landfill; located adjacent to Cell 1; part of a nested pair; historically dry
BH-105(R)	Deep well hydraulically downgradient and approximately 5 m west of the landfill; located adjacent to Cell 1; part of a nested pair
15-9	Shallow monitoring well, located hydraulically downgradient and approximately 35 m west of the landfill; located adjacent to Cells 1 and 3
15-10	Shallow monitoring well, located hydraulically downgradient and approximately 35 m west of the landfill; located adjacent to Cell 3
15-11	Shallow monitoring well, located hydraulically cross-gradient and approximately 30 m west of the landfill; located adjacent to newly constructed Cell 7

All monitoring wells were designed to evaluate the characteristics of shallow and, in some areas, deep groundwater in the unconsolidated surficial deposits and in suspected bedrock. The shallow

monitoring wells are screened to a maximum depth of 11 m bgs and are screened across clay till. The deep monitoring wells are screened to a maximum depth of 24 m bgs.

The groundwater monitoring well locations were chosen based on groundwater flow directions and the potential for impact to groundwater quality associated with onsite facilities. Pre-2012 data from monitoring well BH-103 were used to determine background conditions for the site, as presented in Section 4.

Well 15-11 is presented in this report but the laboratory results are presented and interpreted in the Silverberry TRD annual report.

The well completion details are summarized in Table 2.

Previous investigations at the Silverberry Landfill are summarized in Appendix C.

3 METHODS

Matrix personnel were required to comply with legislated, Matrix, and Tervita health and safety standards.

3.1 Groundwater and Leachate Sampling, and Analytical Program

Matrix personnel conducted groundwater monitoring and sampling programs on May 15, July 27, September 11, and December 7, 2018, according to the methods outlined in Appendix D.

Matrix personnel collected leachate and LDS samples in conjunction with the groundwater monitoring events during all four sampling events. The leachate vault was sampled from a dedicated sampling spigot located on the TRD facility and the LDS was sampled from a dedicated sampling culvert on the north corner of Cell 1 using a dedicated bailer (Figure 2). Samples were submitted to ALS Environmental (May) and AGAT Laboratories (July, September, and December) for analyses.

The 2018 analytical program was conducted in accordance with the Silverberry Landfill's permit, the analytical program outlined by Matrix (Matrix 2018a), and the British Columbia sampling methodology (B.C. WLAP 2013).

Groundwater samples collected in 2018 were analyzed for the following parameters:

- field-measured temperature, pH, and electrical conductivity (EC)
- general and inorganic parameters including pH, EC, calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), sulphate (SO_4), fluoride (F), nitrite-nitrogen (NO_2-N), nitrate-nitrogen (NO_3-N), nitrite/nitrate-nitrogen (NO_2/NO_3-N), total alkalinity, bicarbonate (HCO_3), hardness, TDS, phenol, and dissolved organic carbon (DOC)

- dissolved metals, including aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), lithium (Li), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), tin (Sn), titanium (Ti), uranium (U), vanadium (V), and zinc (Zn)
- petroleum hydrocarbons (PHC) including benzene, toluene, ethylbenzene, and xylenes (BTEX); styrene, volatile petroleum hydrocarbons (VPHw), volatile hydrocarbons (VHw), extractable petroleum hydrocarbons (EPHw; [C_{10}-C_{19}] and [C_{19}-C_{32}]), light extractable petroleum hydrocarbons (LEPHw), heavy extractable petroleum hydrocarbons (HEPHw), and methyl *tert*-butyl ether (MTBE)
- polycyclic aromatic hydrocarbons (PAHs)
- naturally occurring radioactive materials (NORM) isotopes including Pb-210, Ra-226, Ra-228, gross alpha, gross beta, Th-228, Th-230, Th-232, U-234, U-235, and U-238

NORM groundwater analyses adhere to the proposed NORM groundwater monitoring program that was submitted on October 3, 2017 to fulfill the requirements of Section 6.4.1 and the approval response from the Ministry of Environment and Climate Change Strategy (B.C. Env) for the proposed program that commenced in 2017 (Matrix 2018a).

In 2018, leachate and LDS samples were collected and analyzed for the parameters listed above. Leachate vault 1 was sampled during all monitoring events but field parameters were not analyzed due to the presence of free product. In May and July 2018, NORM analyses were not collected from Leachate Vault 1 due to limited sample volume. In September 2018, some isotopes could not be analyzed due to the amount of free product in the leachate sample.

The general rationale and description for the use of specific analyses is discussed in Appendix E.

3.2 Recent Changes to Monitoring and Sampling Program

In 2018, changes to the sampling and monitoring program included the following:

- Monitoring wells 03-4 and BH-104(R) were not sampled by Matrix in accordance with the groundwater monitoring program due to dry conditions. Monitoring well 03-4 has been dry since 2011. BH104 and its replacement well BH104(R) have been dry since 2004 and 2015, respectively.

- Monitoring wells BH-103, 03-3, 03-5, and MW92-7 had insufficient water during one or more sampling events. Matrix was unable to collect samples for one or more of the following parameters: field parameters, general and inorganic parameters, dissolved metals, and PAHs.

- Groundwater samples were collected for NORM isotopes in 2018 as per the proposed program that was submitted and approved in 2017.

3.3 Regulatory Framework

Matrix assessed groundwater quality at the site using the contaminated sites regulation (CSR) most conservative water standards that are protective of freshwater aquatic life, livestock and irrigation watering and drinking water use (Province of British Columbia 2018b) and *Protocol 21 for Contaminated Sites: Water Use Determination* (B.C. ENV 2017).

Water quality results were also compared to historical groundwater quality data from 2008 to 2012 which was interpreted to be representative of baseline conditions for the site (Monitoring well BH-103 is located hydraulically upgradient of the landfill and onsite facilities; Figure 2).

NORM concentrations in groundwater were compared to Alberta Tier 1 Soil and Groundwater Remediation Guidelines (Tier 1; AEP 2016), as outlined in the proposed NORM groundwater monitoring program (Matrix 2018b). Applicable pathways included natural area, agricultural, residential/parkland and commercial/industrial. The Guidelines for Canadian Drinking Water Quality Summary Table (CDWQ; Health Canada 2017) are also provided for reference purposes.

There are currently no Tier 1 guidelines for gross alpha or gross beta isotopes; additionally, there are currently no CSR guidelines for NORMs in groundwater (Province of British Columbia 2018b).

4 RESULTS

4.1 Groundwater Flow Conditions

Groundwater depth measurements were collected from all accessible monitoring wells on May 15, July 27, September 11, and December 7, 2018 (Table 2). Shallow groundwater elevations determined from the 2018 water levels are posted and contoured on Figures 6, 7, 8, and 9. Groundwater elevations measured at well BH-103 were not used for contouring, as its located approx. 600 m upgradient of site.

Groundwater elevations collected from the deeper monitoring wells, suspected to be installed in bedrock, could not be contoured due to insufficient data points.

The following is a summary of the groundwater conditions:

- In 2018, shallow groundwater was measured at depths ranging from 1.27 m (MW92-6A; July 27, 2018) to 8.51 m below ground surface [bgs]; 03-5; September 11, 2018). Deep groundwater was measured at depths ranging from 5.32 m (MW92-1; May 15, 2018) to 18.23 m btoc (MW92-7; September 11, 2018). Historical groundwater elevations are posted on Figure 10. The 2018 shallow and deep groundwater elevations were similar to historical elevations.

- Shallow groundwater beneath the site is interpreted to flow toward the northwest.

- Permeability testing at the site by previous consultants indicates an estimated hydraulic conductivity (K) within the shallow clay unit to range from 7×10^{-8} to 4×10^{-9} m/s (HBT 1994; Clifton 2002).

- In 2018, the calculated horizontal hydraulic gradient (i) within the shallow clay unit was 0.03 m/m. Groundwater flow was calculated using Darcy's equation:

$$v_L = \frac{Ki}{n_e}$$

  assuming an effective porosity (n_e) of 20% for the clay till and a maximum hydraulic conductivity of 7×10^{-8} m/s (Clifton 2002). The horizontal groundwater velocity (vL) beneath the landfill is estimated to be < 1 m/year and is consistent with historical calculations.

- In 2018, vertical hydraulic gradient beneath the landfill were estimated using measured water depths in nested well pairs MW92-1/1A and MW92-7/7A (Table D). These nested well pairs consist of two wells in the same location completed at different depth intervals.

TABLE C 2018 Estimated Vertical Gradients

Nested Well Pair	Vertical Gradient (m/m)			
	May15, 2018	July 27, 2018	September 11, 2018	December 7, 2018
MW92-1/1A	0.29 (downward)	0.35 (downward)	0.46 (downward)	0.33 (downward)
MW92-7/7A	0.82 (downward)	0.30 (downward)	1.02 (downward)	1.02 (downward)

4.2 Groundwater Quality

The 2018 groundwater quality data are presented in Table 3 (Field Parameters), Table 4 (General and Inorganic Parameters), Table 5 (Dissolved Metals), Table 6 (Hydrocarbons), Table 7 (Polycyclic Aromatic Hydrocarbons), and Table 8 (Isotopes). The 2018 piper diagrams are presented on Figures 11a and 11b and historical groundwater concentrations are presented graphically on Figures 11 to 15.

Historical groundwater quality results are tabulated in Appendix F. Laboratory reports are included in Appendix G. Based on piper diagrams (Figures 11a and 11b), groundwater beneath the site is classified as a calcium/magnesium-sulphate type.

The 2018 leachate and LDS quality results are presented alongside the 2018 groundwater quality data (Tables 3 to 8) for comparative purposes in assessing leachate impact on the groundwater below and downgradient of the landfill.

4.2.1 Background

Monitoring well BH-103, located hydraulically upgradient and away from the landfill activities, was historically used to determine background conditions for the site. However, Matrix monitored the following trends in the inorganic chemistry data at this location from 2013 to 2016:

- EC, sodium, potassium, sulphate, nitrate-nitrogen, and TDS have been increasing
- pH, calcium, magnesium, bicarbonate (alkalinity), and hardness have been decreasing

The explanation for these trends were outlined in a previous monitoring report (Matrix 2018). Water quality results from 2018 appear to be consistent with 2017 results that show BH-103 parameters reverting back to average pre-2012 background concentrations.

While the data collected in 2018 indicates that the majority of the parameters listed above have returned to historical concentration levels; until these trends can be confirmed, the laboratory concentrations between 2008 and 2012 were averaged to derive background concentrations for the site and are tabulated in Table E below:

TABLE D BH-103 Background Concentrations (2008 to 2012)

pH	EC (µS/cm)	Ca (m/L)	Mg (m/L)	Na (m/L)	K (m/L)	Cl (m/L)	SO_4 (m/L)	NO_3-N (m/L)	Alkalinity (m/L)	HCO_3 (m/L)	Hardness (m/L)	TDS (m/L)
7.1	4,561	408	363	370	8.2	ND	3,054	ND-0.5	131	159	2,513	4,283

4.2.2 pH and Electrical Conductivity

Field and laboratory pH and EC results are discussed below:

- Field-measured pH values at all monitoring wells ranged from 5.5 to 7.5, and were consistent with historical measurements (Table 3; Appendix F, Table F1).

- Laboratory-measured pH values were generally higher than the corresponding field-measured pH values, likely due to a loss of carbon-dioxide, which usually occurs during the time between sample collection and sample analysis.

- Field- and laboratory-measured EC values were comparable and within historical ranges. (Tables F1 and F2).

- Laboratory-measured EC values are comparable to background values at all onsite monitoring wells. (Table 4).

4.2.3 General and Inorganic Parameters

Sodium, sulphate, and fluoride concentrations exceeded British Columbia CSR standards at one or more of the wells sampled. The 2018 results for those parameters are presented in Table 4 and are discussed

in the following subsections. Chloride, magnesium, and TDS were also graphed and are discussed below at the request of Tervita.

4.2.3.1 Sodium and Chloride

- Sodium concentrations exceeded the British Columbia CSR (DW) standard at all monitoring wells except for MW92-1A, MW92-6A, 03-3, and 03-5. The wells with exceedances were within expected background concentrations in 2018 (Table 4). Sodium concentrations at monitoring well MW92-7, screened deeper in the clay till, displays a decreasing trend.

- Fluroride concentrations exceeded the British Columbia CSR (DW) standard of 1.00 mg/L at monitoring wells MW92-7A and BH-105(R) during the July sampling event (Table 4). July marked the first time that concentrations were detected above CSR standards at these wells, but concentrations dropped below guideline limits in the following September sampling event. Concentrations at these wells, in 2018, were higher than historical values, which were all below laboratory detection limits.

- Chloride concentrations at background monitoring well BH-103 in 2018 were below CSR (DW) standard, which is consistent with historical concentrations at that well. Concentrations at all monitoring wells sampled in 2018 were below the British Columbia CSR (IW) standard of 100 mg/L, with approximately half the readings being below the laboratory method detection limit (Table 4).

- Mann-Kendall trend analysis was conducted for chloride at monitoring well 92-6A (Figures 13b and 13c). The Mann-Kendall trend test has been identified as the primary statistical analysis to be used for the detection of trends (U.S. EPA 2009).

- The Mann-Kendall trend analysis test confirmed that the chloride concentrations at monitoring well MW92-6A display no increasing or decreasing trends; this is in contrast to the increasing trend seen in chloride concentrations in 2017. Well MW92-6A is located downgradient to Cells 2 and 5 and chloride concentrations remained below 20 mg/L in 2018.

4.2.3.2 Magnesium, Sulphate, and Total Dissolved Solids

- Magnesium concentrations were within expected background concentrations at all monitoring wells sampled in 2018. There are no discernable trends over time (Figure 14; Appendix F, Table F2).

- Sulphate concentrations exceeded the British Columbia CSR (DW) standard at all monitoring wells sampled in 2018, but were within expected background concentrations (Table 4). The 2018 sulphate concentrations are within historical ranges (Figure 15; Appendix F, Table F2).

- TDS concentrations were consistent with historical data and display no apparent increasing or decreasing trends (Figure 16; Appendix F, Table F2).

4.2.3.3 Nitrate-nitrogen

In 2018, nitrate-nitrogen concentrations were below the British Columbia CSR standard (DW) of 10 mg/L and within expected background concentrations at all wells analyzed (Table 4). Nitrate-nitrogen concentrations at well BH-103 have previously been detected below British Columbia CSR standards, with a large increase in concentrations detected in samples collected between May and September 2014. Nitrate-nitrogen concentrations at well BH-103 had been displaying an increasing trend between 2013 and 2016, when it peaked at 20 mg/L, but has decreased in 2017 and 2018 to historical levels. Nitrate-nitrogen concentrations have varied across the landfill, and no increasing or decreasing trends are apparent at any of the other monitoring wells (Appendix F, Table F2).

4.2.4 Dissolved Metals

In 2018, dissolved boron, cadmium, cobalt, lithium, manganese, nickel, selenium, strontium, and uranium exceeded the British Columbia CSR standards in samples collected from select monitoring wells including background well BH-103. Results are discussed below:

- Dissolved cadmium and nickel concentrations exceeded their respective British Columbia CSR standards at background monitoring well BH-103 in September 2018 (Table 5). Results are consistent with historical data.

- Dissolved boron exceeded the standard at background well BH-103 during the May, July, and September 2018 sampling events. Historically, dissolved boron has been detected above standards at BH-103; its highest concentration was recorded in July 2018. (Appendix F, Table F3). Dissolved boron concentrations were detected above standards in several other samples collected from monitoring wells in 2018 (Table F3).

- Dissolved cobalt exceeded the British Columbia CSR standard (DW) of 0.001 mg/L at background well BH-103 (July and September), and monitoring wells MW92-6A (July), MW92-7A (May and September), 03-5, and BH-105(R). The 2018 concentrations are consistent with historical data.

- Dissolved lithium exceeded the British Columbia CSR standard (DW) of 0.008 mg/L at all monitoring wells sampled in 2018. The 2018 concentrations are consistent with historical data.

- Dissolved selenium exceeded the British Columbia CSR standard (DW) of 0.01 mg/L at monitoring well MW92-7 in December.

- Dissolved manganese, strontium, and uranium exceeded their respective British Columbia CSR standards in the majority of the monitoring wells sampled in 2018. The 2018 concentrations are consistent with historical data.

4.2.5 Dissolved Hydrocarbons and Polycyclic Aromatic Hydrocarbons

All dissolved hydrocarbons concentrations were below CSR standards, and for the most part, below laboratory methods detection limits (Table 6). Historical results indicate that since monitoring began, dissolved hydrocarbons have been detected only in samples collected from wells MW92-1 in 2009/2012, MW92-1A in 2012, MW92-7 in 2008/2011, 03-5 in 2012, and BH-104 in 2010. Toluene was detected for the first time at well BH-103 in 2017, but has since returned to below detection limit in 2018.

Dissolved PAHs were above the British Columbia CSR standards in July 2018 at MW92-6A (pyrene). Dissolved PAHs were either below the British Columbia CSR standards or below detection limits for all other monitoring wells sampled in 2018. Dissolved benzo(a)pyrene has been historically detected above the British Columbia CSR standard in monitoring wells MW92-6A, 03-5, and BH105(R). Dissolved quinolone was detected above standard at monitoring well MW92-7 in 2017 and has returned to below laboratory detection limits in 2018. Dissolved pyrene concentrations have historically been detected either above laboratory method detection limits or CSR standards in background well BH-103 and monitoring wells MW92-1, MW92-6A, MW92-7, MW92-7A, 03-3, 03-5, and BH-104.

The 2018 dissolved hydrocarbon and PAHs results are consistent with historical results and display no apparent increasing or decreasing trends at any of the monitoring wells sampled at the landfill (Appendix F, Table F5).

4.2.6 Isotopes

Various isotopes were detected in all monitoring wells sampled as part of the program but were all below Tier 1 and CDWQ guidelines in 2018 (Table 8). Isotope concentrations were generally lower in samples collected from background well BH-103 in 2018, with concentrations of PB-210, Ra-228, gross alpha, gross beta, Th-228, and Th-232 being below laboratory detection limits. Concentrations were generally lower in 2018 in comparison to results from November 2017 for the majority of the NORM parameters analyzed (Table 8).

4.3 Leachate and Leak Detection System Sample Quality

For comparison purposes, leachate quality results were compared to the British Columbia CSR standards for groundwater.

The 2018 leachate vault sample quality results are summarized below:

- Calcium, sodium, chloride, sulphate, fluoride, nitrite- and nitrate-nitrogen, and phenol concentrations measured in samples collected from the leachate vault exceeded British Columbia CSR standards and interpreted background measurements. The leachate parameters were one or more orders of magnitude higher than the measurements from all wells in 2018, with the exception of sulphate concentrations; sulphate concentrations were an order of magnitude lower than

expected background groundwater concentrations. The 2018 results are consistent with historical data (Appendix F, Table F2).

- Dissolved arsenic, barium, boron, chromium, cobalt, iron, lithium, manganese, molybdenum, nickel, selenium, strontium, uranium, and validium concentrations exceeded the British Columbia CSR (DW) standards in 2018 in one or more of the leachate vault samples (Table 5). Chromium exceeded the standard for the first time in 2018. The rest of the parameters have historically been detected in the leachate samples, showing variable concentrations from year to year (Appendix F, Table F3).

- Several dissolved hydrocarbons and PAH parameters were detected in the samples collected from the leachate vault in 2018 and exceeded the British Columbia CSR (DW and AW) standards (Table 6). The highest hydrocarbon concentrations were in the C_{10} to C_{19} range (Table 6). Various PAHs were detected above both British Columbia CSR (DW and AW) standards in leachate samples collected in 2018, including several PAHs not detected in any of the monitoring wells at the landfill (Table 7).

- Isotope Ra-228 was detected in the leachate sample but at a value less than the Tier 1 guideline (Table 8).

The 2018 LDS samples quality results are summarized below:

- Sodium LDS concentrations exceeded the British Columbia CSR (DW) standard of 200 mg/L in July 2018. Calcium concentrations collected from the LDS exceeded the British Columbia CSR livestock standard of 1,000 mg/L in 2017 and returned to below standard in 2018. Chloride concentrations from samples collected from the LDS exceeded the CSR standards in 2018, except in May and December (Table 4).

- Sulphate concentrations exceeded the British Columbia CSR standard of 500 mg/L at the LDS in 2018 (Table 4). Nitrite-nitrogen and nitrite and nitrate-nitrogen exceeded their respective British Columbia CSR standards in July 2018. Concentrations in 2018 at the LDS were comparable to background and historical concentrations and show no discernible trends.

- Cobalt, iron, lithium, manganese, and uranium exceeded their respective British Columbia CSR standards in 2018. The cobalt concentrations appear to be increasing overtime whereas the manganese and uranium concentrations have been variable over time with no discernable trends at the LDS.

- Dissolved hydrocarbons were not detected above British Columbia CSR standards in samples collected from the LDS in 2018 (Table 6). EPH (C_{10}-C_{19}) and HEPH have historically been measured above and below the standards from 2011 to 2016.

- PAHs concentrations were either not detected or below the British Columbia CSR standards in all LDS samples collected in 2018. PAHs concentrations have historically been detected in the LDS samples; varying from year to year at the LDS and they show no discernible trends (Appendix F, Table F5).

4.4 Quality Control Sample Results

In accordance with Matrix's standard practices, quality control (QC) protocols were followed for the sampling program. The QC measures included collecting and analyzing duplicate samples, submitting trip blanks and field blanks for dissolved hydrocarbons and PAHs analysis, and reviewing the results of the laboratory-reported QC measures. The results from duplicate samples help monitor the quality of sampling and analysis. A detailed description of these QC measures is provided in Appendix H. QC sample results are included in Appendix I.

While the reproducibility of some routine and dissolved metal parameters in select duplicate results were judged to be poor, from samples collected in May, July and December,there were no concerns with the overall quality of the laboratory results.

5 CONCLUSIONS

The following conclusions are based on the results of the 2018 groundwater monitoring and sampling program conducted at the Silverberry Landfill:

- In 2018, the calculated horizontal groundwater velocity beneath the site in the shallow clay till was estimated to be < 1 m/year and is consistent with historical calculations. Groundwater was interpreted to flow toward the northwest.

- The ongoing changes in inorganic parameters at BH-103 observed since the 2013 sampling events were not observed with the 2018 data; inorganic parameter concentrations generally returned to their pre-2012 background levels. The trending data that started in 2013 is believed to be the result of till material oxidation at this location; data observed in 2018 could be the result of the oxidation effects beginning to wane. Pre-2012 data from this well was used to establish background conditions at the site until further sampling confirms if concentrations at the background well have returned to original compositions.

- Chloride concentrations were below the British Columbia CSR (IW) standard at all monitoring wells sampled in 2018.

- Fluoride concentrations exceeded the British Columbia CSR (DW) standard of 1.00 mg/L at monitoring wells MW92-7A and BH-105(R) during the July sampling event. July marked the first time that concentrations were detected above CSR standards at these wells, but concentrations dropped

below standard in the following September sampling event. Concentrations at these wells, in 2018, were higher than historical values, which were all below laboratory detection limits.

- All general and inorganic parameters measured in 2018 are generally consistent with historical data at all non-background monitoring wells.

- In 2018, several dissolved metals concentrations in samples collected from well BH-103 exceeded the British Columbia CSR standards. Dissolved boron has stayed within historical range, until the July 2018 sampling event when its highest concentration was recorded. All other parameters appear to be consistent with historical data. Concentrations of dissolved selenium and uranium have been detected at monitoring wells across the landfill historically, but were below laboratory method detection limits in 2018.

- In 2018, dissolved PHCs and PAHs were either not detected or were below the British Columbia CSR standards in samples collected from all onsite wells. These concentrations were consistent with historical data.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells.

- Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected from the monitoring wells in 2018. Chromium exceeded the standard in leachate samples for the first time in 2018. The rest of the parameters have historically been detected in the leachate samples, showing variable concentrations from year to year.

- Several dissolved PHC and PAH concentrations exceeded the British Columbia CSR standards in the samples collected from the leachate vault in 2018.

- LDS results in 2018 were consistent with historical data. Samples collected from the LDS had concentrations of sodium, chloride, sulphate, nitrite-nitrogen, NO_2+NO_3-N, and select dissolved metals that exceeded their respective British Columbia Standards. PHCs and PAHs concentrations were either not detected or below the British Columbia CSR standards in all LDS samples collected in 2018.

- NORM concentrations analyzed in groundwater samples collected in 2018 were consistent with 2017 data.

In conclusion, based on the results of the groundwater chemistry data collected in 2018, the activities of the Silverberry Landfill do not appear to have impacted the groundwater below the site.

6 RECOMMENDATIONS

Based on the requirements of the permit, the results of the 2018 groundwater monitoring program, and the previous investigations, Matrix recommends reducing NORM sampling in 2019 to a semi-annual basis and otherwise continuing with the quarterly groundwater monitoring and sampling program in 2019.

7 REFERENCES

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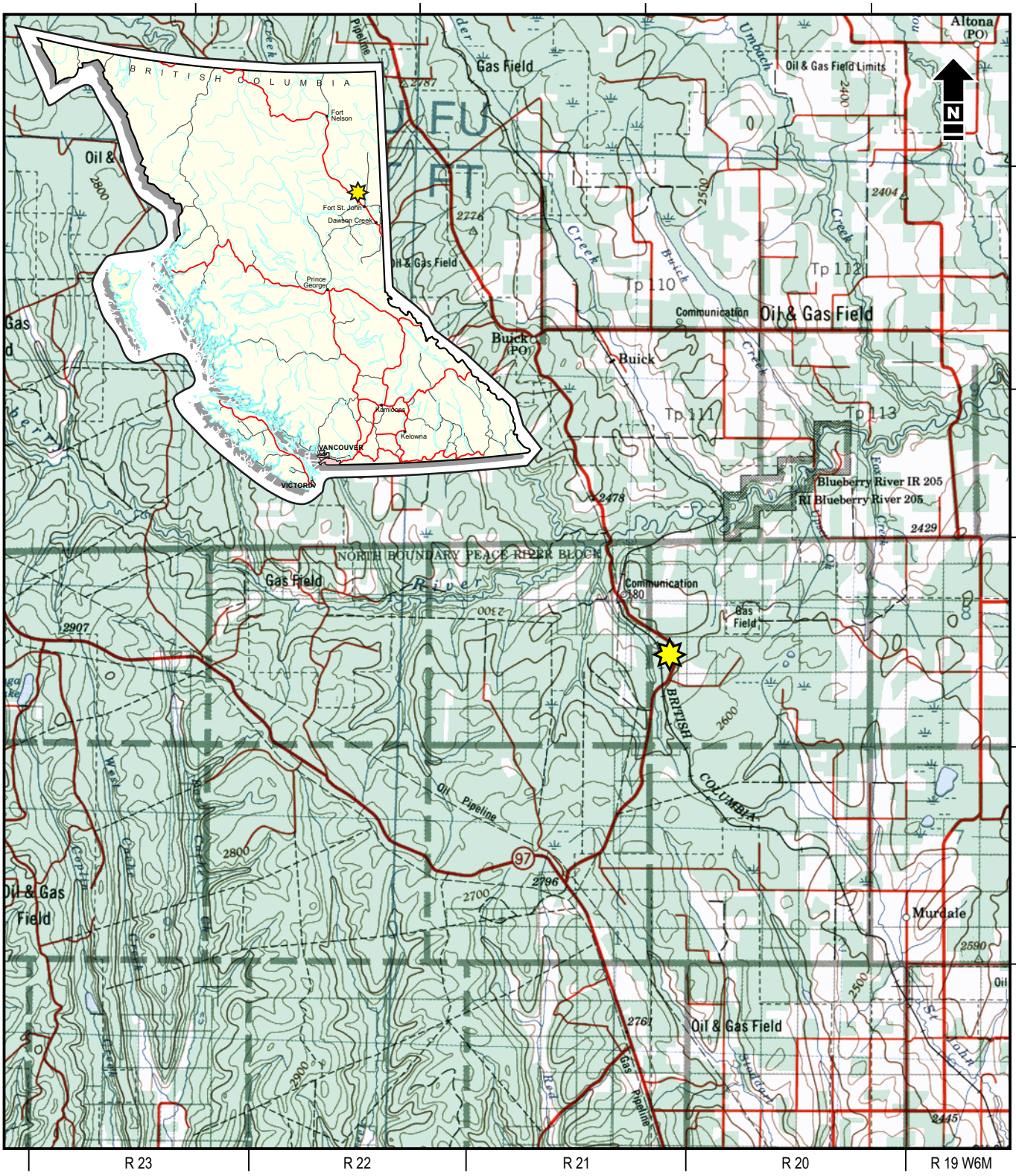

Site Location

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Tervita Corporation
Block A 18-088-20 W6M

Site Location Map

1:250,000
2,500 0 2,500 5,000 metres

Reference: 94A (Charlie Lake), Edition 3, UTM Zone 10, NAD27

Date:	Project:	Technical:	Reviewer:
January 2019	17507-LP-18	N. Jagoda	E. Eddington

Figure 1

F:\17507\Drafting\2018\17507-LP-18.cdr

Plot 11 = Tabloid (L)

Easting (m)

612000 612200 612400 612600 612800 613000 613200 613400 613600 613800 614000

Northing (m)

6278200 6278000 6277800 6277600 6277400 6277200 6277000 6276800 6276600

N

A

MW92-1A MW92-1

03-5

B

MW92-7A MW92-7

03-4

SILVERBERRY TREATMENT FACILITY

03-3

TOPSOIL STOCKPILE

SUBSOIL STOCKPILE

TOPSOIL STOCKPILE

COMMON STOCKPILE

ACCESS ROAD

MW92-6A

BH-105 BH-104

BH-105(R) BH-104(R)

ACCESS ROAD

TRD

STORMWATER DETENTION POND

Leachate Vault 1

CELL 1

CELL 2

CELL 5

15-9

ACCESS ROAD

LEACHATE POND

FRAC WATER POND

CELL 3

CELL 4

15-10

CELL 6

TOPSOIL STOCKPILE

SUBSOIL STOCKPILE

CELL 7

COMMON STOCKPILE

BARBED WIRE FENCE

15-11

B'

BH-101

A'

BH-103

Monitoring Well

Monitoring Well - Decommissioned

Cross-section Location

1:7500 metres

75 0 75 150

UTM83-10

Reference: Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012. September 18 - October 8, 2010 aerial photography obtained from Valtus Imagery Services.

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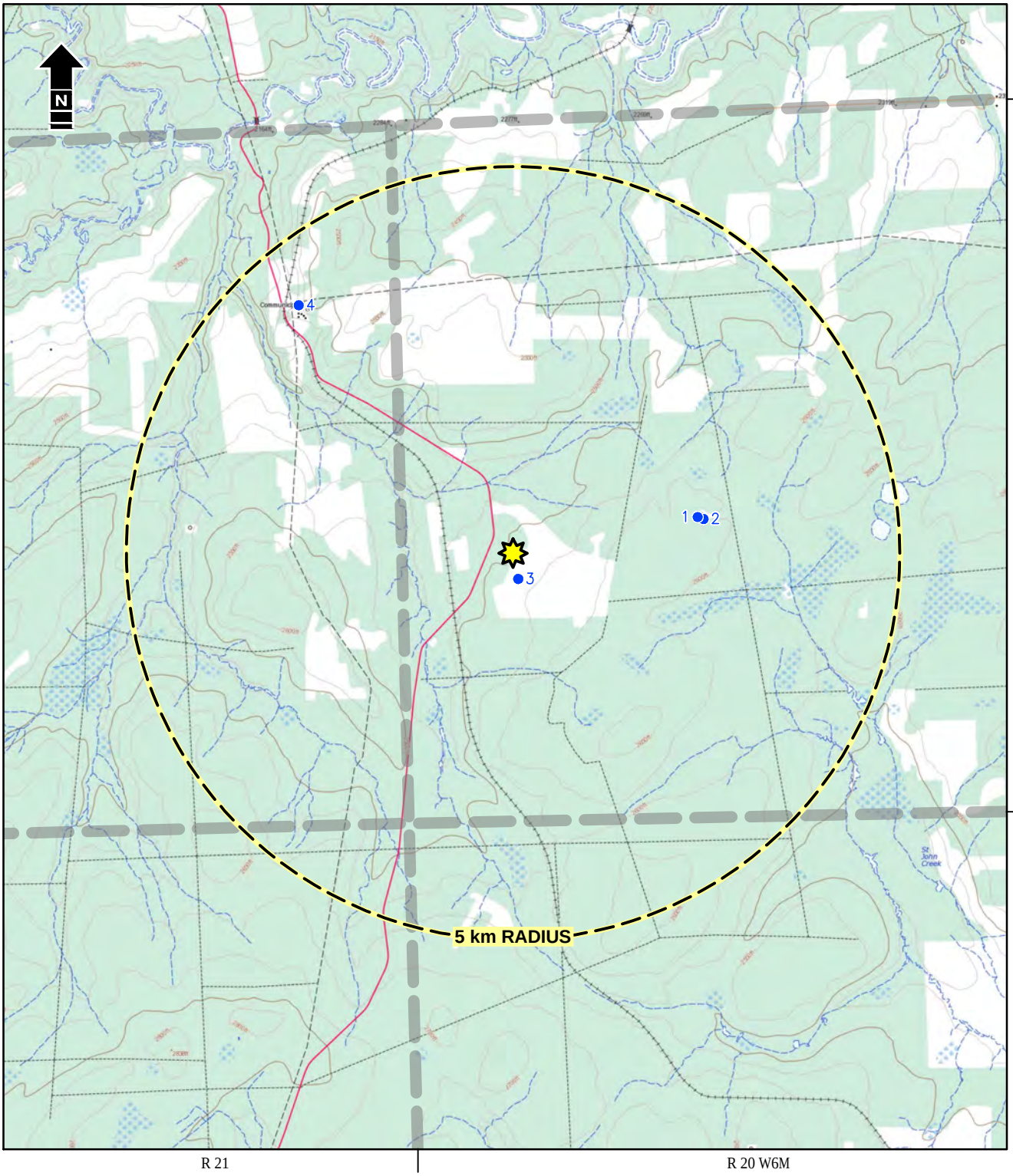
Block A 18-088-20 W6M

Site Plan

Date:	Project:	Technical:	Reviewer:
January 2019	17507-SP-18	N. Jagoda	E. Eddington

Figure 2

F:\17507\Drafting\20181\7507-SP-18.dwg - Site - Thursday, December 20, 2018 3:13:59 PM - Diego Cortese



Approximate Site Location

Water Wells (locations are approximate and not field verified)

1:75000 metres

750 0 750 1500

UTM83-10

Reference: 094A11 (Murdale), Edition 4, UTM Zone 11, NAD 83,

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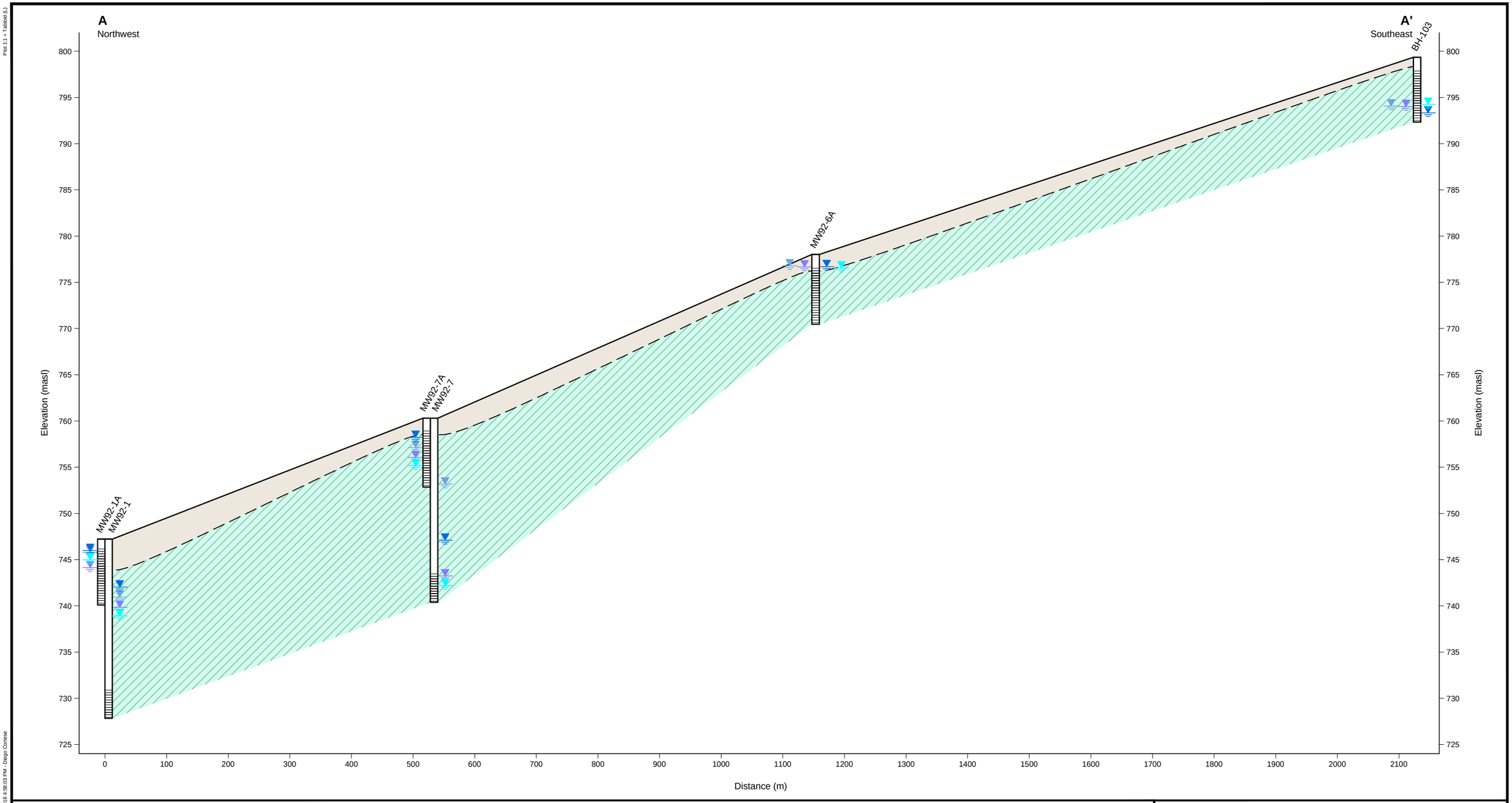
Block A 18-088-20 W6M

Regional Topography Including Water Wells Within a 5 km Radius

Date:	Project:	Technical:	Reviewer:
January 2019	17507-RT-18	N. Jagoda	E. Eddington

Figure 3



Fill

Clay Till

Monitoring Well

- Solid Pipe
- Water Level - May 15, 2018
- Water Level - July 27, 2018
- Water Level - September 9, 2018
- Water Level - December 7, 2018
- Screened Interval

Note: The cross-section is interpreted from geological principles. Information is known only at the locations investigated and interpretation may change if additional information becomes available.

1:400 metres
4 0 4 8
Vertical Scale

1:6000
60 0 60 120
Horizontal Scale

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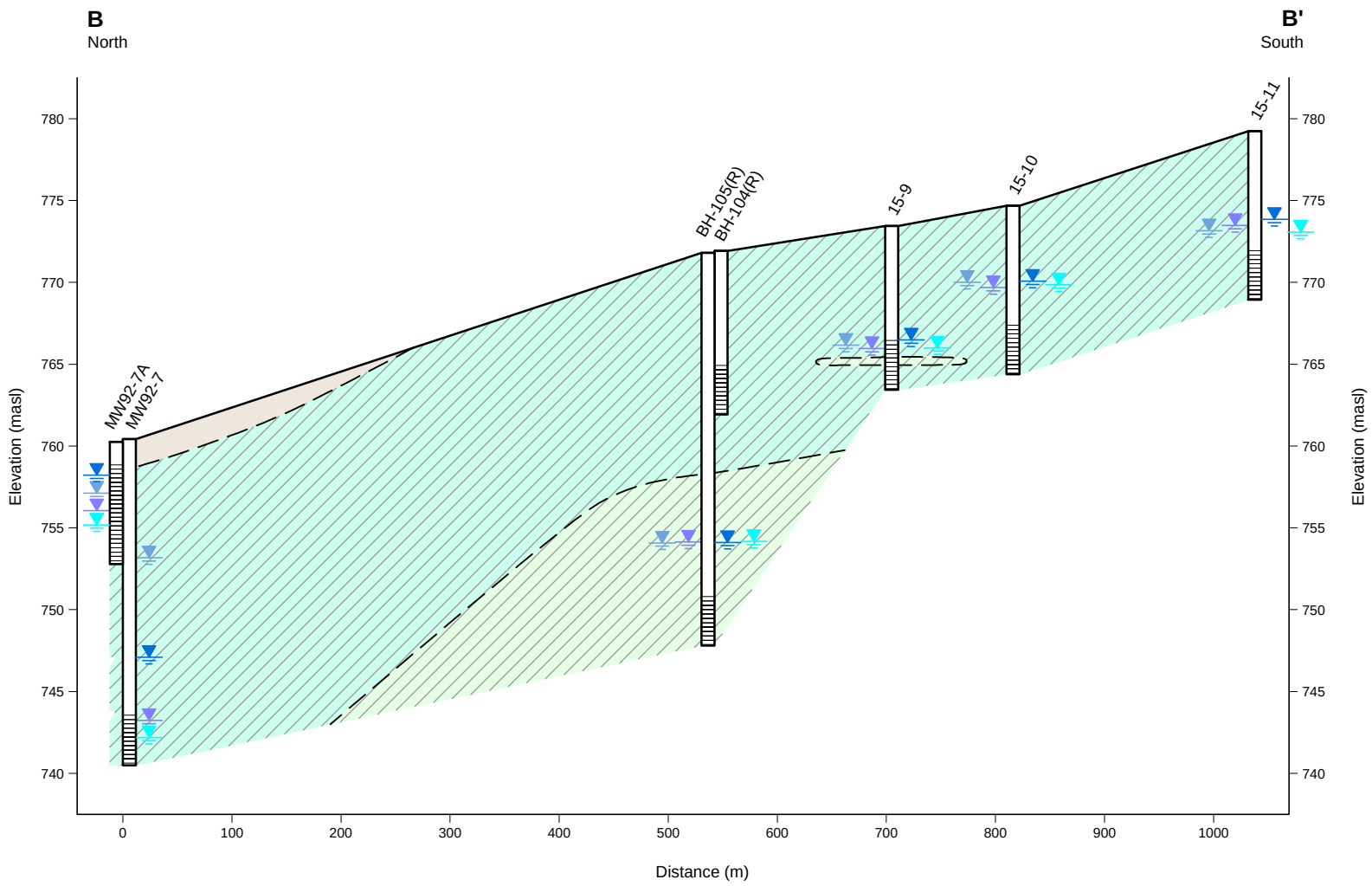
Block A 18-088-20 W6M

Geologic Cross-section A-A'

Date:	Project:	Technical:	Reviewer:
January 2019	17507-XS-18	N. Jagoda	E. Eddington

Figure 4



Fill

Clay Till

Clayey Silt

Monitoring Well

Solid Pipe

Water Level - May 15, 2018

Water Level - July 27, 2018

Water Level - September 9, 2018

Water Level - December 7, 2018

Screened Interval

Note: The cross-section is interpreted from geological principles. Information is known only at the locations investigated and interpretation may change if additional information becomes available.

1:400 metres

4 0 4 8

Vertical Scale

1:6000

60 0 60 120

Horizontal Scale

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Block A 18-088-20 W6M

Geologic Cross-section B-B'

Date:	Project:	Technical:	Reviewer:
January 2019	17507-XS-18	N. Jagoda	E. Eddington

Figure 5

Easting (m)

612000 612200 612400 612600 612800 613000 613200 613400 613600 613800 614000

Northing (m)

6278200 6278000 6277800 6277600 6277400 6277200 6277000 6276800 6276600

N

MW92-1A 745.98
MW92-1 742.03*
03-5 743.07
03-4 dry*
MW92-7A 758.22
MW92-7 747.10*
03-3 750.42
MW92-6A 776.69
BH-105 754.11*
BH-104
BH-105(R)
BH-104(R) dry*
15-9 766.48
15-10 770.07
15-11 773.84
BH-101
BH-103 793.34*
Leachate Vault 1

745 750 755 760 765 770 775

SILVERBERRY TREATMENT FACILITY
STORMWATER DETENTION POND
LEACHATE FRAC WATER POND
TRD
ACCESS ROAD
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
CELL 6
CELL 7
TOPSOIL STOCKPILE
SUBSOIL STOCKPILE
COMMON STOCKPILE
BARBED WIRE FENCE

Monitoring Well
Monitoring Well - Decommissioned
776.69 Groundwater Elevation (masl)
750 Groundwater Contour (masl)
Groundwater Flow Direction
* Not Used for Contouring

1:7500
75 0 75 150 metres
UTM83-10

Reference: Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012.

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Tervita Corporation
Block A 18-088-20 W6M

Groundwater Flow Map
May 15, 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-SP-18	N. Jagoda	E. Eddington

Figure 6

Easting (m)

612000 612200 612400 612600 612800 613000 613200 613400 613600 613800 614000

Northing (m)

6278200 6278000 6277800 6277600 6277400 6277200 6277000 6276800 6276600

N

MW92-1A 745.75
MW92-1 740.94*
03-5 742.48
03-4 unable to sample
MW92-7A 757.12
MW92-7 753.17*
03-3 750.75
MW92-6A 776.79
BH-105 754.08*
BH-104
BH-105(R)
BH-104(R) dry*
Leachate Vault 1
15-9 766.16
15-10 770.00
15-11 773.15
BH-101
BH-103 794.08*

745 750 755 760 765 770 775

SILVERBERRY TREATMENT FACILITY
TOPSOIL STOCKPILE
SUBSOIL STOCKPILE
COMMON STOCKPILE
ACCESS ROAD
TRD
STORMWATER DETENTION POND
LEACHATE FRAC WATER POND
CELL 3
CELL 4
CELL 5
CELL 6
CELL 7
BARBED WIRE FENCE

Monitoring Well
Monitoring Well - Decommissioned
776.79 Groundwater Elevation (masl)
770 Groundwater Contour (masl)
Groundwater Flow Direction
* Not Used for Contouring

1:7500 metres
75 0 75 150
UTM83-10

Reference: Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012.

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Tervita Corporation
Block A 18-088-20 W6M

Groundwater Flow Map
July 27, 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-SP-18	N. Jagoda	E. Eddington

Figure 7

Easting (m)

612000 612200 612400 612600 612800 613000 613200 613400 613600 613800 614000

Northing (m)

6278200 6278000 6277800 6277600 6277400 6277200 6277000 6276800 6276600

N

MW92-1A 744.98
MW92-1 738.90*
03-5 742.21
03-4 dry*
MW92-7A 755.18
MW92-7 742.19*
03-3 750.58
MW92-6A 776.54
BH-105 754.17*
BH-104
BH-105(R)
BH-104(R) dry*
15-9 766.00
15-10 769.85
15-11 773.07
BH-101
BH-103 794.25*
Leachate Vault 1

745 750 755 760 765 770 775

SILVERBERRY TREATMENT FACILITY
TRD
STORMWATER DETENTION POND
LEACHATE FRAC WATER POND
ACCESS ROAD
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
CELL 6
CELL 7
TOPSOIL STOCKPILE
SUBSOIL STOCKPILE
COMMON STOCKPILE
BARBED WIRE FENCE

Monitoring Well
Monitoring Well - Decommissioned
740.50 Groundwater Elevation (masl)
750 Groundwater Contour (masl)
Groundwater Flow Direction
* Not Used for Contouring

1:7500
metres
75 0 75 150
UTM83-10

Reference: Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012.

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Tervita Corporation
Block A 18-088-20 W6M

Groundwater Flow Map
September 11, 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-SP-18	N. Jagoda	E. Eddington

Figure 8

Easting (m)

612000 612200 612400 612600 612800 613000 613200 613400 613600 613800 614000

Northing (m)

6278200 6278000 6277800 6277600 6277400 6277200 6277000 6276800 6276600

N

MW92-1A 744.14
MW92-1 739.83*
03-5 742.54
MW92-7A 756.05
MW92-7 743.24*
03-4 dry*
03-3 752.11
MW92-6A 776.67
BH-105 754.13*
BH-104 BH-105(R) BH-104(R) dry*
15-9 765.95
15-10 769.68
15-11 773.47
BH-101
BH-103 794.03*
Leachate Vault 1

745 750 755 760 765 770 775

SILVERBERRY TREATMENT FACILITY
STORMWATER DETENTION POND
LEACHATE FRAC WATER POND
TRD
ACCESS ROAD
CELL 1
CELL 2
CELL 3
CELL 4
CELL 5
CELL 6
CELL 7
TOPSOIL STOCKPILE
SUBSOIL STOCKPILE
COMMON STOCKPILE
BARBED WIRE FENCE

- Monitoring Well
- Monitoring Well - Decommissioned
- 776.67 Groundwater Elevation (masl)
- 755 Groundwater Contour (masl)
- Groundwater Flow Direction
- * Not Used for Contouring

1:7500
75 0 75 150 metres
UTM83-10

Reference: Site Plan from NLR/AE Consultants, Project No. 20123525-35-307, Rev. No. A, dated November 26, 2012.

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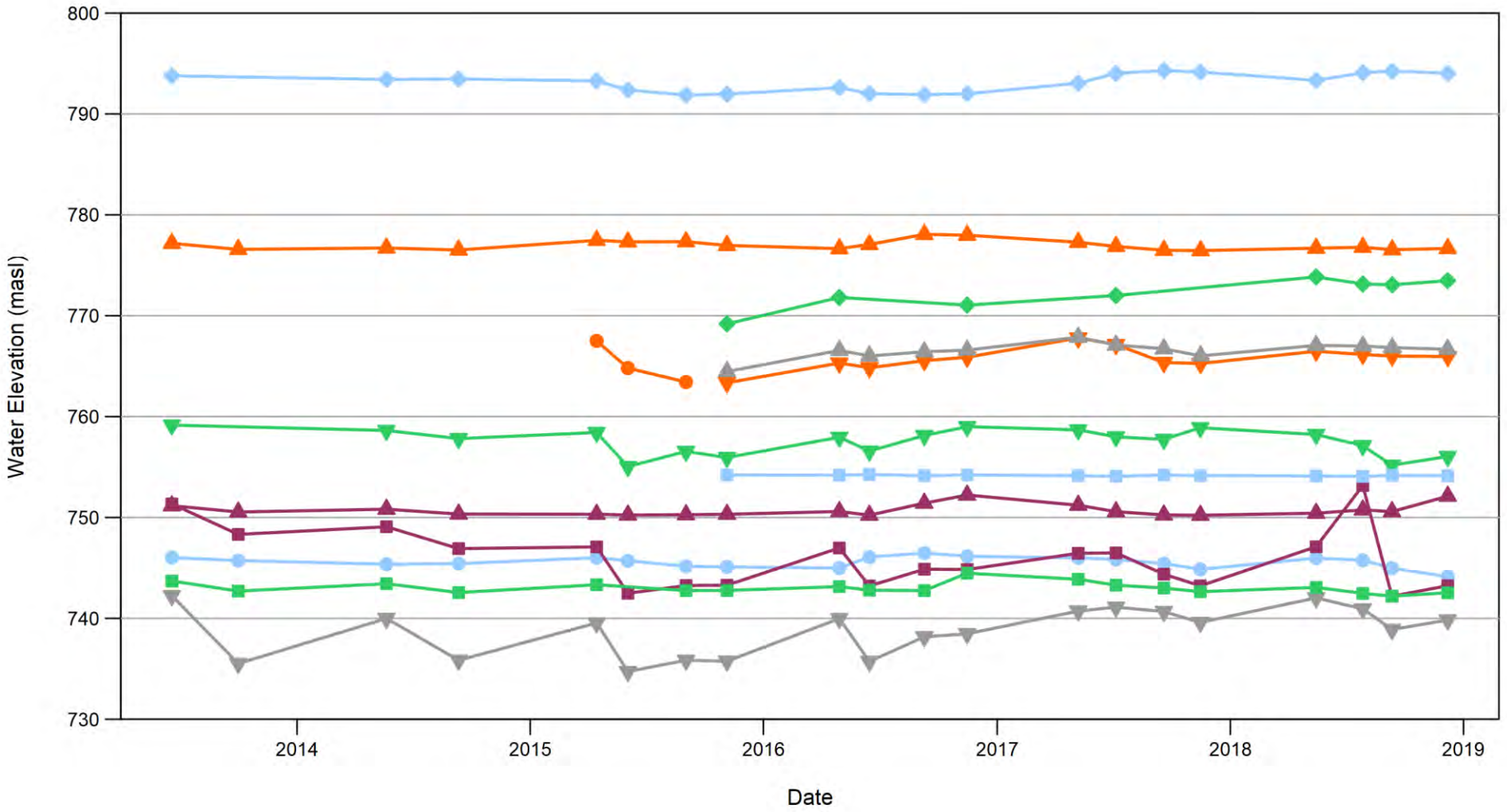
Block A 18-088-20 W6M

Groundwater Flow Map
December 7, 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-SP-18	N. Jagoda	E. Eddington

Figure 9



MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A
03-3
03-5
BH-103
BH-104
BH-105(R)
15-9
15-10
15-11

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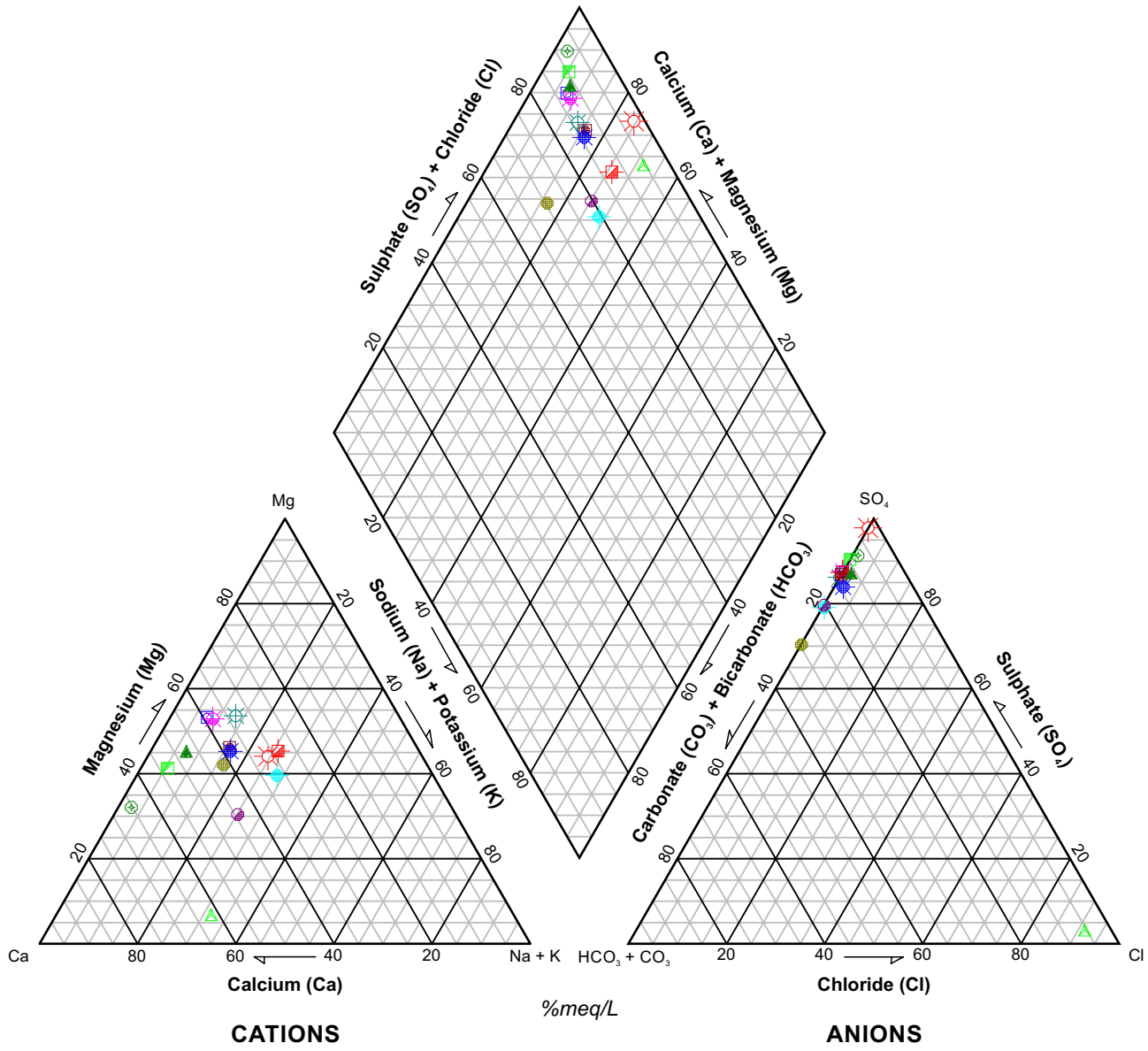
Block A-18-088-20 W6M

Historical Water Elevations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure 10



- BH-103
- MW92-1
- MW92-1A
- MW92-6A
- MW92-7
- MW92-7A
- 03-3
- 03-5
- BH-105(R)
- 15-9
- 15-10
- 15-11
- Leachate Vault 1
- Leak Detection System

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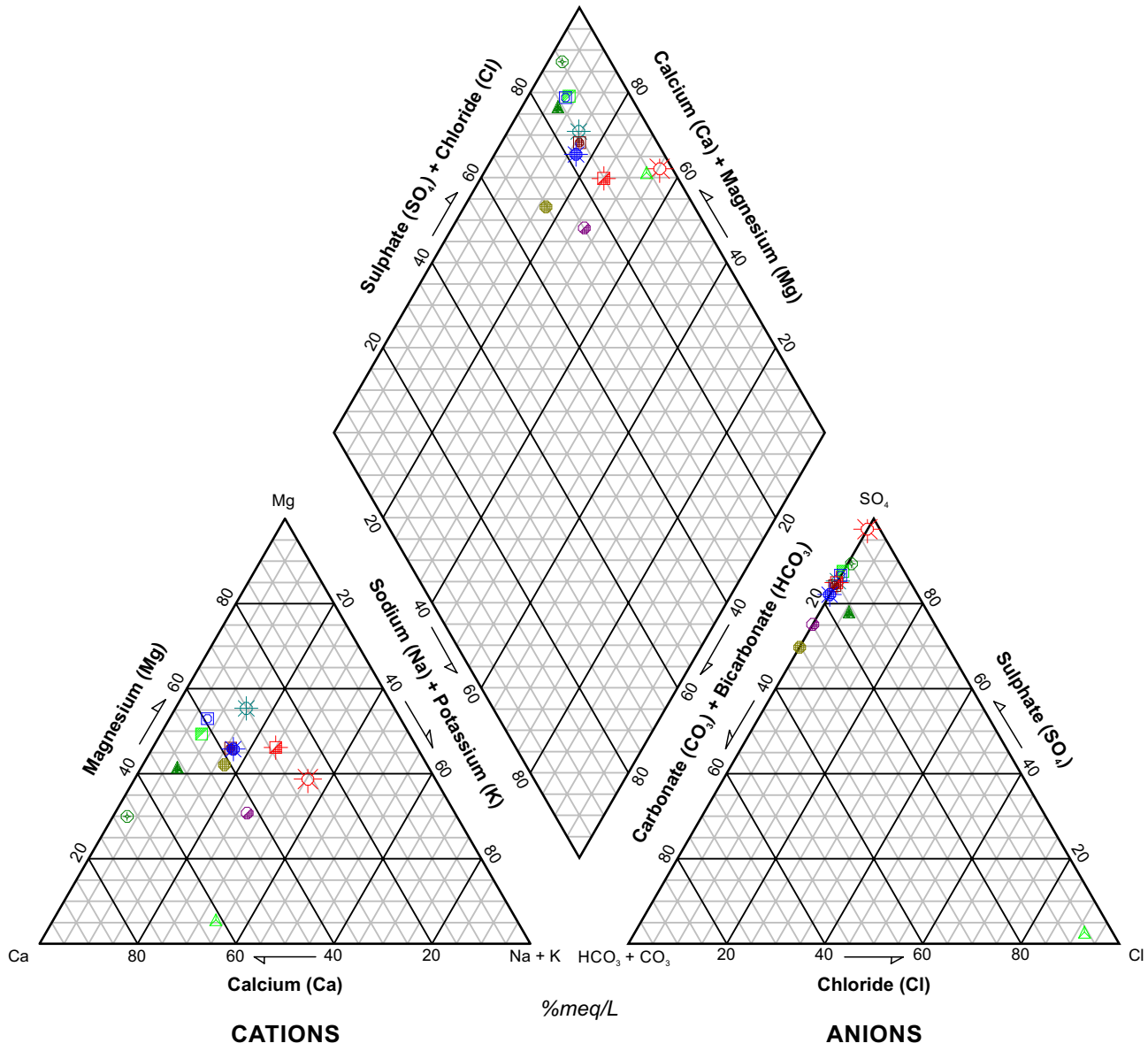
Tervita CorporationClient
Block A-18-088-20 W6M

Piper Diagram - May 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-PD-18	A. Hum	E. Eddington

Figure 11a

F:\17507\Drafting\2018\17507-PD-18.cdr



- BH-103
- MW92-1
- MW92-1A
- MW92-6A
- MW92-7A
- 03-3
- BH-105(R)
- 15-9
- 15-10
- 15-11
- Leachate Vault 1
- Leak Detection System

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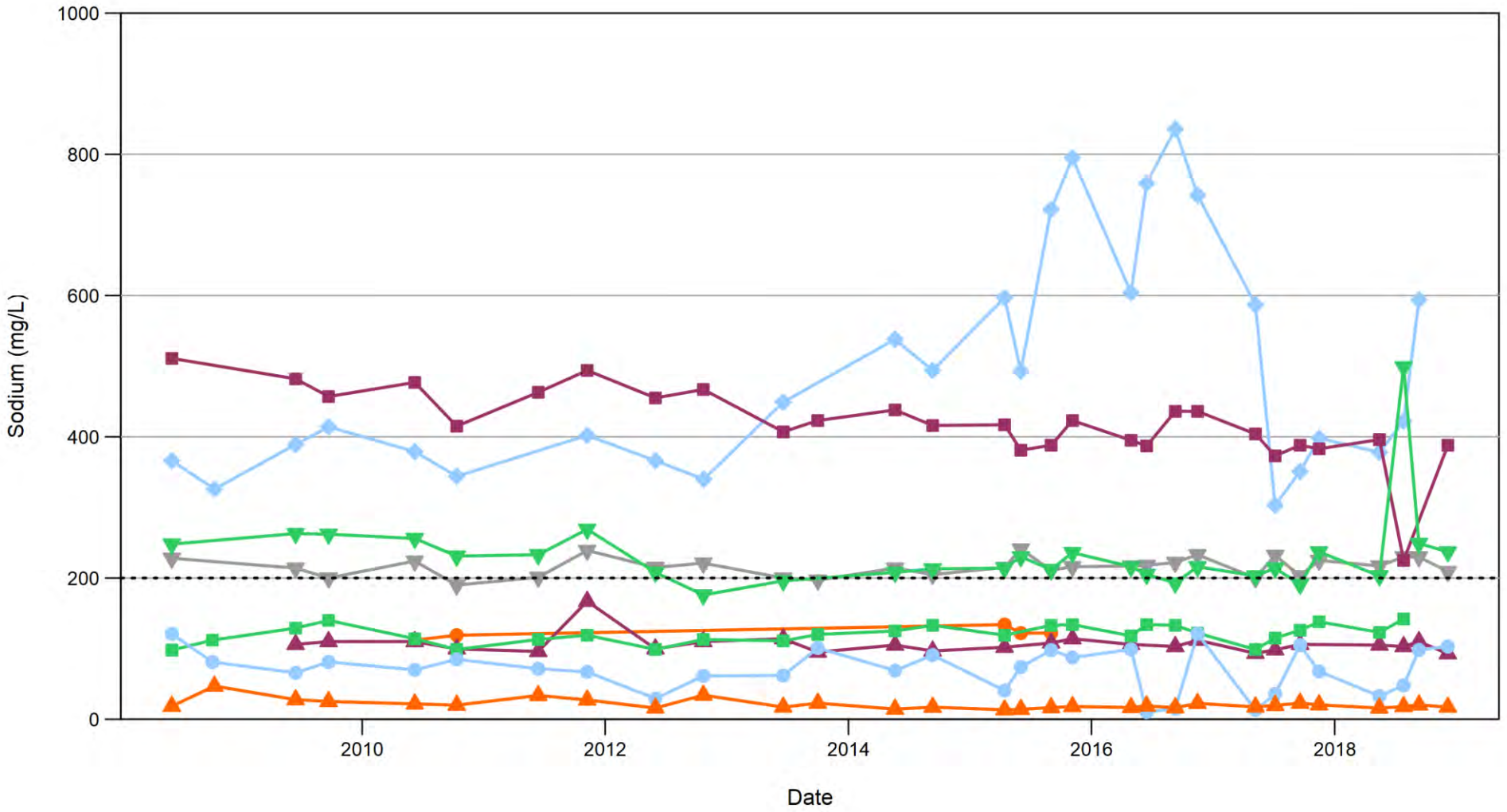
Tervita CorporationClient
Block A-18-088-20 W6M

Piper Diagram - September 2018

Date:	Project:	Technical:	Reviewer:
January 2019	17507-PD-18	A. Hum	E. Eddington

Figure 11b

F:\17507\Drafting\2018\17507-PD-18.cdr



BH-103
BH-104
03-3
03-5
MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A

B.C. Contaminated Sites Regulation 375/96 - Drinking Water Standards (2018) = 200 mg/L

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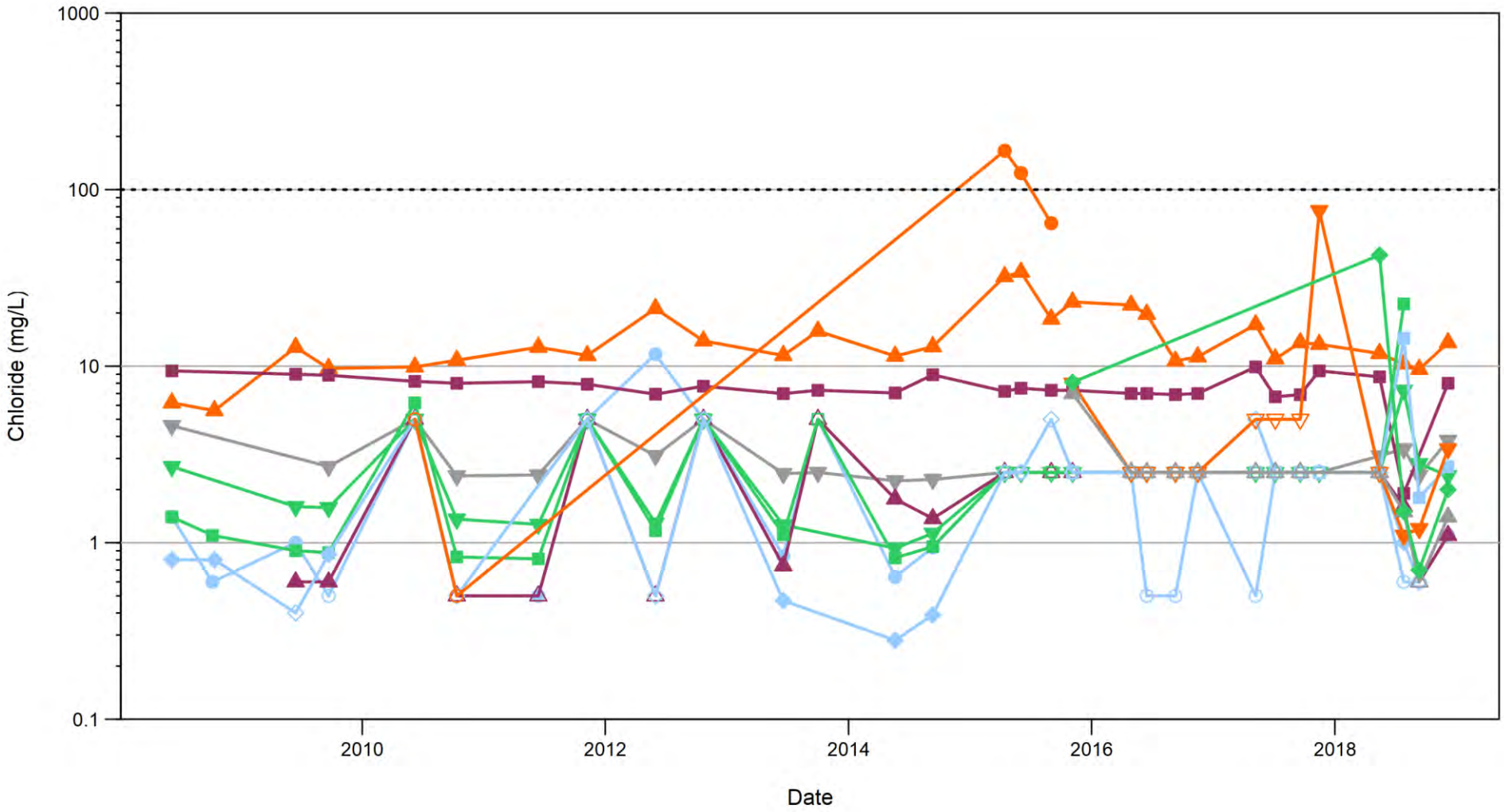
Tervita Corporation
Block A-18-088-20 W6M

Historical Sodium Concentrations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure 12



MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A
03-3
03-5
BH-103
BH-104
BH-105(R)
15-9
15-10
15-11

Non Detect (Open Symbol)

B.C. Contaminated Sites Regulation 375/96 - Irrigation Standards (2018) = 100 mg/L

Matrix Solutions Inc.
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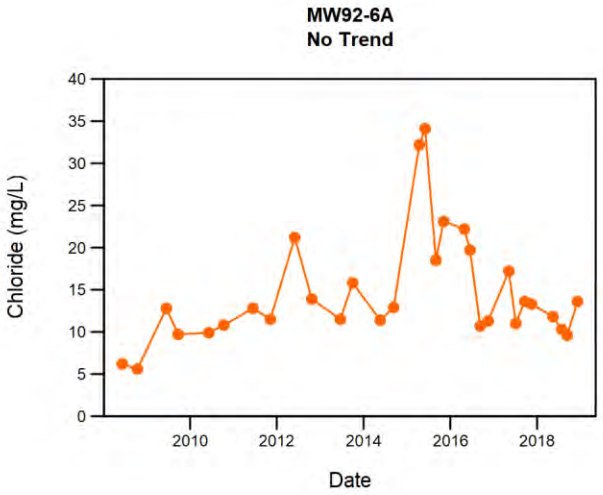
Tervita Corporation
Block A-18-088-20 W6M

Historical Chloride Concentrations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure
13a



Chloride
B.C. Contaminated Sites Regulation 375/96 - Irrigation Standards (2018) = 100 mg/L

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Tervita Corporation
Block A-18-088-20 W6M

Mann-Kendall Trend Analysis - Chloride - MW92-6A

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure
13b

FIGURE 13c

Mann-Kendall Statistical Summary

Tervita Corporation

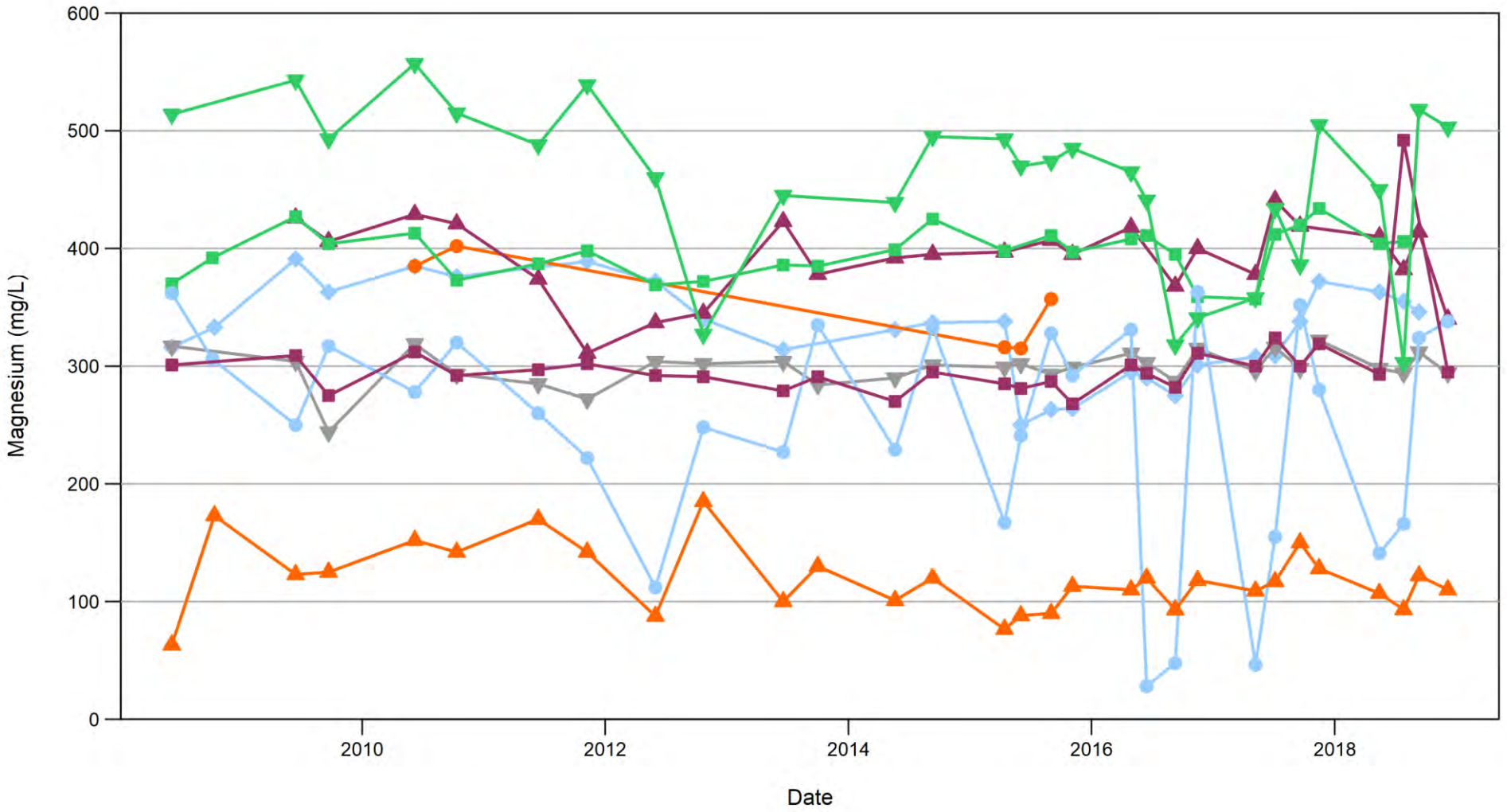
Block A-18-088-20 W6M

Well	Analyte	Statistical Trend Detected (α=0.05)	Mann-Kendall p-value	Sen Slope
MW92-6A	Chloride	no	0.276	---

Notes:

--- - not applicable

- *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance* (U.S.EPA 2009)



BH-103
BH-104
03-3
03-5
MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A

Matrix Solutions Inc.
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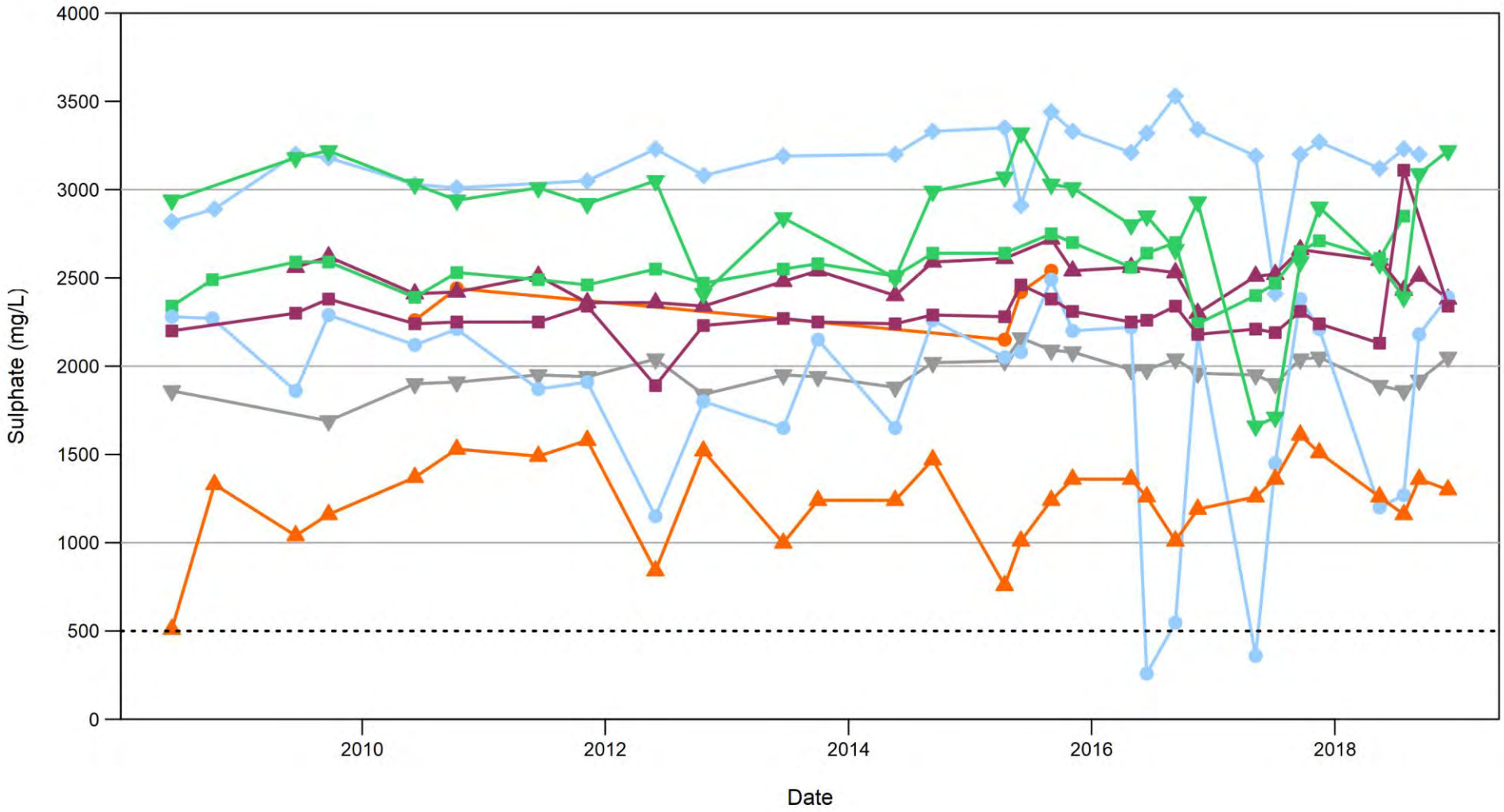
Tervita Corporation
Block A-18-088-20 W6M

Historical Magnesium Concentrations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure 14



BH-103
BH-104
03-3
03-5
MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A

B.C. Contaminated Sites Regulation 375/96 - Drinking Water Standards (2018) = 500 mg/L

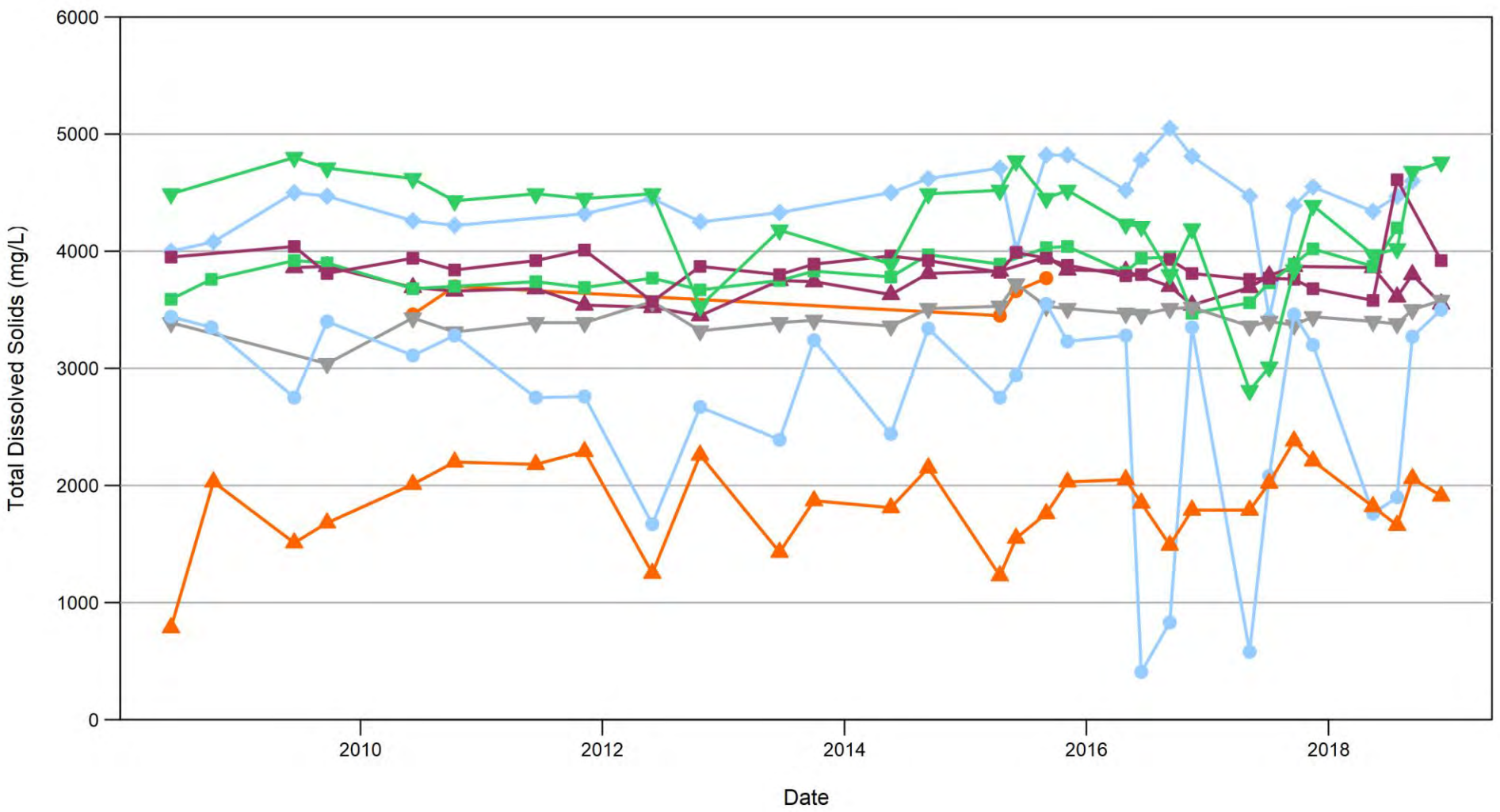
Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Tervita Corporation
Block A-18-088-20 W6M

Historical Sulphate Concentrations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure 15



BH-103
BH-104
03-3
03-5
MW92-1
MW92-1A
MW92-6A
MW92-7
MW92-7A

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

Tervita Corporation
Block A-18-088-20 W6M

Historical Total Dissolved Solids Concentrations

Date:	Project:	Submitter:	Reviewer:
08 Mar 2019	17507	A. Hum	C. Bromba

Figure 16

TABLE 1

Water Wells Within a 5 km Radius

Tervita Corporation
Block A-18-088-20 W6M

Water Well Number	Well ID*	Location	Well Owner	Direction From Site **	Distance From Site km**	Total Depth m	Top of Screen m	Bottom of Screen m	Bottom of Casing m	Depth to Water m	Bedrock Depth m	Date of Information	Proposed Use For Well	Type of Work
1	113095	---	Tervita Corporation	S-SE	0.34	73	60.96	73.15	73.15	---	---	5-Dec-02	Non-domestic	New Well
2	111502	SW 16-088-20 W6M	Leucrotta Exploration Inc.	E	2.43	---	50.25	53.3	55	46	---	24-Oct-14	Monitoring	New Well
3	111508	SW 16-088-20 W6M	Leucrotta Exploration Inc.	E	2.50	186	174.49	177.54	186	135	---	24-Oct-14	Monitoring	New Well
4	104393	SW 25-088-21 W6M	BC Rail	NW	4.24	60	47.55	59.74	59.74	---	---	---	Domestic	Closure

Notes:

--- - not available

* - British Columbia Ministry of Environment (B.C. MoE). 2018. *BC Water Resources Atlas* (WRBC). Matrix Solutions Inc. retrieved dataset from B.C. MoE website. July 2018. Uploaded to Prometheus Matrix Field Data Portal. Accessed on January 21, 2019.

** - When no specific project location available, distance is calculated from the centre of the LSD or from the centre of the quarter section when LSD is not specified.
- the presence and location of these wells were not field verified by Matrix personnel.

TABLE 2

Monitoring Well Summary

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Elevation[g] (masl)						Depth (m)															Hydraulic Conductivity (m/s)	Method	Stratigraphy of Screened Interval
			15-May-18	27-Jul-18	11-Sep-18	07-Dec-18			15-May-18			27-Jul-18			11-Sep-18			07-Dec-18					
	Ground Surface	Top of Casing	Water Level	Water Level	Water Level	Water Level	Grnd. to Top of Screen	Grnd. to Base of Screen	Top of Casing to Water	Grnd. to Water	Product Thickness (cm)	Top of Casing to Water	Grnd. to Water	Product Thickness (cm)	Top of Casing to Water	Grnd. to Water	Product Thickness (cm)	Top of Casing to Water	Grnd. to Water	Product Thickness (cm)			
MW92-1	747.35	748.20	742.03	740.94	738.90	739.83	16.5	19.5	6.17	5.32	ND	7.26	6.41	ND	9.30	8.45	ND	8.36	7.52	ND	1.7E-08**	---	clay till
MW92-1A	747.25	747.94	745.98	745.75	744.98	744.14	1.0	7.2	1.96	1.27	ND	2.19	1.50	ND	2.96	2.27	ND	3.80	3.11	ND	4.3E-09**	---	clay, clay till
MW92-6A	778.20	778.71	776.69	776.79	776.54	776.67	1.5	7.6	2.02	1.51	ND	1.93	1.41	ND	2.17	1.66	ND	2.05	1.53	ND	<E-09**	---	clay, clay till
MW92-7	760.42	761.44	747.10	753.17	742.19	743.24	17.0	20.0	14.35	13.32	ND	8.28	7.25	ND	19.25	18.23	ND	18.20	17.18	ND	<E-09**	---	clay till
MW92-7A	760.25	761.29	758.22	757.12	755.18	756.05	1.5	7.5	3.06	2.03	ND	4.17	3.13	ND	6.11	5.07	ND	5.24	4.20	ND	1.7E-09**	---	clay, clay till
03-3	757.88	758.78	750.42	750.75	750.58	752.11	1.9	7.9	8.35	7.46	ND	8.03	7.13	ND	8.19	7.30	ND	6.66	5.77	ND	---	---	clay till
03-4	753.74	754.67	dry	unable to sample	dry	dry	4.9	10.9	---	---	---	---	---	---	---	---	---	---	---	---	---	---	clay till
03-5	750.72	751.65	743.07	742.48	742.21	742.54	2.9	8.9	8.57	7.65	ND	9.17	8.24	ND	9.44	8.51	ND	9.11	8.18	ND	---	---	clay till
BH-103	799.34*	799.223*	793.34	794.08	794.25	794.03	1.5	7.0	5.89	6.00	ND	5.15	5.26	ND	4.97	5.09	ND	5.20	5.31	ND	7E-08***	BR	silt till
BH-104	770.31	771.24	decommissioned				1.2	7.3	---	---	---	---	---	---	---	---	---	---	---	---	---	---	clay till
BH-104(R)	771.92	772.70	dry	dry	dry	dry	7.0	10.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	silty clay
BH-105	---	771.27	decommissioned				19.2	20.7	---	---	---	---	---	---	---	---	---	---	---	---	1E-09***	---	clay
BH-105(R)	771.80	772.62	754.11	754.08	754.17	754.13	21.0	24.0	18.51	17.69	ND	18.54	17.72	ND	18.46	17.63	ND	18.49	17.67	ND	---	---	clayey silt
15-9	773.44	774.36	766.48	766.16	766.00	765.95	7.0	10.0	7.88	6.96	ND	8.21	7.28	ND	8.37	7.44	ND	8.41	7.49	ND	---	---	silty clay, clayey silt
15-10	774.68	775.55	770.07	770.00	769.85	769.68	7.3	10.3	8.49	7.62	ND	8.56	7.69	ND	8.71	7.84	ND	8.87	8.00	ND	---	---	silty clay
15-11	779.23	780.07	773.84	773.15	773.07	773.47	7.3	10.3	6.23	5.39	ND	6.93	6.08	ND	7.01	6.16	ND	6.60	5.76	ND	---	---	silty clay

Notes:

Bold - background well

* - elevations were not surveyed on November 9, 2018 - previous elevations reported

[g] - elevations are geodetic

masl - metres above sea level

BR - Bouwer and Rice method (1976)

--- - not available

ND - not detected

** - HBT, 1994

*** - Clifton, 2002

TABLE 3

2018 Groundwater Quality Results - Field Parameters

Tervita Corporation
Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
BH-103	15-May-18	17507180515009	10.0	5.7	4660
BH-103	27-Jul-18	17507180727009	16.3	6.0	4530
BH-103	11-Sep-18	insufficient water	---	---	---
BH-103	07-Dec-18	17507181207009	---	---	---
MW92-1	15-May-18	17507180515001	12.8	6.7	3850
MW92-1	27-Jul-18	17507180727001	25.0	6.8	4010
MW92-1	11-Sep-18	17507180911001	5.4	6.2	3570
MW92-1	07-Dec-18	17507181207001	3.2	7.1	3970
MW92-1A	15-May-18	17507180515002	12.5	6.8	1720
MW92-1A	27-Jul-18	17507180727002	16.3	6.7	3170
MW92-1A	11-Sep-18	17507180911002	4.5	5.5	3250
MW92-1A	07-Dec-18	17507181207002	4.1	6.9	3630
MW92-6A	15-May-18	17507180515003	8.3	6.8	2080
MW92-6A	27-Jul-18	17507180727003	23.2	6.7	1976
MW92-6A	11-Sep-18	17507180911003	5.8	5.6	2070
MW92-6A	07-Dec-18	17507181207003	1.3	7.5	2170
MW92-7	15-May-18	17507180515004	12.3	7.2	4320
MW92-7	27-Jul-18	17507180727005	24.8	6.1	4800
MW92-7	11-Sep-18	insufficient water	---	---	---
MW92-7	07-Dec-18	17507181207004	2.0	7.4	4410
MW92-7A	15-May-18	17507180515005	13.0	6.6	4230
MW92-7A	27-Jul-18	17507180727004	---	---	---
MW92-7A	11-Sep-18	17507180911005	4.9	6.6	4590
MW92-7A	07-Dec-18	17507181207005	1.4	6.9	4860
03-3	15-May-18	17507180515006	10.2	6.2	4550
03-3	27-Jul-18	17507180727006	---	---	---
03-3	11-Sep-18	insufficient water	---	---	---
03-3	07-Dec-18	17507181207008	1.9	7.3	3690
03-4	15-May-18	dry	---	---	---
03-4	27-Jul-18	unable to sample	---	---	---
03-4	07-Dec-18	dry	---	---	---
03-5	15-May-18	17507180515008	10.4	6.5	4230
03-5	27-Jul-18	17507180727008	---	---	---
03-5	11-Sep-18	insufficient water	---	---	---
03-5	07-Dec-18	not sampled	---	---	---
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Irrigation Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**NS**	**NS**	**NS**

TABLE 3

2018 Groundwater Quality Results - Field Parameters

Tervita Corporation
Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
BH-104(R)	15-May-18	dry	---	---	---
BH-104(R)	27-Jul-18	dry	---	---	---
BH-104(R)	11-Sep-18	dry	---	---	---
BH-104(R)	07-Dec-18	dry	---	---	---
BH-105(R)	15-May-18	17507180515012	10.7	6.9	4070
BH-105(R)	27-Jul-18	17507180727012	19.4	6.5	4510
BH-105(R)	11-Sep-18	17507180911012	8.5	6.8	3800
BH-105(R)	07-Dec-18	17507181207011	---	---	---
15-9	15-May-18	17507180515013	11.2	6.5	5390
15-9	27-Jul-18	17507180727013	20.6	6.8	5610
15-9	11-Sep-18	17507180911013	6.3	6.7	5540
15-9	07-Dec-18	17507181207013	2.0	7.1	5620
15-10	15-May-18	17507180515014	10.6	6.8	4280
15-10	27-Jul-18	17507180727014	15.2	6.7	4360
15-10	11-Sep-18	17507180911014	5.5	6.5	5070
15-10	07-Dec-18	17507181207014	1.9	7.2	4380
15-11	15-May-18	17507180515015	10.8	6.6	4330
15-11	27-Jul-18	17507180727015	18.2	6.6	4410
15-11	11-Sep-18	17507180911015	4.6	6.3	4120
15-11	07-Dec-18	17507181207015	1.9	7.1	4490
Leachate Vault 1	15-May-18	sheen	---	---	---
Leachate Vault 1	27-Jul-18	17507180727016	---	---	---
Leachate Vault 1	11-Sep-18	sheen	---	---	---
Leachate Vault 1	07-Dec-18	sheen	---	---	---
Leak Detection System	15-May-18	17507180515016	11.0	6.7	3750
Leak Detection System	27-Jul-18	17507180727017	18.4	6.5	5450
Leak Detection System	11-Sep-18	sheen	---	---	---
Leak Detection System	07-Dec-18	17507181207017	0.9	7.1	3990
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Irrigation Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**NS**	**NS**	**NS**

Notes:

Bold - background well
--- - not analyzed
NS - not specified
^{25} - field EC corrected to 25°C
* - *Contaminated Sites Regulation 375/96* (Province of British Columbia November 2017)
Italics - indicates value does not meet applicable standards

TABLE 4

2018 Groundwater Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
BH-103	15-May-18	17507180515009	7.91	4730	428	363	***378***	8.2	<2.5	***3120***	0.4	<0.050	0.48	0.48	74	90.3	2560	4340	<0.0010	6.4
BH-103	27-Jul-18	17507180727009	6.96	4840	382	355	***422***	8.5	1	***3230***	0.3	<0.01	0.63	0.63	122	149	2420	4470	0.002	6
BH-103	11-Sep-18	17507180911009	6.53	5070	385	346	***594***	10.8	<0.6	***3200***	0.3	<0.01	1.99	1.99	87	107	2390	4600	0.003	6
MW92-1	15-May-18	17507180515001	7.72	3900	486	298	***217***	7.62	3.1	***1890***	<0.10	<0.050	0.12	0.12	830	1010	2440	3400	<0.0010	3.7
MW92-1	27-Jul-18	17507180727001	7.50	4080	457	294	***230***	7.5	3.4	***1860***	<0.03	<0.01	<0.02	<0.02	873	1070	2350	3380	0.004	4
MW92-1	11-Sep-18	17507180911001	7.04	3920	507	312	***230***	7.6	2.4	***1920***	0.0	<0.01	<0.02	<0.02	871	1060	2550	3500	<0.002	3
MW92-1	07-Dec-18	17507181207001	7.53	3930	478	294	***209***	7.1	3.8	***2050***	0.1	<0.01	0.08	0.08	896	1090	2400	3580	<0.002	4
MW92-1A	15-May-18	17507180515002	8.21	2120	301	141	32.7	4.64	<2.5	***1200***	0.2	<0.050	<0.10	<0.11	133	163	1330	1760	<0.0010	7
MW92-1A	27-Jul-18	17507180727002	7.50	2360	298	166	47.9	6.1	<0.6	***1270***	0.3	<0.01	0.06	0.06	180	220	1430	1900	0.007	7
MW92-1A	11-Sep-18	17507180911002	7.14	3480	460	324	98.2	10.2	<0.6	***2180***	0.1	<0.01	0.16	0.16	325	396	2480	3270	<0.002	8
MW92-1A	07-Dec-18	17507181207002	7.52	3600	464	338	103	10.3	1.1	***2390***	0.2	<0.01	0.13	0.13	323	394	2550	3500	0.003	7
MW92-6A	15-May-18	17507180515003	8.18	2110	360	107	15.8	2.29	11.8	***1260***	0.3	<0.050	0.27	0.27	109	133	1340	1820	<0.0010	10.6
MW92-6A	27-Jul-18	17507180727003	7.27	1930	313	93.2	18	3.4	10.3	***1160***	0.2	<0.01	0.09	0.09	97	118	1170	1660	0.005	15
MW92-6A	11-Sep-18	17507180911003	7.22	2290	454	122	20.3	3.8	9.6	***1360***	0.3	<0.01	0.07	0.07	156	191	1640	2060	<0.002	11
MW92-6A	07-Dec-18	17507181207003	7.58	2110	396	110	17.2	3	13.6	***1300***	0.3	<0.01	0.07	0.07	110	134	1440	1910	0.003	12
MW92-7	15-May-18	17507180515004	7.83	4240	389	293	***396***	9.74	8.7	***2130***	0.1	<0.050	1.66	1.66	578	705	2180	3580	<0.0010	3.3
MW92-7	27-Jul-18	17507180727005	7.58	5170	441	492	***225***	12.1	1.9	***3110***	0.3	<0.01	3.43	3.43	5.28	644	3130	4610	0.005	7
MW92-7	07-Dec-18	17507181207004	7.83	4360	398	295	***388***	9.2	8	***2340***	0.1	<0.01	1.75	1.75	783	955	2210	3920	0.006	4
MW92-7A	15-May-18	17507180515005	8.14	4300	461	450	***203***	12.1	<2.5	***2580***	0.1	<0.050	0.3	0.3	432	527	3000	3970	<0.0010	6.1
MW92-7A	27-Jul-18	17507180727004	7.90	4740	351	303	***499***	10	7.3	***2390***	***1.5***	<0.01	2.17	2.17	757	924	2120	4020	---	---
MW92-7A	11-Sep-18	17507180911005	7.18	4900	468	518	***249***	13	2.8	***3090***	0.1	<0.01	0.44	0.44	555	677	3300	4680	0.005	5
MW92-7A	07-Dec-18	17507181207005	7.55	4850	455	503	***237***	12.7	2.4	***3220***	0.1	<0.01	0.59	0.59	539	657	3210	4760	0.006	6
03-3	15-May-18	17507180515006	8.16	4060	499	410	105	9.64	<2.5	***2600***	<0.10	<0.050	0.87	0.87	390	476	2930	3860	---	---
03-3	27-Jul-18	17507180727006	7.61	4090	440	382	103	8.8	1.6	***2430***	<0.03	<0.01	0.68	0.68	410	500	2670	3610	<0.002	7
03-3	11-Sep-18	17507180911007	7.34	3990	509	414	110	9.5	<0.6	***2510***	0.1	<0.01	0.73	0.73	406	495	2980	3800	---	---
03-3	07-Dec-18	17507181207008	7.87	3690	496	340	92.8	8.3	1.1	***2380***	0.1	<0.01	0.38	0.38	378	461	2640	3550	0.004	12
03-5	15-May-18	17507180515008	8.09	4120	483	404	123	10.1	<2.5	***2610***	0.1	<0.050	1.02	1.02	387	473	2870	3870	<0.0010	3.2
03-5	27-Jul-18	17507180727008	7.49	4310	461	406	142	9.7	22.5	***2850***	0.2	<0.01	7.82	7.82	465	567	2820	4200	0.003	3
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**1500**	**H**	**H**	**Cl**	**400^{amph}**	**400^{amph}**	**NS**	**NS**	**NS**	**NS**	**2**	**NS**
B.C. CSR 375/96 - Irrigation Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100**	**NS**	**1**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**600**	**1000**	**1^{LS}**	**10**	**100**	**100**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**NS**	**NS**	**NS**	**NS**	**200^{HH}**	**NS**	**250^{TAO}**	**500^{TAO}**	**1.5**	**1**	**10**	**10**	**NS**	**NS**	**NS**	**NS**	**1**	**NS**

TABLE 4

2018 Groundwater Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
BH-105(R)	15-May-18	17507180515012	7.83	3900	510	211	*327*	8.39	2.5	*2040*	0.1	<0.050	<0.10	<0.11	542	661	2140	3420	<0.0010	<1.0
BH-105(R)	27-Jul-18	17507180727012	7.73	4200	458	205	*355*	8.1	14.4	*2170*	*1.4*	<0.01	<0.02	<0.02	711	868	1990	3640	0.003	1
BH-105(R)	11-Sep-18	17507180911012	7.37	4160	503	220	*362*	8.3	1.8	*2050*	0.1	<0.01	<0.02	<0.02	709	865	2160	3570	<0.002	1
BH-105(R)	07-Dec-18	17507181207011	7.62	4120	498	211	*340*	7.9	2.7	*2210*	0.1	<0.01	0.07	0.07	734	896	2110	3710	---	---
15-9	15-May-18	17507180515013	8.11	5570	468	446	*475*	16.5	<2.5	*3460*	0.1	<0.050	2.55	2.55	525	641	3010	5190	<0.0010	12.9
15-9	27-Jul-18	17507180727013	7.57	5740	443	465	*507*	16.2	1.1	*3300*	0.0	<0.01	2.19	2.19	627	765	3020	5120	<0.002	10
15-9	11-Sep-18	17507180911013	7.22	5560	508	491	*497*	16.2	1.2	*3350*	0.2	<0.01	2.06	2.06	622	759	3290	5250	<0.002	10
15-9	07-Dec-18	17507181207013	7.73	5640	481	480	*470*	15.4	3.4	*3540*	0.2	<0.01	2.07	2.07	624	761	3180	5370	<0.002	12
15-10	15-May-18	17507180515014	8.07	4280	499	365	*227*	13.9	<2.5	*2610*	0.2	<0.050	1.65	1.65	414	505	2750	3970	<0.0010	8.8
15-10	27-Jul-18	17507180727014	7.62	4450	483	361	*254*	14.5	1.5	*2490*	0.1	<0.01	1.09	1.09	507	619	2690	3910	<0.002	2
15-10	11-Sep-18	17507180911014	7.26	4290	512	374	*238*	13.3	<0.6	*2590*	0.2	<0.01	0.82	0.82	509	621	2820	4040	<0.002	1
15-10	07-Dec-18	17507181207014	7.65	4340	503	350	*221*	12.3	1.4	*2750*	0.3	<0.01	1.25	1.25	509	621	2700	4150	<0.002	2
15-11	15-May-18	17507180515015	8.00	4380	497	354	*234*	12.8	42.6	*2620*	0.2	<0.050	2.39	2.39	464	566	2700	4050	<0.0010	10.1
15-11	27-Jul-18	17507180727015	7.52	4550	486	363	*262*	12.4	1.5	*2510*	0.1	<0.01	1.64	1.64	579	706	2710	3990	<0.002	3
15-11	11-Sep-18	17507180911015	7.15	4410	519	381	*255*	12.5	0.7	*2550*	0.1	<0.01	1.49	1.49	581	709	2860	4070	<0.002	3
15-11	07-Dec-18	17507181207015	7.60	4460	479	362	*230*	11.7	2	*2780*	0.1	<0.01	1.6	1.6	602	735	2690	4230	<0.002	4
Leachate Vault 1	15-May-18	17507180515007	6.88	34400	*4770*	318	*2440*	625	*14300*	*666*	*3.7*	*6.5*	*60.8*	*67.2*	1200	1460	13200	24100	*1.09*	1010
Leachate Vault 1	27-Jul-18	17507180727016	7.01	34500	*5080*	255	*2230*	612	*13800*	436	0.6	*22.9*	*14.8*	*37.7*	1250	1530	13700	23300	*1.29*	790
Leachate Vault 1	11-Sep-18	17507180911016	6.96	24100	*3420*	186	*1780*	577	*8780*	335	<0.1	*29.4*	*54.2*	*83.6*	770	939	9310	15900	0.79	821
Leachate Vault 1	07-Dec-18	17507181207016	6.93	38100	*5160*	300	*2690*	705	*14500*	303	0.9	*28.0*	*18*	*46*	1220	1490	14100	24600	0.71	1410
Leak Detection System	15-May-18	17507180515016	8.06	3760	539	311	91.8	5.17	36.2	*2320*	0.3	<0.050	0.25	0.25	305	372	2630	3490	<0.0010	17.7
Leak Detection System	27-Jul-18	17507180727017	7.30	5730	799	293	*201*	16.2	*831*	*1970*	0.2	*6.2*	5.76	*11.9*	483	590	3200	4450	0.009	42
Leak Detection System	11-Sep-18	17507180911017	6.87	3930	577	283	91	6.3	*121*	*2130*	<0.03	<0.01	1.79	1.79	456	556	2610	3490	0.003	20
Leak Detection System	07-Dec-18	17507181207017	7.56	3930	547	317	93.9	5.7	67.9	*2450*	0.3	<0.01	0.15	0.15	409	499	2670	3730	0.003	21
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**1500**	**H**	**H**	**Cl**	**400^{amph}**	**400^{amph}**	**NS**	**NS**	**NS**	**NS**	**2**	**NS**
B.C. CSR 375/96 - Irrigation Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**100**	**NS**	**1**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**1000**	**NS**	**NS**	**NS**	**600**	**1000**	**1^{LS}**	**10**	**100**	**100**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**NS**	**NS**	**NS**	**NS**	**200^{HH}**	**NS**	**250^{TAO}**	**500^{TAO}**	**1.5**	**1**	**10**	**10**	**NS**	**NS**	**NS**	**NS**	**1**	**NS**

Notes:

Bold - background well

--- - not analyzed

NS - not specified

Cl - dependent on chloride value

H - standard level is dependent on hardness value

amph - standard may not protect all amphibians

HH - standard is specific to protection of human health

LS - standard varies with type of livestock

TAO - standard to protect against taste and odour concerns

* - *Contaminated Sites Regulation 375/96* (Province of British Columbia November 2017)

Italics - indicates value does not meet applicable standards

TABLE 5

2018 Groundwater Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
BH-103	15-May-18	17507180515009	0.062	<0.0010	<0.0010	0.0094	<0.0010	***0.76***	0.00196	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	***0.405***	0.054	<0.0000050	<0.00050	0.031	0.00089	<0.00010	1.73	0.00012	<0.0010	<0.0030	<0.00010	<0.0050	0.075
BH-103	27-Jul-18	17507180727009	0.056	<0.001	<0.001	<0.05	<0.001	***1.36***	0.00236	<0.001	***0.0014***	0.0049	<0.1	<0.0005	***0.381***	***0.250***	<0.000025	<0.001	0.043	0.0042	<0.0001	---	0.0002	---	0.002	<0.001	<0.001	0.065
BH-103	11-Sep-18	17507180911009	0.067	<0.001	<0.001	<0.05	<0.001	***0.88***	***0.00777***	<0.001	***0.0104***	0.0014	0.1	<0.0005	***0.482***	***1.990***	<0.000025	<0.001	***0.092***	0.0015	<0.0001	---	0.0005	---	0.002	<0.001	0.002	0.169
MW92-1	15-May-18	17507180515001	<0.0050	0.00056	<0.00050	0.00706	<0.00050	0.381	0.00117	<0.00050	<0.00050	<0.0010	<0.050	<0.00025	***0.0323***	***1.96***	0.0000089	0.00054	0.019	0.00047	<0.000050	***3.33***	<0.000050	<0.00050	<0.0015	***0.0291***	<0.0025	0.0114
MW92-1	27-Jul-18	17507180727001	<0.004	<0.001	<0.001	<0.05	<0.001	***0.61***	0.00115	<0.001	<0.0009	0.0035	<0.1	<0.0005	***0.034***	***1.85***	<0.000025	<0.001	0.023	0.0013	<0.0001	---	<0.0001	---	0.003	***0.034***	<0.001	0.014
MW92-1	11-Sep-18	17507180911001	0.056	<0.001	0.002	<0.05	<0.001	0.44	0.00123	<0.001	<0.0009	0.0013	<0.1	<0.0005	***0.035***	***2.16***	<0.000025	<0.001	0.021	0.0013	<0.0001	---	<0.0001	---	0.003	***0.036***	0.002	0.013
MW92-1	07-Dec-18	17507181207001	<0.004	<0.001	<0.001	<0.05	<0.001	0.45	0.00112	<0.001	<0.0009	0.0013	<0.1	<0.0005	***0.033***	***2.2***	<0.000025	<0.001	0.02	0.0018	<0.0001	***3.34***	<0.0001	<0.0005	0.018	***0.037***	<0.001	0.013
MW92-1A	15-May-18	17507180515002	<0.0050	<0.00050	<0.00050	0.00454	<0.00050	0.118	0.000302	<0.00050	<0.00050	0.0015	<0.050	<0.00025	***0.0925***	0.0219	<0.0000050	0.00026	0.0031	0.00291	<0.000050	1.22	<0.000050	<0.00050	<0.0015	0.00495	<0.0025	<0.0050
MW92-1A	27-Jul-18	17507180727002	0.006	<0.001	<0.001	<0.05	<0.001	0.29	0.00034	<0.001	<0.0009	0.002	<0.1	<0.0005	***0.125***	0.015	<0.000025	<0.001	0.004	0.0026	<0.0001	---	<0.0001	---	0.002	0.007	<0.001	<0.005
MW92-1A	11-Sep-18	17507180911002	0.007	<0.001	0.002	<0.05	<0.001	0.31	0.00081	<0.001	<0.0009	0.0012	<0.1	<0.0005	***0.201***	***0.259***	<0.000025	<0.001	0.007	0.002	0.0002	---	0.0001	---	0.002	***0.014***	0.002	0.005
MW92-1A	07-Dec-18	17507181207002	0.014	<0.001	<0.001	<0.05	<0.001	0.33	0.00058	<0.001	<0.0009	0.0022	0.5	0.0008	***0.19***	***0.786***	<0.000025	<0.001	0.009	0.002	<0.0001	***2.57***	0.0001	<0.0005	0.009	***0.015***	<0.001	0.017
MW92-6A	15-May-18	17507180515003	<0.0050	<0.00050	<0.00050	0.0133	<0.00050	0.066	0.000239	<0.00050	<0.00050	0.0012	<0.050	<0.00025	***0.0232***	0.00372	<0.0000050	<0.00025	0.004	0.00058	<0.000050	0.935	<0.000050	<0.00050	<0.0015	0.00172	<0.0025	<0.0050
MW92-6A	27-Jul-18	17507180727003	0.011	<0.001	<0.001	<0.05	<0.001	0.16	0.00051	<0.001	***0.003***	0.0022	<0.1	<0.0005	***0.016***	0.168	<0.000025	<0.001	0.012	0.0012	<0.0001	---	<0.0001	---	0.001	<0.001	<0.001	<0.005
MW92-6A	11-Sep-18	17507180911003	0.121	<0.001	0.001	<0.05	<0.001	0.15	0.00045	<0.001	<0.0009	0.0019	0.2	<0.0005	***0.041***	0.077	<0.000025	<0.001	0.006	0.0007	<0.0001	---	<0.0001	---	0.003	0.003	0.002	0.008
MW92-6A	07-Dec-18	17507181207003	0.007	<0.001	<0.001	<0.05	<0.001	0.1	0.00026	<0.001	<0.0009	0.0016	<0.1	<0.0005	***0.032***	0.007	<0.000025	<0.001	0.005	0.001	<0.0001	1.01	<0.0001	<0.0005	0.002	0.003	<0.001	<0.005
MW92-7	15-May-18	17507180515004	0.049	<0.0010	<0.0010	0.0084	<0.0010	0.43	0.000207	<0.0010	<0.0010	0.0022	<0.10	<0.00050	***0.022***	0.044	<0.0000050	0.00188	0.0077	0.00453	<0.00010	***5.08***	<0.00010	<0.0010	<0.0030	***0.0472***	<0.0050	<0.010
MW92-7	27-Jul-18	17507180727005	0.006	<0.001	<0.001	<0.05	<0.001	***0.52***	0.00131	<0.001	0.001	0.0024	0.3	<0.0005	***0.179***	***1.15***	<0.000025	<0.001	0.011	<0.0005	<0.0001	---	0.0001	---	0.003	0.01	<0.001	0.01
MW92-7	07-Dec-18	17507181207004	0.134	<0.001	<0.001	<0.05	<0.001	***0.52***	0.0002	<0.001	<0.0009	0.0015	0.2	<0.0005	***0.027***	0.009	<0.000025	0.002	0.005	***0.0124***	<0.0001	***4.8***	<0.0001	<0.0005	0.018	***0.059***	<0.001	0.016
MW92-7A	15-May-18	17507180515005	0.031	<0.0010	<0.0010	0.0097	<0.0010	0.33	0.000748	<0.0010	***0.0015***	<0.0020	0.63	<0.00050	***0.16***	***1.76***	<0.0000050	<0.00050	0.0145	<0.00050	<0.00010	***3.22***	0.00015	<0.0010	<0.0030	0.00786	<0.0050	0.012
MW92-7A	27-Jul-18	17507180727004	---	---	---	---	---	---	---	---	---	---	0.2	---	---	0.016	---	---	---	---	---	---	---	---	---	---	---	---
MW92-7A	11-Sep-18	17507180911005	0.021	<0.001	0.001	<0.05	<0.001	0.4	0.00109	<0.001	***0.0031***	<0.0008	1	<0.0005	***0.156***	***2.23***	<0.000025	<0.001	0.013	0.0013	<0.0001	---	0.0001	---	0.003	0.009	0.002	0.01
MW92-7A	07-Dec-18	17507181207005	0.029	<0.001	<0.001	<0.05	<0.001	0.41	0.00045	<0.001	***0.0048***	<0.0008	2.4	<0.0005	***0.148***	***3.21***	<0.000025	<0.001	0.017	0.0013	<0.0001	***3.42***	0.0001	<0.0005	0.014	0.009	<0.001	0.013
03-3	27-Jul-18	17507180727006	<0.004	<0.001	<0.001	<0.05	<0.001	***0.53***	0.00018	<0.001	<0.0009	0.0011	<0.1	<0.0005	***0.108***	<0.005	<0.000025	<0.001	0.006	0.0019	0.0001	---	<0.0001	---	0.003	***0.017***	<0.001	<0.005
03-3	11-Sep-18	17507180911007	---	---	---	---	---	---	---	---	---	---	<0.1	---	---	<0.005	---	---	---	---	---	---	---	---	---	---	---	---
03-3	07-Dec-18	17507181207008	<0.004	<0.001	<0.001	<0.05	<0.001	0.38	0.00066	<0.001	<0.0009	0.0024	<0.1	<0.0005	***0.113***	<0.005	<0.000025	<0.001	0.009	0.0031	<0.0001	***2.94***	<0.0001	<0.0005	0.008	***0.017***	<0.001	0.01
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**0.09**	**0.05**	**10**	**0.0015**	**12**	**H**	**0.01^{Cr6}**	**0.04**	**H**	**NS**	**H**	**NS**	**NS**	**0.00025**	**10**	**H**	**0.02**	**H**	**NS**	**0.003**	**NS**	**1**	**0.085**	**NS**	**H**
B.C. CSR 375/96 - Irrigation Standards*			**5**	**NS**	**0.1**	**NS**	**0.1**	**0.5^{crop}**	**0.005**	**0.005^{Cr3}**	**0.05**	**0.2**	**5^{IC2}**	**0.2**	**2.5**	**0.2^{IC2}**	**0.001**	**0.01^{crop}**	**0.2**	**0.02^{appl}**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.01**	**0.1**	**1^{pH}**
B.C. CSR 375/96 - Livestock Standards*			**5**	**NS**	**0.025**	**NS**	**0.1**	**5**	**0.08**	**0.05^{Cr3,Cr6}**	**1**	**0.3**	**NS**	**0.1**	**5**	**NS**	**0.002**	**0.05**	**1**	**0.03**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.2**	**0.1**	**2**
B.C. CSR 375/96 - Drinking Water Standards*			**9.5^{HH}**	**0.006**	**0.01**	**1**	**0.008**	**5**	**0.005**	**0.05^{Cr6}**	**0.001**	**1.5$^{HH, WT}$**	**6.5$^{HH, IC2, WT}$**	**0.01**	**0.008**	**1.5$^{HH, IC2, WT}$**	**0.001**	**0.25**	**0.08**	**0.01**	**0.02**	**2.5**	**NS**	**2.5**	**NS**	**0.02**	**0.02**	**3^{HH}**

TABLE 5

2018 Groundwater Quality Results - Dissolved Metals

Tervita Corporation
Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
03-5	15-May-18	17507180515008	<0.010	<0.0010	<0.0010	0.0162	<0.0010	0.36	0.000538	<0.0010	***0.0014***	<0.0020	<0.10	<0.00050	***0.092***	***1.32***	<0.0000050	<0.00050	0.0129	0.00072	<0.00010	***3.46***	<0.00010	<0.0010	<0.0030	***0.0116***	<0.0050	<0.010
03-5	27-Jul-18	17507180727008	<0.004	<0.001	<0.001	<0.05	<0.001	***0.59***	0.00063	<0.001	***0.0016***	0.0025	<0.1	<0.0005	***0.1***	***1.31***	<0.000025	<0.001	0.012	0.0028	<0.0001	---	<0.0001	---	0.003	***0.014***	<0.001	0.007
BH-105(R)	15-May-18	17507180515012	<0.0050	<0.00050	0.0008	0.0091	<0.00050	0.283	0.000494	<0.00050	***0.0123***	0.0047	0.424	<0.00025	***0.0559***	***0.28***	<0.0000050	0.00136	0.014	0.00025	<0.000050	***5.46***	0.000051	<0.00050	<0.0015	***0.0552***	<0.0025	0.0251
BH-105(R)	27-Jul-18	17507180727012	0.006	<0.001	<0.001	<0.05	<0.001	0.43	0.00053	<0.001	***0.0112***	0.0013	<0.1	<0.0005	***0.059***	***0.289***	<0.000025	0.001	0.015	0.0019	<0.0001	---	<0.0001	---	0.003	***0.056***	<0.001	0.018
BH-105(R)	11-Sep-18	17507180911012	<0.004	<0.001	0.001	<0.05	<0.001	0.33	0.00043	<0.001	***0.0094***	0.0009	<0.1	<0.0005	***0.066***	***0.315***	<0.000025	0.001	0.012	0.0008	<0.0001	---	<0.0001	---	0.002	***0.059***	0.002	0.018
BH-105(R)	07-Dec-18	17507181207011	<0.004	<0.001	<0.001	<0.05	<0.001	0.34	0.00043	<0.001	***0.0101***	0.001	0.3	<0.0005	***0.06***	***0.325***	<0.000025	<0.001	<0.003	<0.0005	<0.0001	***5.13***	<0.0001	<0.0005	<0.001	***0.061***	0.002	<0.005
15-9	15-May-18	17507180515013	0.506	<0.0010	<0.0010	0.0211	<0.0010	0.35	0.000677	0.0011	<0.0010	0.004	0.46	0.00084	***0.215***	0.083	<0.0000050	0.00126	0.0178	0.00361	<0.00010	***4.31***	<0.00010	<0.0010	0.0079	***0.0468***	<0.0050	0.014
15-9	27-Jul-18	17507180727013	0.005	<0.001	<0.001	<0.05	<0.001	***0.55***	0.00075	<0.001	<0.0009	0.0018	<0.1	<0.0005	***0.211***	0.036	<0.000025	<0.001	0.018	0.0033	<0.0001	---	<0.0001	---	0.004	***0.054***	<0.001	0.008
15-9	11-Sep-18	17507180911013	0.032	<0.001	0.001	<0.05	<0.001	0.42	0.00092	<0.001	<0.0009	0.0017	<0.1	<0.0005	***0.216***	0.111	<0.000025	<0.001	0.014	0.004	<0.0001	---	<0.0001	---	0.004	***0.053***	0.002	0.008
15-9	07-Dec-18	17507181207013	0.011	<0.001	<0.001	<0.05	<0.001	0.42	0.00065	<0.001	<0.0009	<0.0008	<0.1	<0.0005	***0.184***	0.058	<0.000025	<0.001	<0.003	0.0038	<0.0001	***4.18***	<0.0001	<0.0005	<0.001	***0.053***	<0.001	0.009
15-10	15-May-18	17507180515014	<0.010	<0.0010	<0.0010	0.0125	<0.0010	0.45	0.000981	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	***0.125***	0.0666	<0.0000050	0.00056	0.0385	0.00871	<0.00010	***4.63***	<0.00010	<0.0010	<0.0030	***0.0167***	<0.0050	0.02
15-10	27-Jul-18	17507180727014	0.011	<0.001	<0.001	<0.05	<0.001	***0.66***	0.00114	<0.001	<0.0009	0.0017	0.4	<0.0005	***0.126***	0.139	<0.000025	<0.001	0.039	0.0092	<0.0001	---	<0.0001	---	0.003	***0.02***	<0.001	0.018
15-10	11-Sep-18	17507180911014	0.017	<0.001	0.001	<0.05	<0.001	***0.52***	0.00138	<0.001	<0.0009	0.0039	<0.1	<0.0005	***0.13***	***0.402***	<0.000025	<0.001	0.036	0.0061	<0.0001	---	<0.0001	---	0.002	***0.02***	0.002	0.021
15-10	07-Dec-18	17507181207014	<0.004	<0.001	<0.001	<0.05	<0.001	***0.54***	0.0009	<0.001	<0.0009	<0.0008	<0.1	<0.0005	***0.117***	***0.348***	<0.000025	<0.001	<0.003	<0.0005	<0.0001	***4.51***	<0.0001	<0.0005	<0.001	***0.018***	<0.001	<0.005
15-11	15-May-18	17507180515015	<0.010	<0.0010	<0.0010	0.0108	<0.0010	0.4	0.00203	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	***0.109***	***0.644***	<0.0000050	<0.00050	0.0352	0.00169	<0.00010	***4.32***	<0.00010	<0.0010	<0.0030	***0.0215***	<0.0050	0.023
15-11	27-Jul-18	17507180727015	<0.004	<0.001	<0.001	<0.05	<0.001	***0.63***	0.00154	<0.001	<0.0009	<0.0008	<0.1	<0.0005	***0.118***	***0.594***	<0.000025	<0.001	0.037	0.0034	<0.0001	---	<0.0001	---	0.005	***0.026***	<0.001	0.019
15-11	11-Sep-18	17507180911015	0.007	<0.001	0.001	<0.05	<0.001	0.5	0.00167	<0.001	<0.0009	<0.0008	<0.1	<0.0005	***0.13***	***0.957***	<0.000025	<0.001	0.035	0.0028	<0.0001	---	0.0001	---	0.003	***0.027***	0.002	0.019
15-11	07-Dec-18	17507181207015	<0.004	<0.001	<0.001	<0.05	<0.001	0.5	0.001	<0.001	<0.0009	<0.0008	<0.1	<0.0005	***0.115***	***0.312***	<0.000025	<0.001	<0.003	<0.0005	<0.0001	***4.46***	<0.0001	<0.0005	<0.001	***0.028***	0.002	<0.005
Leachate Vault 1	15-May-18	17507180515007	<0.10	<0.010	***0.024***	***2.3***	<0.010	<1.0	<0.00050	<0.010	***0.04***	<0.020	***5.8***	<0.0050	***0.64***	***5.17***	<0.000050	***0.146***	***0.234***	<0.0050	<0.0010	***66.4***	<0.0010	<0.010	<0.030	***0.0177***	<0.050	<0.10
Leachate Vault 1	27-Jul-18	17507180727016	0.033	0.005	***0.038***	***3.95***	<0.001	***1.02***	0.00039	***0.007***	***0.0344***	0.0019	3	<0.0005	***0.65***	***4.85***	<0.000025	***0.104***	***0.218***	***0.124***	<0.0001	---	<0.0001	---	0.059	***0.014***	***0.036***	0.021
Leachate Vault 1	11-Sep-18	17507180911016	0.052	0.003	***0.032***	***3.78***	<0.001	***0.58***	0.00039	0.005	***0.0224***	0.0024	***23.9***	0.0006	***0.471***	***3.41***	<0.000025	***0.065***	***0.139***	***0.0818***	0.0001	---	<0.0001	---	0.051	0.01	***0.029***	0.024
Leachate Vault 1	07-Dec-18	17507181207016	0.041	0.005	***0.028***	***5.95***	<0.001	***0.6***	0.00033	***0.006***	***0.0341***	0.0012	***33.5***	<0.0005	***0.599***	***5.35***	<0.000025	***0.102***	***0.203***	***0.771***	0.0001	***82.7***	<0.0001	<0.0005	0.098	***0.015***	***0.042***	0.058
Leak Detection System	15-May-18	17507180515016	<0.0050	<0.00050	<0.00050	0.0186	<0.00050	0.223	0.000276	<0.00050	0.00094	0.0023	<0.050	<0.00025	***0.121***	***0.353***	<0.0000050	0.00041	0.0125	0.00039	<0.000050	2.27	<0.000050	<0.00050	<0.0015	***0.0156***	<0.0025	0.0061
Leak Detection System	27-Jul-18	17507180727017	0.019	<0.001	0.002	<0.05	<0.001	0.38	0.00283	<0.001	***0.0067***	0.0039	0.9	<0.0005	***0.141***	***1.52***	<0.000025	0.001	0.043	0.008	<0.0001	---	0.0001	---	0.004	***0.024***	0.001	0.015
Leak Detection System	11-Sep-18	17507180911017	0.067	<0.001	0.001	<0.05	<0.001	0.26	0.001	<0.001	***0.0036***	0.0037	0.6	<0.0005	***0.11***	***0.795***	<0.000025	<0.001	0.023	<0.0005	<0.0001	---	<0.0001	---	0.004	***0.019***	0.003	0.01
Leak Detection System	07-Dec-18	17507181207017	<0.004	<0.001	<0.001	<0.05	<0.001	0.28	0.00049	<0.001	***0.0017***	<0.0008	<0.1	<0.0005	***0.127***	***0.544***	<0.000025	<0.001	<0.003	<0.0005	<0.0001	2.4	<0.0001	<0.0005	<0.001	***0.021***	0.002	<0.005
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**NS**	**0.09**	**0.05**	**10**	**0.0015**	**12**	**H**	**0.01^{Cr6}**	**0.04**	**H**	**NS**	**H**	**NS**	**NS**	**0.00025**	**10**	**H**	**0.02**	**H**	**NS**	**0.003**	**NS**	**1**	**0.085**	**NS**	**H**
B.C. CSR 375/96 - Irrigation Standards*			**5**	**NS**	**0.1**	**NS**	**0.1**	**0.5^{crop}**	**0.005**	**0.005^{Cr3}**	**0.05**	**0.2**	**5^{IC2}**	**0.2**	**2.5**	**0.2^{IC2}**	**0.001**	**0.01^{crop}**	**0.2**	**0.02^{appl}**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.01**	**0.1**	**1^{pH}**
B.C. CSR 375/96 - Livestock Standards*			**5**	**NS**	**0.025**	**NS**	**0.1**	**5**	**0.08**	**0.05^{Cr3,Cr6}**	**1**	**0.3**	**NS**	**0.1**	**5**	**NS**	**0.002**	**0.05**	**1**	**0.03**	**NS**	**NS**	**NS**	**NS**	**NS**	**0.2**	**0.1**	**2**
B.C. CSR 375/96 - Drinking Water Standards*			**9.5^{HH}**	**0.006**	**0.01**	**1**	**0.008**	**5**	**0.005**	**0.05^{Cr6}**	**0.001**	**1.5$^{HH, WT}$**	**6.5$^{HH, IC2, WT}$**	**0.01**	**0.008**	**1.5$^{HH, IC2, WT}$**	**0.001**	**0.25**	**0.08**	**0.01**	**0.02**	**2.5**	**NS**	**2.5**	**NS**	**0.02**	**0.02**	**3^{HH}**

Notes:

Bold - background well
NS - not specified
H - standard level is dependent on hardness value
pH - standard varies with soil pH; most stringent applied
appl - standard for continuous application on crops; standard for intermittent application on crops is 50 ug/L
crop - standard level is dependent on type of crop; standard shown is the most stringent value
Cr3 - guideline value for Cr(III)
Cr6 - guideline value for Cr(VI)
HH - standard is specific to protection of human health
IC2 - standard applies to a site used for an industrial or commercial purpose or activity set out in Schedule 2
WT - standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.
* - *Contaminated Sites Regulation 375/96* (Province of British Columbia November 2017)
Italics - indicates value does not meet applicable standards

TABLE 6

2018 Groundwater Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	MTBE mg/L
BH-103	15-May-18	17507180515009	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
BH-103	27-Jul-18	17507180727009	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-103	11-Sep-18	17507180911009	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1	15-May-18	17507180515001	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-1	27-Jul-18	17507180727001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.2	0.4	0.2	0.4	<0.001
MW92-1	11-Sep-18	17507180911001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1	07-Dec-18	17507181207001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1A	15-May-18	17507180515002	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-1A	27-Jul-18	17507180727002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.001
MW92-1A	11-Sep-18	17507180911002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1A	07-Dec-18	17507181207002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-6A	15-May-18	17507180515003	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-6A	27-Jul-18	17507180727003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.1	0.4	0.1	0.4	<0.001
MW92-6A	11-Sep-18	17507180911003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-6A	07-Dec-18	17507181207003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7	15-May-18	17507180515004	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-7	27-Jul-18	17507180727005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7	11-Sep-18	17507180911004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
MW92-7	07-Dec-18	17507181207004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7A	15-May-18	17507180515005	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-7A	27-Jul-18	17507180727004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	---
MW92-7A	11-Sep-18	17507180911005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7A	07-Dec-18	17507181207005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
03-3	15-May-18	17507180515006	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
03-3	27-Jul-18	17507180727006	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
03-3	11-Sep-18	17507180911007	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
03-3	07-Dec-18	17507181207008	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
B.C. CSR 375/96 - Freshwater Aquatic Standards**			0.4	0.005	2	0.3	0.72	1.5	15^{IWU}	5^{IWU}	NS	0.5	NS	34
B.C. CSR 375/96 - Irrigation Standards**			NS	NS	NS	NS	NS	NS	15^{IWU}	5^{IWU}	NS	NS	NS	NS
B.C. CSR 375/96 - Livestock Standards**			NS	NS	NS	NS	NS	NS	15^{IWU}	5^{IWU}	NS	NS	NS	11
B.C. CSR 375/96 - Drinking Water Standards*			0.005	0.06^{WT}	0.14^{WT}	0.09	0.8	NS	15^{IWU}	5^{IWU}	NS	NS	NS	$0.095^{HH, WT}$

TABLE 6

2018 Groundwater Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	MTBE mg/L
03-5	15-May-18	17507180515008	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
03-5	27-Jul-18	17507180727008	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-105(R)	15-May-18	17507180515012	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
BH-105(R)	27-Jul-18	17507180727012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.001
BH-105(R)	11-Sep-18	17507180911012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-105(R)	07-Dec-18	17507181207011	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
15-9	15-May-18	17507180515013	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-9	27-Jul-18	17507180727013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-9	11-Sep-18	17507180911013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-9	07-Dec-18	17507181207013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-10	15-May-18	17507180515014	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-10	27-Jul-18	17507180727014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-10	11-Sep-18	17507180911014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-10	07-Dec-18	17507181207014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	15-May-18	17507180515015	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-11	27-Jul-18	17507180727015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	11-Sep-18	17507180911015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	07-Dec-18	17507181207015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
Leachate Vault 1	15-May-18	17507180515007	***0.0218***	***0.0256***	0.00583	0.0363	<0.00050	0.32	0.41	***126***	28.7	***125***	28.7	<0.0010
Leachate Vault 1	27-Jul-18	17507180727016	***0.0336***	***0.0446***	0.0039	0.0248	<0.0005	<0.1	0.1	1.5	0.4	***1.5***	0.4	<0.001
Leachate Vault 1	11-Sep-18	17507180911016	***0.0281***	***0.0482***	0.00352	0.0247	<0.0005	0.3	0.4	***65***	11.2	***65***	11.2	<0.001
Leachate Vault 1	07-Dec-18	17507181207016	***0.419***	***0.273***	0.00797	0.0605	<0.0005	0.3	1.1	3.5	3.5	***0.7***	0.7	<0.001
Leak Detection System	15-May-18	17507180515016	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
Leak Detection System	27-Jul-18	17507180727017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.2	0.3	0.2	0.3	<0.001
Leak Detection System	11-Sep-18	17507180911017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
Leak Detection System	07-Dec-18	17507181207017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
B.C. CSR 375/96 - Freshwater Aquatic Standards**			0.4	0.005	2	0.3	0.72	1.5	15^{IWU}	5^{IWU}	NS	0.5	NS	34
B.C. CSR 375/96 - Irrigation Standards**			NS	NS	NS	NS	NS	NS	15^{IWU}	5^{IWU}	NS	NS	NS	NS
B.C. CSR 375/96 - Livestock Standards**			NS	NS	NS	NS	NS	NS	15^{IWU}	5^{IWU}	NS	NS	NS	11
B.C. CSR 375/96 - Drinking Water Standards*			0.005	0.06^{WT}	0.14^{WT}	0.09	0.8	NS	15^{IWU}	5^{IWU}	NS	NS	NS	$0.095^{HH, WT}$

Notes:

Bold - background well

--- - not analyzed

NS - not specified

^{HH} - standard is specific to protection of human health

^{IWU} - standard is applicable to all sites, irrespective of water use

^{WT} - standard may not address aesthetic (organoleptic) concerns related to drinking water quality. Water treatment may be required.

* - LEPHs and HEPHs do not include CSR-regulated PAHs

** - *Contaminated Sites Regulation 375/96* (Province of British Columbia November 2017)

VPHw - does not include BTEX

VHw (C_6-C_{10}) - includes BTEX

Italics - indicates value does not meet applicable standards

TABLE 7

2018 Groundwater Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
BH-103	15-May-18	17507180515009	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	27-Jul-18	17507180727009	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-103	11-Sep-18	17507180911009	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	0.02	<0.01	<0.01	0.02	0.02	<0.04
MW92-1	15-May-18	17507180515001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	27-Jul-18	17507180727001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1	11-Sep-18	17507180911001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.04
MW92-1	07-Dec-18	17507181207001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	15-May-18	17507180515002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	27-Jul-18	17507180727002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	11-Sep-18	17507180911002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	07-Dec-18	17507181207002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-6A	15-May-18	17507180515003	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-6A	27-Jul-18	17507180727003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	0.32	<0.01	<0.01	0.07	***1.11***	<0.04
MW92-6A	11-Sep-18	17507180911003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-6A	07-Dec-18	17507181207003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.04
MW92-7	15-May-18	17507180515004	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7	27-Jul-18	17507180727005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-7	11-Sep-18	17507180911004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.04
MW92-7	07-Dec-18	17507181207004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.04
MW92-7A	15-May-18	17507180515005	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7A	27-Jul-18	17507180727004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.04
MW92-7A	11-Sep-18	17507180911005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-7A	07-Dec-18	17507181207005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-3	15-May-18	17507180515006	<0.010	<0.010	<0.010	<0.010	<0.0050	0.017	0.014	<0.010	<0.050	<0.020	0.035	<0.050
03-3	27-Jul-18	17507180727006	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-3	11-Sep-18	17507180911007	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-3	07-Dec-18	17507181207008	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-5	15-May-18	17507180515008	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
03-5	27-Jul-18	17507180727008	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**60**	**0.5**	**1**	**1**	**0.1**	**1**	**2**	**120**	**10**	**3**	**0.2**	**34**
B.C. CSR 375/96 - Irrigation standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**250**	**NS**	**1000**	**0.07**	**0.01**	**7**	**150**	**150**	**80**	**NS**	**100**	**0.05**

TABLE 7

2018 Groundwater Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
BH-105(R)	15-May-18	17507180515012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	27-Jul-18	17507180727012	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-105(R)	11-Sep-18	17507180911012	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.04
BH-105(R)	07-Dec-18	17507181207011	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-9	15-May-18	17507180515013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-9	27-Jul-18	17507180727013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-9	11-Sep-18	17507180911013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.04
15-9	07-Dec-18	17507181207013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	15-May-18	17507180515014	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	27-Jul-18	17507180727014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	11-Sep-18	17507180911014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	07-Dec-18	17507181207014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	15-May-18	17507180515015	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-11	27-Jul-18	17507180727015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	11-Sep-18	17507180911015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	07-Dec-18	17507181207015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
Leachate Vault 1	15-May-18	17507180515007	9.7	<0.30	<1.3	<0.40	<0.24	*1.04*	1.48	31.7	*52.4*	*53.4*	*2.93*	<0.75
Leachate Vault 1	27-Jul-18	17507180727016	0.53	<0.05	<0.010	<0.01	<0.007	<0.01	0.06	1.15	5.86	1.33	0.07	<0.04
Leachate Vault 1	11-Sep-18	17507180911016	1.95	<0.05	<0.010	*0.2*	*0.11*	0.21	0.78	4.43	8.5	*8.75*	*1.1*	<0.04
Leachate Vault 1	07-Dec-18	17507181207016	1.36	<0.05	<0.010	0.06	<0.007	0.02	0.26	4.76	9.03	*6.21*	*0.38*	<0.04
Leak Detection System	15-May-18	17507180515016	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	0.012	0.036	<0.050	0.192	<0.010	<0.050
Leak Detection System	27-Jul-18	17507180727017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	0.01	0.01	0.03	<0.01	<0.04
Leak Detection System	11-Sep-18	17507180911017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.04
Leak Detection System	07-Dec-18	17507181207017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
B.C. CSR 375/96 - Freshwater Aquatic Standards*			**60**	**0.5**	**1**	**1**	**0.1**	**1**	**2**	**120**	**10**	**3**	**0.2**	**34**
B.C. CSR 375/96 - Irrigation standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Livestock Standards*			**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**
B.C. CSR 375/96 - Drinking Water Standards*			**250**	**NS**	**1000**	**0.07**	**0.01**	**7**	**150**	**150**	**80**	**NS**	**100**	**0.05**

Notes:

Bold - background well

NS - not specified

* - *Contaminated Sites Regulation 375/96* (Province of British Columbia November 2017)

Italics - indicates value does not meet applicable standards

TABLE 8

2018 Groundwater Quality Results - Isotopes

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Pb-210 Bq/L	Ra-226 Bq/L	Ra-228 Bq/L	Gross Alpha Bq/L	Gross Beta Bq/L	Th-228 Bq/L	Th-230 Bq/L	Th-232 Bq/L	U-234 Bq/L	U-235 Bq/L	U-238 Bq/L
BH-103	15-Nov-17	17507171115002	0.033	<0.0005	0.035	<0.6	<0.8	0.018	0.0066	0.0069	0.0065	<0.0039	0.0039
BH-103	15-May-18	17507180515009	<0.080	0.0300	<0.200	<3	<2	<0.040	<0.040	---	---	0.0002	0.0030
BH-103	27-Jul-18	17507180727009	<0.04	<0.02	<0.07	<1.5	<1.0	<0.02	<0.02	<0.02	0.003	0.0002	0.0030
BH-103	11-Sep-18	17507180911009	---	---	---	<1.8	<1.3	---	---	---	---	---	---
BH-103	7-Dec-18	17507181207009	<0.04	0.02	<0.08	3.1±1.4	2.5±0.5	<0.02	<0.02	<0.02	0.006	0.0003	0.006
MW92-6A	15-Nov-17	17507171115006	0.070	0.016	0.034	3.5	3.4	0.047	0.028	0.031	0.042	<0.0028	0.033
MW92-6A	15-May-18	17507180515003	<0.080	0.03	<0.20	<2	1	0.04	<0.040	---	---	0.0027	0.054
MW92-6A	27-Jul-18	17507180727003	0.08	<0.02	<0.07	<0.56	<0.40	0.03	<0.02	0.02	0.016	0.0008	0.016
MW92-6A	11-Sep-18	17507180911003	---	---	---	2.7±1.1	1.9±0.4	---	---	---	---	---	---
MW92-6A	7-Dec-18	17507181207003	<0.04	0.04	<0.08	1.9±0.8	1.5±0.3	<0.02	<0.02	<0.02	0.038	0.0019	0.038
BH-105(R)	15-Nov-17	17507171115005	0.036	0.013	0.027	2	1.2	0.033	0.028	0.026	1.7	0.036	0.650
BH-105(R)	15-May-18	17507180515012	<0.080	<0.020	<0.20	<2	<1	<0.040	<0.040	---	---	0.035	0.670
BH-105(R)	27-Jul-18	17507180727012	<0.04	<0.02	0.2	3.8	1.3	<0.02	<0.02	<0.02	0.7	0.035	0.7
BH-105(R)	11-Sep-18	17507180911012	---	---	---	5.0±1.9	<0.99	---	---	---	---	---	---
BH-105(R)	7-Dec-18	17507181207012	<0.02	0.02	<0.04	3.9±1.5	<0.98	0.01	<0.01	<0.01	0.7	0.035	0.7
15-9	15-Nov-17	17507171115004	0.021	0.023	<0.023	1.3	1.5	0.21	0.067	0.091	1.1	0.031	0.600
15-9	15-May-18	17507180515013	<0.080	0.05	<0.20	<4	9.6	0.12	<0.040	---	---	0.034	0.680
15-9	27-Jul-18	17507180727013	<0.04	<0.02	<0.09	3.7	<1.4	<0.02	<0.02	<0.02	0.71	0.035	0.71
15-9	11-Sep-18	17507180911013	---	---	---	5.3±2.4	2.5±0.6	---	---	---	---	---	---
15-9	7-Dec-18	17507181207013	<0.08	0.12	<0.2	5.6±2.2	3.6±0.7	0.1	0.08	0.08	0.67	0.033	0.67
15-10	15-Nov-17	17507171115003	<0.019	0.021	0.048	0.85	0.87	0.180	0.043	0.087	0.480	0.015	0.240
15-10	15-May-18	17507180515014	<0.080	0.04	<0.20	<3	<1	<0.040	<0.040	---	---	0.013	0.260
15-10	27-Jul-18	17507180727014	<0.04	0.07	<0.09	<1.5	<1.0	0.02	<0.02	<0.02	0.25	0.012	0.25
15-10	11-Sep-18	17507180911014	---	---	---	3.8±1.7	<1.3	---	---	---	---	---	---
15-10	7-Dec-18	17507181207014	<0.04	0.08	<0.09	3.3±1.4	2.6±0.5	0.04	<0.02	<0.02	0.22	0.011	0.22
15-11	15-Nov-17	17507171115001	<0.020	0.034	0.051	0.92	1.1	0.068	0.019	0.038	0.66	0.022	0.300
15-11	15-May-18	17507180515015	<0.080	0.06	<0.20	<3	<1	0.05	<0.040	---	---	0.017	0.350
15-11	27-Jul-18	17507180727015	<0.04	<0.02	<0.09	1.8	<1.0	<0.02	<0.02	<0.02	0.3	0.015	0.300
15-11	11-Sep-18	17507180911015	---	---	---	6.0±2.3	2.4±0.5	---	---	---	---	---	---
15-11	7-Dec-18	17507181207015	<0.02	0.02	<0.05	<1.8	<1	<0.01	<0.01	<0.01	0.32	0.016	0.320
Alberta Tier 1 - Natural Areas*			0.2	0.5	0.5	NS	NS	2.0	0.4	0.1	4.0	4.0	4.0
Alberta Tier 1 - Agricultural*			0.2	0.5	0.5	NS	NS	2.0	0.4	0.1	4.0	4.0	4.0
Alberta Tier 1 - Residential/Parkland*			0.2	0.5	0.5	NS	NS	2.0	0.4	0.1	4.0	4.0	4.0
Alberta Tier 1 - Commercial/Industrial*			0.2	0.5	0.5	NS	NS	2.0	0.4	0.1	4.0	4.0	4.0
Canadian Drinking Water Guidelines**			0.2^{MAC}	0.5^{MAC}	0.2^{MAC}	NS	NS	2.0^{MAC}	0.6^{MAC}	0.6^{MAC}	3.0^{MAC}	3.0^{MAC}	3.0^{MAC}

TABLE 8

2018 Groundwater Quality Results - Isotopes

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Pb-210 Bq/L	Ra-226 Bq/L	Ra-228 Bq/L	Gross Alpha Bq/L	Gross Beta Bq/L	Th-228 Bq/L	Th-230 Bq/L	Th-232 Bq/L	U-234 Bq/L	U-235 Bq/L	U-238 Bq/L
Leachate^	30-Nov-17	1242452-1	<0.1	0.1	<0.8	---	---	<0.1	<0.1	<0.1	---	---	<0.1
Leachate Vault 1	11-Sep-18	17507180911016	---	---	---	12±6	17±3	---	---	---	---	---	---
Leachate vault 1	7-Dec-18	17507181207016	<0.08	<0.02	***0.3***	<12	22±4	<0.04	<0.04	<0.04	0.17	0.0085	0.170
Alberta Tier 1 - Natural Areas*			**0.2**	**0.5**	**0.5**	**NS**	**NS**	**2.0**	**0.4**	**0.1**	**4.0**	**4.0**	**4.0**
Alberta Tier 1 - Agricultural*			**0.2**	**0.5**	**0.5**	**NS**	**NS**	**2.0**	**0.4**	**0.1**	**4.0**	**4.0**	**4.0**
Alberta Tier 1 - Residential/Parkland*			**0.2**	**0.5**	**0.5**	**NS**	**NS**	**2.0**	**0.4**	**0.1**	**4.0**	**4.0**	**4.0**
Alberta Tier 1 - Commercial/Industrial*			**0.2**	**0.5**	**0.5**	**NS**	**NS**	**2.0**	**0.4**	**0.1**	**4.0**	**4.0**	**4.0**
Canadian Drinking Water Guidelines**			**0.2^{MAC}**	**0.5^{MAC}**	**0.2^{MAC}**	**NS**	**NS**	**2.0^{MAC}**	**0.6^{MAC}**	**0.6^{MAC}**	**3.0^{MAC}**	**3.0^{MAC}**	**3.0^{MAC}**

Notes:

Bold - background well

^ - sample collected by Tervita Corporation

--- - not analyzed

NS - not specified

MAC - maximum acceptable concentration

* - *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* (AEP 2016)

** - *Guidelines for Canadian Drinking Water Quality-Summary Table* (Health Canada 2017)

Italics - values do not meet applicable guidelines

APPENDIX A
Environmental Management Act Permit 17150

September 1, 2017

Tracking Number: 354730
Authorization Number: 17150

REGISTERED MAIL

Tervita Corporation
500, 140 10TH AVENUE S.E.
CALGARY AB T2G 0R1

Dear Permittee:

Enclosed is Amended Permit 17150 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the permit. An annual fee will be determined according to the Permit Fees Regulation.

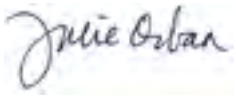
This permit does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This permit is issued pursuant to the provisions of the *Environmental Management Act* to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

Administration of this permit will be carried out by staff from the Environmental Protection Division's Regional Operations Branch. Plans, data, reports, non-compliance notifications and non-compliance reports pertinent to the permit are to be submitted to the Director via email or other electronic means as described in the following web link: http://www2.gov.bc.ca/gov/content/environment/waste-management/waste-discharge-authorization/data-and-report-submissions, or as further instructed.

Yours truly,

Environmental Protection Division
Ministry of Environment
Bag 5000
Smithers, BC V0J 2N0
Authorizations - North Region
Telephone: (250) 847-7260
Facsimile: (250) 847-7591



Julie Orban P. Geo.
for Director, *Environmental Management Act*
Authorizations - North Region

Enclosure

cc: Environment Canada
BC Environmental Assessment Office – Audrey Roburn (Audrey.Roburn@gov.bc.ca)

MINISTRY OF ENVIRONMENT

PERMIT

17150

Under the Provisions of the Environmental Management Act

Tervita Corporation

500, 140 10TH AVENUE S.E.
CALGARY AB T2G 0R1

is authorized to discharge refuse to ground at the Silverberry Landfill facility located north of Fort St. John, British Columbia, subject to the terms and conditions listed below.

Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

This Permit supersedes and amends all previous versions of Permit 17150 issued under Part 2, Section 14 of the *Environmental Management Act.*

1. AUTHORIZED DISCHARGES

1.1 This section applies to the discharge of refuse from a **SECURE LANDFILL**. The EMS site reference number for this discharge is E249572.

1.1.1 The maximum quantity of waste authorized to be discharged is 3,933,000 m^3.

1.1.2 The characteristics of the discharge are those of refuse including hazardous and naturally occurring radioactive materials (NORM), except waste as set out in Section 6.

1.1.3 The authorized works are a landfill, liner systems, leachate collection systems and related appurtenances approximately located as shown on the attached Site Plan.

Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

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for Director, *Environmental Management Act*
Authorizations - North Region

1.1.4 The location of the point of discharge is approximately 50 kilometers north of Fort St John on a 25 hectare site within Block A, Section 8, Township 88, Range 20, west of the 6th Meridian.

2. POSTING OF SECURITY

2.1 The Permittee must submit a cost estimate for maintenance, monitoring and closure of the landfill for the active life of the site and a minimum twenty-five year post-closure period. The cost estimate must be prepared or reviewed by a suitably qualified, independent third party. An updated cost estimate must be submitted each year with the ANNUAL REPORT proposing the security for the following calendar year.

2.2 The Permittee must provide and maintain security in the amount agreed upon by the Director. The security may be applied at the discretion of the Director under the provisions of the *Environmental Management Act* to dispose of the waste, correct inadequacies relating to construction or operation, monitor the site, or carry out post-closure maintenance.

2.3 The operation of the facility without valid security is not authorized.

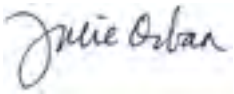
2.4 The Director may extend the post-closure period where the landfill will produce contaminants at levels that could have an unacceptable impact if they were to be discharged to the environment surrounding the landfill.

2.5 The Permittee may request the return of security where the title of the works has been transferred to a municipal authority or where the posted amount exceeds the estimated closure and post-closure costs. Granting the request is at the discretion of the Director.

3. HAZARDOUS WASTE REGULATION REQUIREMENTS

The Permittee must comply with all applicable provisions of the Hazardous Waste Regulation of the *Environmental Management Act*. Where a conflict exists between this Permit and the Hazardous Waste Regulation, the latter must take precedence.

Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)



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Authorizations - North Region

4. GENERAL REQUIREMENTS

4.1 Plans

Plans and specifications of any new works, future upgrades or modifications to existing works must be submitted to the Director and his/her consent must be obtained in writing before construction commences. All plans and specifications must be generated by a Qualified Professional and include:

a) a Design Plan and Specifications for the proposed construction;

b) a Construction Quality Assurance Plan; and,

c) a Construction Quality Control Plan.

The works must be constructed in accordance with the approved plans. Consent of the Director in writing must be obtained for any modifications to approved plans.

Upon completion of construction and prior to accepting waste, all plans and specifications must be stamped and signed by a Qualified Professional.

4.2 Auditing

The facility must be audited by a qualified independent 3rd party a minimum of once every three years. The results of the audit must be submitted to the Director within 30 days of completing the audit.

4.3 Site Restoration

Provision of fencing, site access, vehicle safety barriers, surface water diversionary works, firebreaks and site restoration as required, must be carried out to the satisfaction of the Director.

4.4 Site Access Security

The Permittee must provide adequate security for the facility and restrict access to authorized personnel. All valves, pumps, doors and controls, accessible if security were breached, are to be locked.

4.5 Warning Signs

Warning signs conforming to Section 8(d) of the Hazardous Waste Regulation are to be posted at each entrance to the facility and at other locations as required by the Director.

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Date amended: September 1, 2017
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4.6 **Burning**

Burning of waste materials is prohibited other than, in compliance with section 6 of the *Environmental Management Act*, and for the sole purpose of comfort heating in an appliance meeting the Canadian standard as defined by the Solid Fuel Burning Domestic Appliance Regulation.

4.7 **Emergency Procedures**

The Permittee must inspect the authorized works regularly and maintain them in good working order. In the event of an emergency or condition beyond the control of the Permittee which prevents continuing operation of the approved method of pollution control, the Permittee must take appropriate remedial action and notify the Director immediately.

4.8 **Non-Compliance Reporting**

The Permittee must immediately notify the Director, or designate by e-mail, of any non-compliance with the requirements of this Permit.

The Permittee must identify the non-compliance and any remedial action taken to deal with the non-compliance.

Written confirmation of all non-compliance events, including available test results, is required by email within 24 hours of the original notification unless otherwise instructed by the Director.

4.9 **Process Modifications**

The Permittee must notify the Director, in writing, prior to implementing changes to the authorized works or to any process that may affect the quality and/or quantity of the discharge.

4.10 **Changes to the Operations or Works**

Based on monitoring data, or any other information related to the impact of the landfill operation on human health or the environment, the Director may require the Permittee to make changes to the quantity or type of waste accepted at the landfill, the construction and maintenance of the landfill, the operating procedures and/or the monitoring program**.**

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Date amended: September 1, 2017
(most recent)

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for Director, *Environmental Management Act*
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5. OPERATIONAL REQUIREMENTS

5.1 Operational Plan

Prior to construction, an OPERATIONAL PLAN must be submitted to and approved by the Director.

The OPERATIONAL PLAN must address, at a minimum, all of the following:

a) waste acceptance policies and procedures;

b) policies and procedures for complying with:

i. Section 6.4 of this Permit;

ii. the regional protocol for the management of landfilling of contaminated soils and other hazardous and non-hazardous waste streams; and

iii. all applicable parts of the Hazardous Waste Regulation for the facility.

c) a leachate monitoring and management program;

d) a surface water monitoring and management program;

e) a ground water monitoring and management program;

f) a detailed description of maximum design; elevations, slope and boundary for final landfill contours;

g) a nuisance control program;

h) an emergency response plan; and,

i) any other information requested by the Director.

The facility must operate in accordance with the approved OPERATIONAL PLAN and any requirements which the Director may attach to the OPERATIONAL PLAN as a condition of approval.

5.2 Compaction and Contouring

The Permittee must compact and contour the refuse daily. The OPERATIONAL PLAN must include details on a progressive closure plan. The purpose of the progressive closure is to minimize the amount of leachate generated at the site.

Final cover requirements must be in accordance with the approved OPERATIONAL PLAN and CLOSURE PLAN.

Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

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for Director, *Environmental Management Act*
Authorizations - North Region

5.3 Quality Assurance and Quality Control (QA/QC)

During the construction phase and/or the addition of new works, a QA/QC program must be carried out by a qualified independent 3rd party. The permittee must submit to the Director a summary report of the QA/QC program results confirming the integrity of the liners and leachate collection system prior to depositing waste into any new landfill cell.

6. MANAGEMENT OF SELECT WASTE

6.1 Prohibited Waste

The following wastes are prohibited from disposal in the landfill:

a) Liquids,

b) Waste materials which contain free liquids,

c) Containers with:
   i Liquids, or
   ii. Waste materials which contain free liquid,

d) Empty waste containers unless they are crushed, shredded or similarly reduced in volume to the maximum practical extent,

e) Materials having properties of substances defined and regulated in Class 1 through Class 6 and Class 8 of the Transportation of Dangerous Goods Regulations of Canada (TDG) excluding UN3175 Solids Containing Flammable Liquids,

f) Materials having properties of substances defined and regulated in Class 9 of the TDG,

g) Materials listed as "forbidden" in column 3 of Schedule 1 of the TDG,

h) Wastes which contain Benzene, Toluene, Ethylbenzene and/or Xylene (BTEX) in total combined concentration greater than 1,000 mg/kg,

i) Wastes which contain halogenated organic compounds, except for tetrachloroethylene, in total concentrations greater than 100 mg/kg,

j) Wastes which contain tetrachloroethylene in total concentrations greater than 500 mg/kg,

k) Wastes which contain dioxin TEQ, as defined by the Hazardous Waste Regulation, in a concentration greater than 100 parts per billion by weight,

l) Waste which when subjected to the Modified Leachate Extraction Procedure, referenced in Part 2 of Schedule 4 of the Hazardous Waste Regulation, produce an extract which contains one or more contaminants in Column 1 of Table 1 of Schedule 4 in concentrations equal to or greater than the concentration specified for each contaminant in Column II of the Table except for BTEX,

m) Oil products covered under the BC Used Oil Management Association, including but not limited to oil, oil filters and containers,

n) Recyclable Oily Rags,

o) PCB Wastes,

p) Radioactive wastes, except for Naturally Occurring Radioactive Material (NORM) which meets and is handled in accordance with the requirements of Section 6.4 of this document.

6.2 Free Liquid

Waste which are or contain "free liquid" must be determined by US EPA method 9095A Paint Filter Liquids Test, Test Methods for Evaluating Solid Wastes- Physical/Chemical Methods (EPA Publication No. Sw-846).

6.3 Metallic Wastes

Large metallic waste must be segregated into a separate area of the landfill site. The preferred method of final disposal of these metal wastes is through recycling.

6.4 Naturally Occurring Radioactive Material (NORM)

For the purposes of this section, the following definitions apply:

NORM waste means waste material containing or contaminated with naturally occurring radioactive material that exceeds the limits specified as Unconditional Derived Release Limits in Tables 5.1, 5.2 or 5.3 of the *Canadian Guidelines for*

the Management of Naturally Occurring Radioactive Materials (NORM), 2011 Revision;

Non-NORM waste means any other waste as authorized by this Permit, and which may contain small amounts of NORM that does not exceed the Unconditional Derived Release Limits in Tables 5.1, 5.2 or 5.3 of the *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM), 2011 Revision*;

Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials (NORM), 2011 Revision *means the document:*

a) prepared by the Canadian NORM Working Group of the Federal Provincial Territorial Radiation Protection Committee;

b) published by Health Canada; and

c) as amended from time to time.

6.4.1 All NORM must be managed in accordance with an approved NORM Management Plan and must include monitoring procedures for NORM in leachate and groundwater, including parameters to be sampled and analyzed, and frequency of sampling.

A Groundwater Monitoring Plan for radiological parameters must be prepared by a Qualified Professional and submitted to the Director for approval. **The approved plan must be implemented in the fall of 2017**.

An updated NORM Management Plan must be received by the Director on or before **December 1, 2017**, or on another date as authorized by the Director. The plan must be implemented once approved by the Director. The Director may require changes to the plan at any time.

6.4.2 All loads entering the Tervita Silverberry facilities must be screened at the gate for NORM by screening procedures as described in the approved NORM Management Plan.

6.4.3 Any loads with radioactive emission exceeding twice background must be sampled for and meet acceptable concentrations for parameters outlined in 6.4.5. prior to being landfilled.

6.4.4 An incremental (i.e. above background) radiation dose of 0.3 milliSieverts per year (mSv/yr) must not be exceeded at the property boundary of the Silverberry Landfill. Methods for measuring and calculating the dose at the property boundary must be as described in the approved NORM Management Plan.

6.4.5 The maximum acceptable radioactive concentration for NORM is 70 Bq/g, with a maximum radioactive concentration due to Radium 226 of 5 Bq/g. **Any load exceeding these concentrations must not be accepted for disposal.**

6.4.5 All NORM waste must be co-disposed with non-NORM waste at a minimum ratio of 3 parts non-NORM to 1 part NORM, by mass to a maximum of 1,500,000 tonnes.

6.5 Non-Recyclable Municipal Solid Waste

Non-recyclable office waste and food waste generated on-site by Tervita operations may be directed to the Secure Landfill. Recyclable products include paper, cardboard, printer ink and goods covered by a stewardship program.

Waste is to be immediately covered with a minimum of 0.15 metres of suitable cover material.

All other Municipal Solid Waste, as defined by the *Environmental Management Act*, is prohibited for disposal unless the Director specifically authorizes in writing the disposal of a discrete type and source of "municipal solid waste".

6.6 Spilled Materials

Despite Section 6.1, spilled materials, as authorized by a Director may also be accepted for treatment and/or disposal under authority of Section 52(1) of the Hazardous Waste Regulation.

7. MONITORING – LANDFILL MONITORING

Monitoring must be performed as outlined in the OPERATIONAL PLAN. Any changes to the monitoring program must be submitted as part of an updated OPERATIONAL PLAN for the approval of the Director.

Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

Julie Orban P. Geo.
for Director, *Environmental Management Act*
Authorizations - North Region

The need for subsequent increased or decreased monitoring will be assessed on the basis of the monitoring data submitted, any other data gathered in connection with the discharges and/or as otherwise specified by the Director.

8. SAMPLING AND ANALYSIS

8.1 Sampling

Sampling is to be carried out in accordance with procedures described in the most current edition of "British Columbia Field Sampling Manual" (January 2003, or most recent update), or by suitable alternative procedures as Authorized by the Director.

8.2 Analyses

Analyses are to be carried out in accordance with procedures described in the "British Columbia Laboratory Manual (2009 Permittee Edition)", or the most recent edition, or by suitable alternative procedures as authorized by the Director.

Copies of the above manuals may be purchased from the Queen's Printer Publications Centre, P. O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409), at the internet at www.crownpub.bc.ca. A copy of the manual is also available for review at all Environmental Protection offices.

9. REPORTING

The Director may, in writing, change the reporting requirements outlined below.

9.1 Annual Discharge Reporting for Determination of Permit Fees

For the purpose of determining discharge fees, the permittee must report the actual tonnage of waste discharged for the preceding calendar year as per section 9.3 of this permit.

Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

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for Director, *Environmental Management Act*
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9.2 **Drawings**

"As built" drawings certified correct and sealed by a qualified professional must be submitted electronically within 60 days of completion of the work or as otherwise specified by the Director.

9.3 **Annual Report**

The Permittee must submit an annual report, in a format satisfactory to the Director, once each year on or before March 31 for the previous calendar year. The annual report must include the following:

a) the category and tonnage of waste received, recycled and discharged for the preceding calendar year;

b) a review of the decision matrix for determining which wastes will be treated versus directly disposed and recommended revisions to the matrix;

c) a current topographic map of the site;

d) the remaining capacity and estimated site life;

e) a cost estimate of the financial security required by Section 2.1;

f) a review of operations for the previous calendar year and detailed plans for the next 12 months. Operational changes must be identified in the ANNUAL REPORT and may require revision of the OPERATIONAL PLAN;

g) any revisions to plans and specifications;

h) up to date contingency plans;

i) the results of all monitoring programs as specified in this Permit. Data interpretation and trend analysis, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year must be carried out by a qualified independent professional; and,

j) the methods and amounts of leachate collection, treatment and disposal, if applicable.

10. **CLOSURE PLAN**

Specifications for the final cap must be submitted at least 60 days in advance of each area of the landfill reaching final elevations or as otherwise specified by the Director.

Details must include the thickness and permeability of barrier and drainage layers, information on topsoil, vegetative cover and erosion prevention controls.
At least one year in advance of decommissioning the landfill, or as otherwise specified by the Director, a CLOSURE PLAN must be submitted for the approval of the Director which includes at least the requirements of Section 27(9) of the Hazardous Waste Regulation plus the following information:

a) a topographic plan showing the final elevations and contours of the landfill and surface water diversion and drainage controls;
b) Proposed end use of the site;
c) Provisions for monitoring radioactivity at the property boundaries, groundwater, surface water, landfill gas, erosion and settlement for a minimum 25 year post- closure period; and,
d) Provisions for maintenance and corrective measures for a minimum 25-year post- closure period.

11. **DEFINITION**

For the purposes of this permit the following definition applies:

"Qualified professional" means:

An applied scientist or technologist specializing in an applied science or technology applicable to the duty or function, including, if applicable and without limiting this, of agrology, biology, chemistry, engineering, geology or hydrogeology and who:

i. is registered with the appropriate professional organization, is acting under that organization's code of ethics and is subject to disciplinary action by that organization, and
ii. through suitable education, experience, accreditation and/or knowledge, may be reasonably relied on to provide advice within their area of expertise.

Date issued: October 18, 2002
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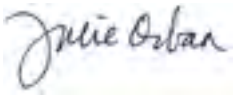
(most recent)



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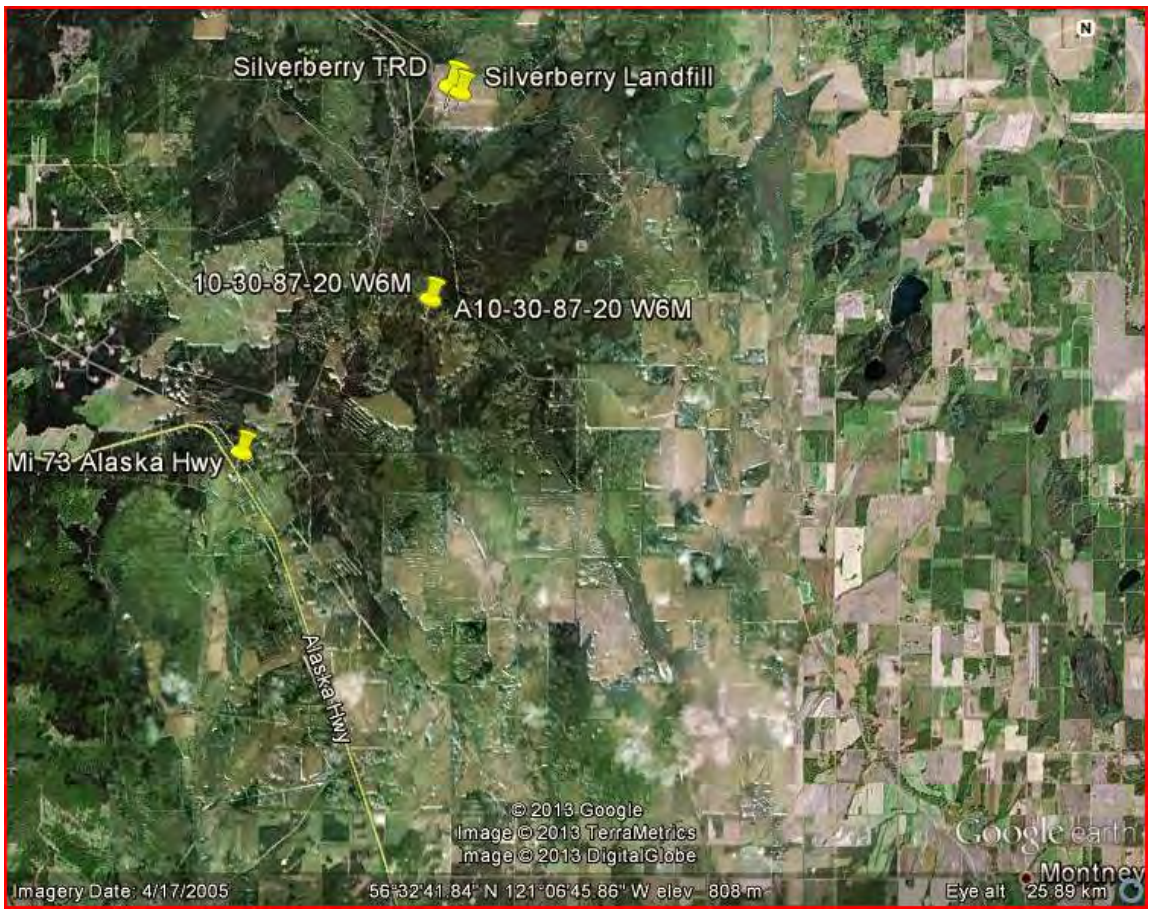
for Director, *Environmental Management Act*
Authorizations - North Region

Location Map



Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

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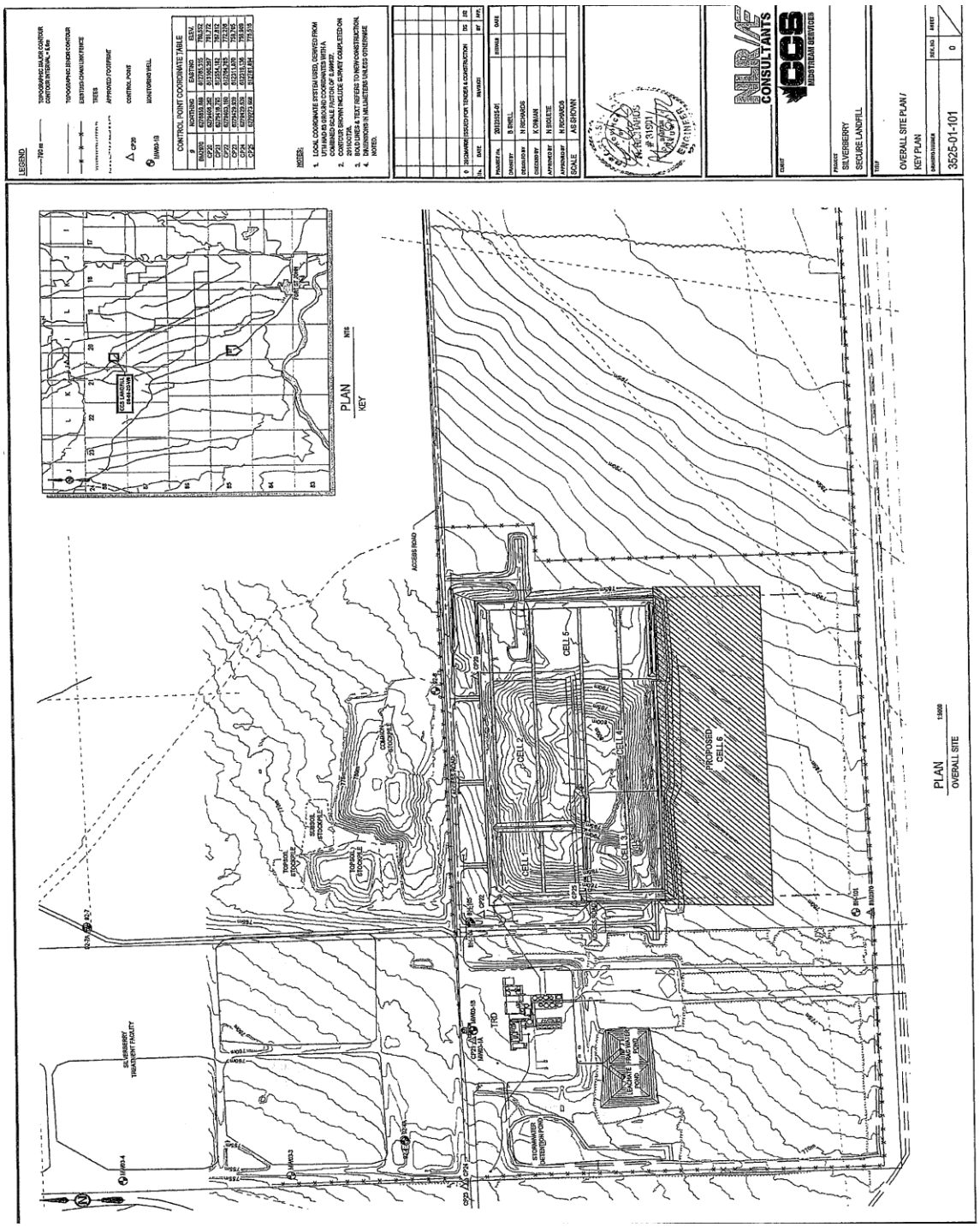
for Director, *Environmental Management Act*
Authorizations - North Region

Site Plan



Date issued: October 18, 2002
Date amended: September 1, 2017
(most recent)

Julie Orban

Julie Orban P. Geo.
for Director, *Environmental Management Act*
Authorizations - North Region

APPENDIX B
Borehole Logs

Borehole Log - USC

Matrix Solutions Inc.

Project/Site: **17507-502**

Well/borehole #: **BH-104(R)**

Client: **Tervita Corporation**

Logged By: **C. Bromba**

Compiled By: **J. Romero**

Driller: **Backcountry Ltd.**

Drill Equipment: **Solid stem auger**

Sample Method: **--**

Date: **September 29, 2015**

Start Time: **13:15**

Finish Time: **14:10**

Top of Casing: **--**

Ground Elev: **--**

Top / Base of Sand Pack: **6.7 / 10.0m**

Screened Interval: **7.0 - 10.0m**

Screen Size: **0.010"**

Total Depth: **10.0m**

Boring Diameter: **6"**

Casing Diameter: **2"**

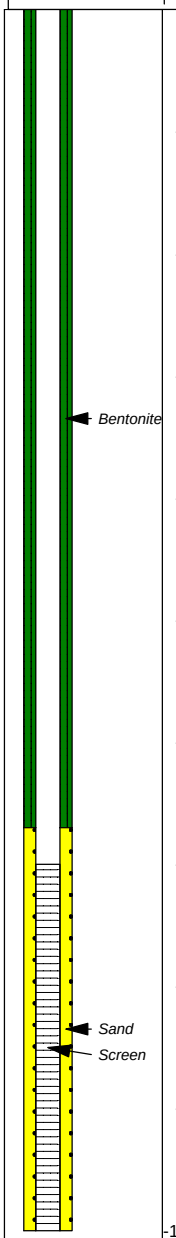
Legal Location: **Block A 18-088-20 W6M**

Relative Location: **See Notes**

Northing: **6277134**

Easting: **612537**

Datum/Zone: **NAD83 / Zone 10N**



Depth (m)	Elevation (relative)	Soil Description
0	0	SILTY CLAY: (0-10.0m) trace sand, trace gravel, trace cobbles, medium plasticity, brown, firm, moist.
-1	-1	
-2	-2	@ 1.5m light/dark brown mottling, trace grey.
-3	-3	
-4	-4	@ 4.0-4.15m sand lense.
-5	-5	
-6	-6	
-7	-7	
-8	-8	
-9	-9	
-10	-10	TD = 10.0m
-11	-11	
-12	-12	

Sample Depth: *B = Bag*, *J = Jar*, MSI N/A

LITHOLOGY: texture, plasticity, colour/oxidation, consistence, moisture, primary structure, secondary structure, genesis, remarks.

EC dS/m: 1, 10

CVC ppm: 100, 1000, 10000

NOTE: Relative location: S of main crossroads. N of Leachate vault.

Template: USC.ldfx

Borehole Log - USC

Matrix Solutions Inc.

Project/Site: **17507-502**

Well/borehole #: **BH-105(R)**

Client: **Tervita Corporation**

Logged By: **C. Bromba**

Compiled By: **J. Romero**

Driller: **Backcountry/TCL**

Drill Equipment: **Solid stem auger**

Sample Method: **--**

Date: **September 29, 2015**

Start Time: **9:15**

Finish Time: **12:20**

Top of Casing: **--**

Ground Elev: **--**

Top / Base of Sand Pack: **20.4 / 24.0m**

Screened Interval: **21.0 - 24.0m**

Screen Size: **0.010"**

Total Depth: **24.0m**

Boring Diameter: **6"**

Casing Diameter: **2"**

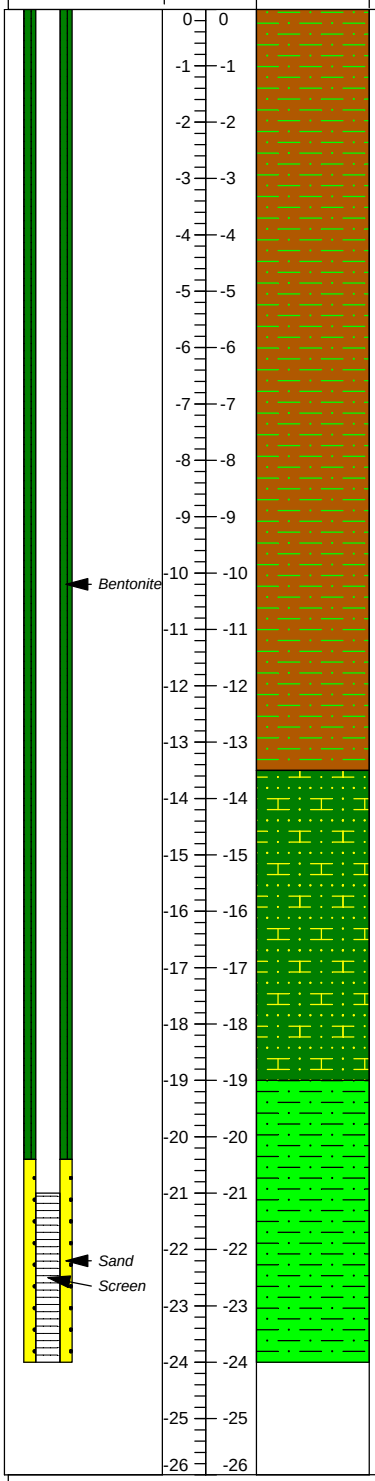
Legal Location: **Block A 18-088-20 W6M**

Relative Location: **See Notes**

Northing: **6277136**

Easting: **612539**

Datum/Zone: **NAD83 / Zone 10N**



Depth (m)	Elevation (relative)
0	0
-1	-1
-2	-2
-3	-3
-4	-4
-5	-5
-6	-6
-7	-7
-8	-8
-9	-9
-10	-10
-11	-11
-12	-12
-13	-13
-14	-14
-15	-15
-16	-16
-17	-17
-18	-18
-19	-19
-20	-20
-21	-21
-22	-22
-23	-23
-24	-24
-25	-25
-26	-26

Sample Depth
B = Bag
J = Jar
MSI N/A

Soil Description

LITHOLOGY: texture, plasticity, colour/oxidation, consistence, moisture, primary structure, secondary structure, genesis, remarks.

SILTY CLAY: (0-13.5m) trace sand, trace gravel, trace cobbles, medium plasticity, brown, firm, moist.

@ 1.5m light/dark brown mottling, trace grey.

@ 4.0-4.15m sand lense.

CLAY AND SILT: (13.5-19.0m) trace sand, trace gravel, low plasticity, brown, soft, moist.

CLAYEY SILT: (19.0-24.0m) trace sand, medium plasticity, light brown, very soft, moist.

TD = 24.0m

EC dS/m: 1 | 10

CVC ppm: 100 | 1000 | 10000

NOTE: Relative location: S of main crossroads. N of Leachate vault. / @ 9.0-9.15m drilled into rock/cobbles. @ 12-12.15m drilled into rock/cobbles. Increased moisture @ 19.0m. increases further @ 22.5m. Small amount of water already in the hole when installing the well.

Template: USC.ldfx

Borehole Log - USC

Matrix Solutions Inc.

Project/Site: **17507-502**

Well/borehole #: **15-9**

Client: **Tervita Corporation**

Logged By: **C. Bromba**

Compiled By: **J. Romero**

Driller: **Backcountry Ltd.**

Drill Equipment: **Solid stem auger**

Sample Method: **--**

Date: **September 29, 2015**

Start Time: **14:20**

Finish Time: **15:30**

Top of Casing: **--**

Ground Elev: **--**

Top / Base of Sand Pack: **6.7 / 10.0m**

Screened Interval: **7.0 - 10.0m**

Screen Size: **0.010"**

Total Depth: **10.0m**

Boring Diameter: **6"**

Casing Diameter: **2"**

Legal Location: **Block A 18-088-20 W6M**

Relative Location: **West of Cell 3**

Northing: **6276980**

Easting: **612490**

Datum/Zone: **NAD83 / Zone 10N**

Well / Borehole Completion Data	Depth (m)	Elevation (relative)	Lithology	Sample Depth (B = Bag, J = Jar; MSI N/A)	Soil Description (LITHOLOGY: texture, plasticity, colour/oxidation, consistence, moisture, primary structure, secondary structure, genesis, remarks.)	EC dS/m (1, 10)	CVC ppm (100, 1000, 10000)
Bentonite; Sand; Screen	0 to -12	0 to -12			TOPSOIL: (0-0.05m) brown, soft, moist, rootlets. SILTY CLAY: (0.05-8.0m) trace sand, trace gravel, medium plasticity, light/dark brown mottling, trace grey oxidation, firm, moist, trace black coal flecks. @ 0.05-0.1m trace rootlets. @ 0.1-3.0m intermittent sand/silt lenses(0.001-0.002m thick). @ 3.0m trace cobbles. @ 3.0-4.5m increased coal. CLAYEY SILT: (8.0-8.5m) trace sand, trace gravel, trace cobbles, low plasticity, light/brown mottling, soft, moist, trace coal flecks. SILTY CLAY: (8.5-10.0m) trace sand, trace gravel, trace cobble, medium plasticity, firm, moist. TD = 10.0m		

NOTE: ---

Template: USC.ldfx

Borehole Log - USC

Matrix Solutions Inc.

Project/Site: **17507-502**

Well/borehole #: **15-10**

Client: **Tervita Corporation**

Logged By: **C. Bromba**

Compiled By: **J. Romero**

Driller: **Backcountry Ltd.**

Drill Equipment: **Solid stem auger**

Sample Method: **--**

Date: **September 29, 2015**

Start Time: **15:50**

Finish Time: **16:45**

Top of Casing: **--**

Ground Elev: **--**

Top / Base of Sand Pack: **7.0 / 10.3m**

Screened Interval: **7.3 - 10.3m**

Screen Size: **0.010"**

Total Depth: **10.3m**

Boring Diameter: **6"**

Casing Diameter: **2"**

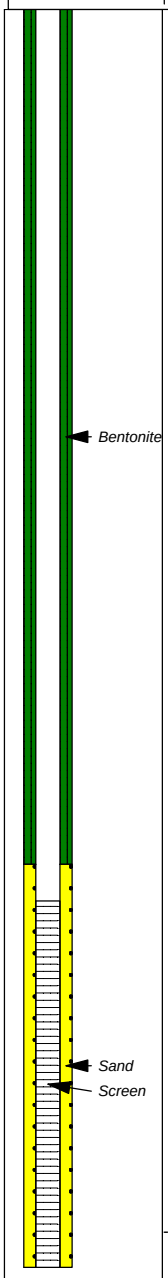
Legal Location: **Block A 18-088-20 W6M**

Relative Location: **West of Cell 6**

Northing: **6276870**

Easting: **612491**

Datum/Zone: **NAD83 / Zone 10N**



Depth (m)	Elevation (relative)
0	0
-1	-1
-2	-2
-3	-3
-4	-4
-5	-5
-6	-6
-7	-7
-8	-8
-9	-9
-10	-10
-11	-11
-12	-12

Lithology

Sample Depth
B = Bag
J = Jar
MSI N/A

Soil Description

LITHOLOGY: texture, plasticity, colour/oxidation, consistence, moisture, primary structure, secondary structure, genesis, remarks.

TOPSOIL: (0-0.05m) brown, soft, rootlets.

SILTY CLAY: (0.05-8.0m) trace sand, trace gravel, medium plasticity, light/dark brown mottling, trace grey oxidation, firm, moist, trace coal flecks.
@ 0.05-0.15m rootlets.

@ 3.0m trace cobbles.
@ 3.0-4.0m increased coal.
@ 4.0-4.5m intermittent sand/silt lenses (0.001-0.002m thick).

TD = 10.3m

EC dS/m — CVC ppm

1 | 10 | 100 | 1000 | 10000

NOTE: ---

Template: USC.ldfx

Borehole Log - USC

Matrix Solutions Inc.

Project/Site: **17507-502**

Well/borehole #: **15-11**

Client: **Tervita Corporation**

Logged By: **C. Bromba**

Compiled By: **J. Romero**

Driller: **Backcountry Ltd.**

Drill Equipment: **Solid stem auger**

Sample Method: **--**

Date: **September 30, 2015**

Start Time: **8:40**

Finish Time: **9:45**

Top of Casing: **--**

Ground Elev: **--**

Top / Base of Sand Pack: **6.7 / 10.3m**

Screened Interval: **7.3 - 10.3m**

Screen Size: **0.010"**

Total Depth: **10.3m**

Boring Diameter: **6"**

Casing Diameter: **2"**

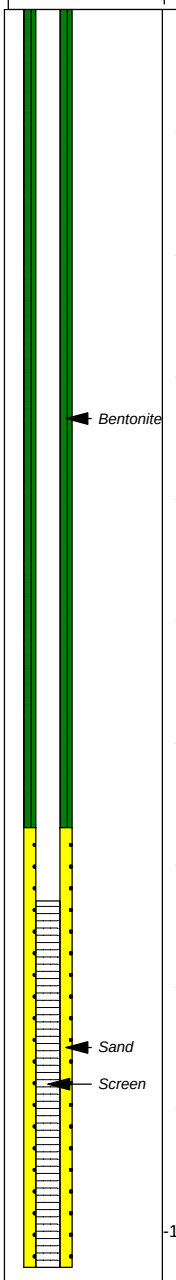
Legal Location: **Block A 18-088-20 W6M**

Relative Location: **West of Cell 7**

Northing: **6276648**

Easting: **612511**

Datum/Zone: **NAD83 / Zone 10N**



Depth (m)	Elevation (relative)	Lithology	Sample Depth (B = Bag, J = Jar; MSI N/A)	Soil Description (LITHOLOGY: texture, plasticity, colour/oxidation, consistence, moisture, primary structure, secondary structure, genesis, remarks.)
0	0			TOPSOIL: (0-0.15m) black, soft, moist, rootlets.
				SILTY CLAY: (0.15-10.3m) trace sand, trace gravel, medium plasticity, light/dark brown mottling, trace grey oxidation, firm, moist.
-1	-1			@ 1.5m trace cobbles.
-2	-2			@ 2.0-2.5m silt/sand lense (0.05m thick).
-3	-3			@ 3.0m trace coal flecks.
-4	-4			@ 4.0-4.1m silt/sand lense.
-5	-5			@ 5.2-5.3m silt/sand lense.
-6	-6			
-7	-7			
-8	-8			
-9	-9			
-10	-10			
-11	-11			TD = 10.3m
-12	-12			

EC (dS/m): 1 | 10 | 100 | 1000 | 10000

CVC (ppm)

NOTE: ---

Template: USC.ldfx

6 Statement of Limitations

NLR/AE Consultants Standard Disclaimer for Contaminated Site Investigations, Monitoring and Confirmation of Remediation Services

Subject to the following conditions and limitations, the investigation described in this report has been conducted in a manner consistent with a reasonable level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area.

1. The scope of the investigation described in this report has been limited by the budget set for the investigation in the work program. The scope of the investigation has been reasonable having regard to that budget constraint.

2. The investigation described in this report has been limited to the scope of work described in the work program.

3. The investigation described in this report has relied upon information provided by third parties concerning the history of the Site. Except as stated in this report, we have not made an independent verification of such historical information.

4. The investigation described in this report has been made in the context of existing government regulations generally promulgated at the date of this report. Except as specifically noted, the investigation did not take account of any government regulations not in effect and generally promulgated at the date of this report.

5. The findings and conclusions are valid only for the specific site identified in the report.

6. Since site conditions may change over time, the report is intended for immediate use.

This report is intended for the exclusive use of Tervita Corporation, including all successors and assigns. The material in it reflects NLR/AE Consultants best judgement, in light of the information available to it, at the time of preparation. Any use which a third party makes of this report or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. NLR/AE Consultants makes no representation of fact or opinion of any nature whatsoever to any person or entity other than Tervita Corporation.

In accepting delivery of this report, Tervita Corporation, hereby agrees that:

1. NLR/AE Consultants liability for all claims of Tervita Corporation, arising out of the agreement between NLR/AE Consultants and Tervita Corporation, pursuant to which this report has been prepared (the “Agreement”) shall absolutely cease to exist after a period of six (6) years from the date of:

   a) substantial completion of the investigation described in this report,
   b) termination of NLR/AE Consultants services under the Agreement,
   c) commencement of the limitation period for claims prescribed by any statute of the Province or Territory for the Site of the investigation described in this report,
   d) any significant alteration of the site of the investigation described in this report and/or neighbouring properties after the date of the final report.

   whichever shall first occur and following the expiration of such period, Tervita Corporation shall have no claim whatsoever against NLR/AE Consultants.

2. Any and all claims which it may have against NLR/AE Consultants or any of its servants, agents or employees arising out of or in any way connected with the investigation described in this report or the preparation of this report, whether such claims are in contract or in tort and whether such claims are based on negligence or otherwise, shall be limited to a total amount equal to the fees payable to NLR/AE Consultants under our contract with Tervita Corporation. NLR/AE Consultants shall bear no liability whatsoever for any consequential loss, injury or damage incurred by Tervita Corporation including but not limited to claims for loss of profits and loss of markets.

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CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff, medium plastic, mottled grey-brown, rootlets, trace fine gravel, shale & sandstone fragments, coal		1		<--- Steel Casing Protector 0.61 m Pipe Stickup	0.0
1.0						2			1.0
2.0		CI				3			2.0
3.0						4		<--- Flowable Bentonite Grout	3.0
4.0				CLAY(TILL) – silty, very stiff, medium plastic, dark grey with oxide staining, fine gravel, trace shale & sandstone fragments, coal chips occasional fissures		5 6 7		4.87 m 19 MAR 94 ▽	4.0
5.0									5.0
6.0						8 9			6.0
7.0		CI		– light grey clayey silt lomminations @ 7.15 m		10 11		<--- 50 mm Dia. Schedule 40 PVC Pipe	7.0
8.0									8.0
9.0				– fissured between 8.70 and 9.15 m, salt lined, sub-vertical, closed – oxidized zones between 9.15 and 10.65 m		12 13			9.0
10.0						14			10.0
11.0						15			11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
	REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/14
	Fig. No: B1	Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				CLAY(TILL) – continued – 150 mm thick oxidized zone		16			11.0
12.0						17			12.0
13.0						18			13.0
				– gravel sizes to 50 mm @ 13.55 m		19			
14.0						20			14.0
15.0		CI				21		<--- Bentonite Seal	15.0
				– becomes siltier, lighter grey below 15.55 m		22			
16.0						23			16.0
17.0				– more abundant shale and sandstone fragments below 17.05 m		24		<--- 50 mm Dia. Machine Slotted PVC Pipe	17.0
18.0						25		<--- 10/20 Silica Sand	18.0
19.0						26			19.0
						27			
20.0				END OF HOLE AT 19.8 m – Hole Open and Dry on Completion – Monitoring Well Installed to 19.35 m -> Water Level Feb 6/93 @ 728.31 Feb 15/93 @ 728.75 Feb 22/93 @ 729.10					20.0
21.0									21.0
22.0									22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/14
Fig. No: B1	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY - silty, stiff, medium plastic, mottled grey-brown, rootlets, trace fine gravel, shale & sandstone fragments, cool				<--- S.C.Protector/0.45m S.U <--- Bentonite Seal	0.0
1.0								1.33 ▽ @ 15 Mar 93	1.0
2.0		CI		- Sieve Analysis: 13% Sand / 49% Silt / 38% Clay		1			2.0
3.0									3.0
4.0				CLAY(TILL) - silty, very stiff, medium plastic, dark grey with oxide staining, fine gravel, trace shale & sandstone frogments, coal chips occasional fissures		2		<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0 ▽									5.0
6.0		CI						<--- 10/20 Silica Sand	6.0
7.0									7.0
8.0				- Sieve Analysis: 18% Sand / 43% Silt / 39% Clay		3			8.0
9.0				END OF HOLE AT 7.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.15 m -> Water Level Feb 6/93 @ 740.71 Feb 15/93 @ 741.43 Feb 22/93 @ 741.92					9.0
10.0									10.0
11.0									11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B2	COMPLETION DEPTH: 7.8 m COMPLETE: 92/12/14 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-6A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 777.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

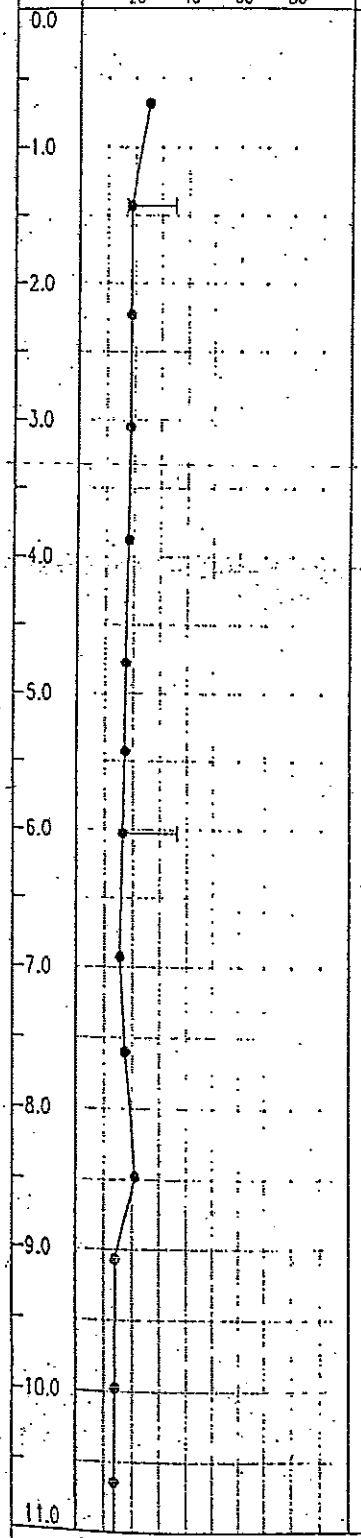
DEPTH (m)	PLASTIC — M.C. — LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, stiff, medium plastic, brown, oxidized zones, trace sand, occasional fissures		<--- Steel Casing Protector 0.40 m Pipe Stickup <--- Bentonite Seal	0.0
1.0		a					1.0
2.0				CLAY(TILL) - silty, very stiff, medium plastic, mottled grey-brown, sand, fine gravel, silt lenses, oxidized zones, trace crystalline salts, coal specks, occasional fissures			2.0
3.0							3.0
4.0				- becomes grey with some brown below 3.6 m		<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0		a					5.0
6.0						<--- 10/20 Silica Sand	6.0
7.0				- becomes grey, hard, with oxide specks below 6.7 m			7.0
8.0				END OF HOLE AT 7.6 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.60 m -> Water Level Feb 6/93 @ Dry Feb 15/93 @ Dry Feb 22/93 @ 770.05			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 7.6 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/20
Fig. No: B12	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: DPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0			CLAY - silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m				<--- Steel Casing Protector 0.72 m Pipe Stickup	0.0
1.0	CI				1		- Bulk Sample 0.00 - 1.20 m	1.0
			- trace free water @ 1.5 m		2		- Sieve Analysis: 13% Sand / 49% Silt / 38% Clay	
2.0			CLAY(TILL) - silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occasional fissures		3		- Bulk Sample 1.80 - 2.75 m	2.0
3.0					4		<--- 50 mm Dia. Schedule 40 PVC Pipe	3.0
4.0					5			4.0
			- becomes grey with some brown, trace crystalline salts		6			
5.0					7			5.0
					8			
6.0			- becomes grey, hard below 5.8 m		9		- Sieve Analysis: 10% Sand / 51% Silt / 39% Clay	6.0
	CI							
7.0					10			7.0
					11		<--- Bentonite Grout	
8.0								8.0
					12			
9.0					13			9.0
10.0					14			10.0
					15			
11.0								11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B13	COMPLETION DEPTH: 20.0 m COMPLETE: 92/12/20 Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued - light brown silt pockets to 300 mm thick between 11.15 and 12.2 m		16			11.0
12.0				- A-Casing Refusal @ 12.2 m		17			12.0
13.0						18			13.0
14.0						19		<--- Bentonite Seal	14.0
15.0		CI				20			15.0
16.0						21			16.0
17.0						22			17.0
18.0						23		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0						24			19.0
20.0				END OF HOLE AT 19.95 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.95 m -> Water Level Feb 6/93 @ 738.59 Feb 15/93 @ 738.71 Feb 22/93 @ 738.82		25		<--- 10/20 Silica Sand	20.0
21.0						26			21.0
22.0						27			22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY
REVIEWED BY: P. BARTLETT
Fig. No: B13

COMPLETION DEPTH: 20.0 m
COMPLETE: 92/12/20

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7A
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m		<--- Steel Casing Protector 0.41 m Pipe Stickup <--- Bentonite Seal	0.0
1.0		CI					1.0
				– trace free water @ 1.5 m		1.5 m Caving?	
2.0				CLAY(TILL) – silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occasional fissures			2.0
3.0							3.0
4.0							4.0
		CI		– becomes grey with some brown, trace crystalline salts			
5.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	5.0
6.0				– becomes grey, hard below 5.8 m			6.0
7.0						<--- 10/20 Silica Sand	7.0
8.0				END OF HOLE AT 7.5 m – Hole Open and Dry on Completion – Monitoring Well Installed to 7.50 m -> Water Level Feb 6/93 @ 751.32 Feb 15/93 @ 751.62 Feb 22/93 @ 751.82			8.0
9.0							9.0
10.0							10.0
11.0							11.0

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Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY | COMPLETION DEPTH: 7.5 m
REVIEWED BY: P. BARTLETT | COMPLETE: 92/12/20
Fig. No: B14

Gamlesh BH Log m CAL V1.tdr

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BORE HOLE LOG

Bore Hole: BH103
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	798.30 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	799.13 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-3}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa, Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt, trace sand. Light brown. Moist. Loose.								Protective standpipe cover, 0.83 m stickup
1		SILT: Some sand, some gravel, trace clay, trace rootlets. Light brown. Oxidized. Dry. Loose. Weakly calcareous.		IH27						Bentonite Seal
2		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Stiff to hard. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH28						50 mm Schedule 40 Solid Pipe
3				IH29		CL				Water Level on 12 Jan. 2002
4		SILT: Some sand, some clay, trace gravel. Brown. Oxidized iron staining. Moist. Firm. Coal fragments. Weakly calcareous.		IH30		ML				Sil 9 Sand
5		@ 4.3 m, wet		IH31		CL				
6		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Gray. Oxidized iron staining. Moist. Hard. Blocky. Silt and fine grained sand lenses. Weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH32						50 mm Schedule 40 Slotted Pipe
7		@ 7.3 m, light gray, high plasticity		IH33						
8		Notes: End of borehole at 7.3 m. Piezometer completed to 7.0 m with an above ground, locked, steel protective cover sticking up 0.83 m. Borehole remained open following drilling, no slough was encountered. Seepage at 4.0 m.		IH34		CH				
9										
10										

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BORE HOLE LOG

Bore Hole: BH104
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.40 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.26 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		CLAY: Silty, trace sand. Brown. Oxidized. Moist. Firm. Blocky with occasional silt and sand lenses. Weakly calcareous.		IH35						Protective standpipe cover, 0.87 m stickup
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized. Moist. Firm to stiff. Blocky. Coal fragments and gypsum crystals. Non-calcareous.		IH36						Bentonite Seal
2										50 mm Schedule 40 Solid Pipe
3				IH37						
4				IH38						Sil 9 Sand
5										50 mm Schedule 40 Slotted Pipe
6		@ 5.8 m, calcareous		IH39						
7		@ 7.2 m, silt lens, non-calcareous		IH40						
8		NOTES: End of borehole at 7.6 m. Monitoring well completed to 7.3 m with an above ground, locked, steel protective cover sticking up 0.87 m. Borehole remained open following drilling and no seepage or slough was encountered.								
9										
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 1 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 ▲ 50 ◆ 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. ■ Pocket Pen. ● Lab Vane ◆ (100 200 300 400)	Piezometer Construction Detail
0		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH41						Protective standpipe cover, 0.86 m stickup
1				IH42						Bentonite Seal
				IH43						
				IH44	16					
2										
3				IH45						
4				IH46						
				IH47			21			
		@ 4.4 m, very dark grayish brown (2.5Y 3/2)		IH48	25					Sil 9 Sand and Bentonite
5										
6		@ 5.8 m, calcareous		IH49						
7										
		@ 7.4 m, noncalcareous		IH50						
				IH51	36	CL				
8										50 mm Schedule 40 Solid Pipe
		@ 8.5 m, silt lens								
9				IH52						
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 2 of 3

Client:	Canadian Crude Separators Inc.	Northing: -	Date Drilled: 27 November 2001
Project:	Hydrogeological Investigation	Easting: -	Drill: B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.: 769.4 m	Drilling Method: Solid Stem Auger
Project No.:	C1548	Top Casing Elev.: 770.28 m	Logged by: IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-3}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 ▲ 50 ● 100 ♦)	Dry Density - kg/m3 (1800 – 2200)	Shear Strength - kPa: Unconf. ■ / Pocket Pen. ● / Lab Vane ◆ (100 200 300 400)	Piezometer Construction Detail
10		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH53	30						
11											
12				IH54							Sil 9 Sand and Bentonite
13				IH55							
				IH56	28						50 mm Schedule 40 Solid Pipe
14		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.									
15				IH57							
		@ 15.0 m, sand lens		IH58							Water Level: 12 Jan. 2002
16											
				IH59							
				IH60	32						
17		@ 17.6 m, clayshale and sandstone fragments		IH61							
18		@ 18.0 m, wet		IH62					310		Bentonite Seal
19		@ 18.8 m. sand lens									Sil 9 Sand
		@ 19.2 m, less silt									50 mm Schedule 40 Slotted Pipe
20				IH63		CL					

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BORE HOLE LOG

Bore Hole: BH105
Page: 3 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-6}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
20		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.		IHG4						
21										
22		NOTES: End of borehole at 21.0 m. Piezometer completed to 20.7 m with an above ground, locked, steel protective cover sticking up 0.88 m. Borehole remained open following drilling and no slough was encountered. Seepage at 18.0 m.								
23										
24										
25										
26										
27										
28										
29										
30										

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 2
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-3
Start Time: 9:05
Finish Time: 10:05
Driller: Peace Drilling

Top of Sand Pack: 1.6m
Base of Sand Pack: 7.9m
Screened Interval: 1.9 - 7.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 7.9m
Boring Diameter: 6"
Casing Diameter: 2"

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay / Silt / Fine / Medium / Coarse / >2mm (0.125mm, 0.25mm, 0.5mm)	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1, 10, 100, 1000, 10000) / EC uS/cm
Bentonite Chips	0	100					
	-1	99				CLAY (FILL): - (0-2.5m) silty, some fine gravel/pebbles, dark brown, stiff, moist.	
	-2	98				@ 1.4-1.55m grey.	
						@ 2.2-2.3m sand lens.	
	-3	97				~~CLAY (TILL): - (2.5-7.9m)~~ increasing plasticity with depth; brown, stiff, claystone and siltstone bedrock clasts <5cm in diameter, carbonate inclusions, weakly calcareous.	
	-4	96				@ 2.75-2.8m oxidized siltstone.	
10-20 Filter Sand							
	-5	95					
	-6	94				@ 5.5-7.0m grey mottling.	
	-7	93				@ 7.0-7.9m brown.	
	-8	92				TD = 7.9m	
	-9	91					
	-10	90					

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 3
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-4
Start Time: 10:30
Finish Time: 11:45
Driller: Peace Drilling

Top of Sand Pack: 4.6m
Base of Sand Pack: 10.9m
Screened Interval: 4.9 - 10.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 10.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay / Silt / Fine / Medium / Coarse / >2mm (0.125mm, 0.25mm, 0.5mm)	Sample Depth (MSI# B = Bag J = Jar)	Soil Description (LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.)	OVA ppm (1, 10, 100)	EC uS/cm (1000, 10000)
Bentonite Chips	0	100				CLAY (FILL): - (0-2.5m) silty, some coarse gravel, brown, firm.		
	-1	99						
	-2	98						
	-3	97				~~CLAY (TILL): - (2.5-10.9m) pebbles <2cm in diameter,~~ brown, firm, siltstone bedrock clasts, weakly calcareous.		
	-4	96						
	-5	95						
	-6	94						
10-20 Filter Sand	-7	93				@ 7.0-8.0m grey mottling.		
	-8	92						
	-9	91						
	-10	90						

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 3
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-4
Start Time: 10:30
Finish Time: 11:45
Driller: Peace Drilling

Top of Sand Pack: 4.6m
Base of Sand Pack: 10.9m
Screened Interval: 4.9 - 10.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 10.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay	Silt	Fine (0.125mm)	Medium (0.25mm)	Coarse (0.5mm)	>2mm	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1, 10, 100, 1000, 10000)	EC uS/cm
10-20 filter sand	-11	89									CLAY (TILL) continues. @ 10.0-10.9m brown.		
	-12	88									TD = 10.9m		
	-13	87											
	-14	86											
	-15	85											
	-16	84											
	-17	83											
	-18	82											
	-19	81											
	-20	80											

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 4
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-5
Start Time: 11:50
Finish Time: 13:30
Driller: Peace Drilling

Top of Sand Pack: 2.6m
Base of Sand Pack: 8.9m
Screened Interval: 2.9 - 8.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 8.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay	Silt	Fine (0.125mm)	Medium (0.25mm)	Coarse (0.5mm)	>2mm	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1 / 10 / 100)	EC uS/cm (1000 / 10000)
Bentonite Chips	0	100											
	-1	99									CLAY (FILL): - (0-2.3m) silty, dark brown, firm, moist.		
	-2	98											
	-3	97									CLAY (TILL): - (2.3-8.9m) silty, increasing plasticity with depth, brown, firm, smooth, carbonate inclusions, weakly calcareous.		
	-4	96											
	-5	95									@ 5.0-8.0m grey.		
10-20 Filter Sand	-6	94											
	-7	93											
	-8	92									@ 8.0-8.9m brown.		
	-9	91											
	-10	90									TD = 8.9m		

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff, medium plastic, mottled grey-brown, rootlets, trace fine gravel, shale & sandstone fragments, coal		1		<--- Steel Casing Protector 0.61 m Pipe Stickup	0.0
1.0						2			1.0
2.0		CI				3			2.0
3.0						4		<--- Flowable Bentonite Grout	3.0
4.0				CLAY(TILL) – silty, very stiff, medium plastic, dark grey with oxide staining, fine gravel, trace shale & sandstone fragments, coal chips occasional fissures		5 6 7		4.87 m 19 MAR 94 ▽	4.0
5.0									5.0
6.0						8 9			6.0
7.0		CI		– light grey clayey silt lomminations @ 7.15 m		10 11		<--- 50 mm Dia. Schedule 40 PVC Pipe	7.0
8.0									8.0
9.0				– fissured between 8.70 and 9.15 m, salt lined, sub-vertical, closed – oxidized zones between 9.15 and 10.65 m		12 13			9.0
10.0						14			10.0
11.0						15			11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
	REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/14
	Fig. No: B1	Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				CLAY(TILL) – continued – 150 mm thick oxidized zone		16			11.0
12.0						17			12.0
13.0						18			13.0
				– gravel sizes to 50 mm @ 13.55 m		19			
14.0						20			14.0
15.0		CI				21		<--- Bentonite Seal	15.0
				– becomes siltier, lighter grey below 15.55 m		22			
16.0						23			16.0
17.0				– more abundant shale and sandstone fragments below 17.05 m		24		<--- 50 mm Dia. Machine Slotted PVC Pipe	17.0
18.0						25		<--- 10/20 Silica Sand	18.0
19.0						26			19.0
						27			
20.0				END OF HOLE AT 19.8 m – Hole Open and Dry on Completion – Monitoring Well Installed to 19.35 m -> Water Level Feb 6/93 @ 728.31 Feb 15/93 @ 728.75 Feb 22/93 @ 729.10					20.0
21.0									21.0
22.0									22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/14
Fig. No: B1	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY - silty, stiff, medium plastic, mottled grey-brown, rootlets, trace fine gravel, shale & sandstone fragments, cool				<--- S.C.Protector/0.45m S.U <--- Bentonite Seal	0.0
1.0								1.33 ▽ @ 15 Mar 93	1.0
2.0		CI		- Sieve Analysis: 13% Sand / 49% Silt / 38% Clay		1			2.0
3.0									3.0
4.0				CLAY(TILL) - silty, very stiff, medium plastic, dark grey with oxide staining, fine gravel, trace shale & sandstone frogments, coal chips occasional fissures		2		<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0 ▽									5.0
6.0		CI						<--- 10/20 Silica Sand	6.0
7.0									7.0
8.0				- Sieve Analysis: 18% Sand / 43% Silt / 39% Clay		3			8.0
9.0				END OF HOLE AT 7.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.15 m -> Water Level Feb 6/93 @ 740.71 Feb 15/93 @ 741.43 Feb 22/93 @ 741.92					9.0
10.0									10.0
11.0									11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B2	COMPLETION DEPTH: 7.8 m COMPLETE: 92/12/14 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-6A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 777.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

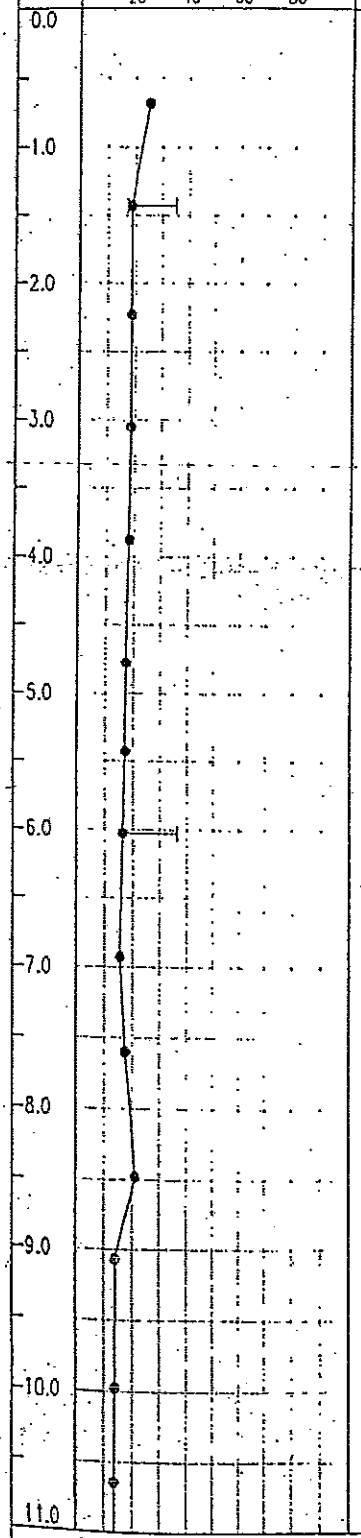
DEPTH (m)	PLASTIC — M.C. — LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, stiff, medium plastic, brown, oxidized zones, trace sand, occasional fissures		<--- Steel Casing Protector 0.40 m Pipe Stickup <--- Bentonite Seal	0.0
1.0		a					1.0
2.0				CLAY(TILL) - silty, very stiff, medium plastic, mottled grey-brown, sand, fine gravel, silt lenses, oxidized zones, trace crystalline salts, coal specks, occasional fissures			2.0
3.0							3.0
4.0				- becomes grey with some brown below 3.6 m		<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0		a					5.0
6.0						<--- 10/20 Silica Sand	6.0
7.0				- becomes grey, hard, with oxide specks below 6.7 m			7.0
8.0				END OF HOLE AT 7.6 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.60 m -> Water Level Feb 6/93 @ Dry Feb 15/93 @ Dry Feb 22/93 @ 770.05			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 7.6 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/20
Fig. No: B12	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: DPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0			CLAY - silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m				<--- Steel Casing Protector 0.72 m Pipe Stickup	0.0
1.0	CI				1		- Bulk Sample 0.00 - 1.20 m	1.0
			- trace free water @ 1.5 m		2		- Sieve Analysis: 13% Sand / 49% Silt / 38% Clay	
2.0			CLAY(TILL) - silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occasional fissures		3		- Bulk Sample 1.80 - 2.75 m	2.0
3.0					4		<--- 50 mm Dia. Schedule 40 PVC Pipe	3.0
4.0					5			4.0
			- becomes grey with some brown, trace crystalline salts		6			
5.0					7			5.0
					8			
6.0			- becomes grey, hard below 5.8 m		9		- Sieve Analysis: 10% Sand / 51% Silt / 39% Clay	6.0
	CI							
7.0					10			7.0
					11		<--- Bentonite Grout	
8.0								8.0
					12			
9.0					13			9.0
10.0					14			10.0
					15			
11.0								11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B13	COMPLETION DEPTH: 20.0 m COMPLETE: 92/12/20 Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued - light brown silt pockets to 300 mm thick between 11.15 and 12.2 m		16			11.0
12.0				- A-Casing Refusal @ 12.2 m		17			12.0
13.0						18			13.0
14.0						19		<--- Bentonite Seal	14.0
15.0		CI				20			15.0
16.0						21			16.0
17.0						22			17.0
18.0						23		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0						24			19.0
20.0				END OF HOLE AT 19.95 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.95 m -> Water Level Feb 6/93 @ 738.59 Feb 15/93 @ 738.71 Feb 22/93 @ 738.82		25		<--- 10/20 Silica Sand	20.0
21.0						26			21.0
22.0						27			22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY
REVIEWED BY: P. BARTLETT
Fig. No: B13

COMPLETION DEPTH: 20.0 m
COMPLETE: 92/12/20

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7A
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m		<--- Steel Casing Protector 0.41 m Pipe Stickup <--- Bentonite Seal	0.0
1.0		CI					1.0
				– trace free water @ 1.5 m		1.5 m Caving?	
2.0				CLAY(TILL) – silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occasional fissures			2.0
3.0							3.0
4.0							4.0
		CI		– becomes grey with some brown, trace crystalline salts			
5.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	5.0
6.0				– becomes grey, hard below 5.8 m			6.0
7.0						<--- 10/20 Silica Sand	7.0
8.0				END OF HOLE AT 7.5 m – Hole Open and Dry on Completion – Monitoring Well Installed to 7.50 m -> Water Level Feb 6/93 @ 751.32 Feb 15/93 @ 751.62 Feb 22/93 @ 751.82			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY | COMPLETION DEPTH: 7.5 m
REVIEWED BY: P. BARTLETT | COMPLETE: 92/12/20
Fig. No: B14

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BORE HOLE LOG

Bore Hole: BH103
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	798.30 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	799.13 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-3}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa, Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt, trace sand. Light brown. Moist. Loose.								Protective standpipe cover, 0.83 m stickup
1		SILT: Some sand, some gravel, trace clay, trace rootlets. Light brown. Oxidized. Dry. Loose. Weakly calcareous.		IH27						Bentonite Seal
2		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Stiff to hard. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH28						50 mm Schedule 40 Solid Pipe
3				IH29		CL				Water Level on 12 Jan. 2002
4		SILT: Some sand, some clay, trace gravel. Brown. Oxidized iron staining. Moist. Firm. Coal fragments. Weakly calcareous.		IH30		ML				Sil 9 Sand
5		@ 4.3 m, wet		IH31		CL				
6		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Gray. Oxidized iron staining. Moist. Hard. Blocky. Silt and fine grained sand lenses. Weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH32						50 mm Schedule 40 Slotted Pipe
7		@ 7.3 m, light gray, high plasticity		IH33						
8		Notes: End of borehole at 7.3 m. Piezometer completed to 7.0 m with an above ground, locked, steel protective cover sticking up 0.83 m. Borehole remained open following drilling, no slough was encountered. Seepage at 4.0 m.		IH34		CH				
9										
10										

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BORE HOLE LOG

Bore Hole: BH104
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.40 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.26 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		CLAY: Silty, trace sand. Brown. Oxidized. Moist. Firm. Blocky with occasional silt and sand lenses. Weakly calcareous.		IH35						Protective standpipe cover, 0.87 m stickup
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized. Moist. Firm to stiff. Blocky. Coal fragments and gypsum crystals. Non-calcareous.		IH36						Bentonite Seal
2										50 mm Schedule 40 Solid Pipe
3				IH37						
4				IH38						Sil 9 Sand
5										50 mm Schedule 40 Slotted Pipe
6		@ 5.8 m, calcareous		IH39						
7		@ 7.2 m, silt lens, non-calcareous		IH40						
8		NOTES: End of borehole at 7.6 m. Monitoring well completed to 7.3 m with an above ground, locked, steel protective cover sticking up 0.87 m. Borehole remained open following drilling and no seepage or slough was encountered.								
9										
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 1 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 ▲ 50 ◆ 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. ■ Pocket Pen. ● Lab Vane ◆ (100 200 300 400)	Piezometer Construction Detail
0		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH41						Protective standpipe cover, 0.86 m stickup
1				IH42						Bentonite Seal
				IH43						
				IH44	16					
2										
3				IH45						
4				IH46						
				IH47			21			
		@ 4.4 m, very dark grayish brown (2.5Y 3/2)		IH48	25					Sil 9 Sand and Bentonite
5										
6		@ 5.8 m, calcareous		IH49						
7										
		@ 7.4 m, noncalcareous		IH50						
				IH51	36	CL				
8										50 mm Schedule 40 Solid Pipe
		@ 8.5 m, silt lens								
9				IH52						
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 2 of 3

Client:	Canadian Crude Separators Inc.	Northing: -	Date Drilled: 27 November 2001
Project:	Hydrogeological Investigation	Easting: -	Drill: B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.: 769.4 m	Drilling Method: Solid Stem Auger
Project No.:	C1548	Top Casing Elev.: 770.28 m	Logged by: IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-3}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 ▲ 50 ● 100 ♦)	Dry Density - kg/m3 (1800 – 2200)	Shear Strength - kPa: Unconf. ■ / Pocket Pen. ● / Lab Vane ◆ (100 200 300 400)	Piezometer Construction Detail
10		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH53	30						
11											
12				IH54							Sil 9 Sand and Bentonite
13				IH55							
				IH56	28						50 mm Schedule 40 Solid Pipe
14		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.									
15				IH57							
		@ 15.0 m, sand lens		IH58							Water Level: 12 Jan. 2002
16											
				IH59							
				IH60	32						
17		@ 17.6 m, clayshale and sandstone fragments		IH61							
18		@ 18.0 m, wet		IH62					310		Bentonite Seal
19		@ 18.8 m. sand lens									Sil 9 Sand
		@ 19.2 m, less silt									50 mm Schedule 40 Slotted Pipe
20				IH63		CL					

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BORE HOLE LOG

Bore Hole: BH105
Page: 3 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-6}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
20		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.		IHG4						
21										
22		NOTES: End of borehole at 21.0 m. Piezometer completed to 20.7 m with an above ground, locked, steel protective cover sticking up 0.88 m. Borehole remained open following drilling and no slough was encountered. Seepage at 18.0 m.								
23										
24										
25										
26										
27										
28										
29										
30										

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 2
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-3
Start Time: 9:05
Finish Time: 10:05
Driller: Peace Drilling

Top of Sand Pack: 1.6m
Base of Sand Pack: 7.9m
Screened Interval: 1.9 - 7.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 7.9m
Boring Diameter: 6"
Casing Diameter: 2"

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay / Silt / Fine / Medium / Coarse / >2mm (0.125mm, 0.25mm, 0.5mm)	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1, 10, 100, 1000, 10000) / EC uS/cm
Bentonite Chips	0	100					
	-1	99				CLAY (FILL): - (0-2.5m) silty, some fine gravel/pebbles, dark brown, stiff, moist.	
	-2	98				@ 1.4-1.55m grey.	
						@ 2.2-2.3m sand lens.	
	-3	97				~~CLAY (TILL): - (2.5-7.9m)~~ increasing plasticity with depth; brown, stiff, claystone and siltstone bedrock clasts <5cm in diameter, carbonate inclusions, weakly calcareous.	
	-4	96				@ 2.75-2.8m oxidized siltstone.	
10-20 Filter Sand							
	-5	95					
	-6	94				@ 5.5-7.0m grey mottling.	
	-7	93				@ 7.0-7.9m brown.	
	-8	92				TD = 7.9m	
	-9	91					
	-10	90					

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 3
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-4
Start Time: 10:30
Finish Time: 11:45
Driller: Peace Drilling

Top of Sand Pack: 4.6m
Base of Sand Pack: 10.9m
Screened Interval: 4.9 - 10.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 10.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay / Silt / Fine / Medium / Coarse / >2mm (0.125mm, 0.25mm, 0.5mm)	Sample Depth (MSI# B = Bag J = Jar)	Soil Description (LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.)	OVA ppm (1, 10, 100)	EC uS/cm (1000, 10000)
Bentonite Chips	0	100				CLAY (FILL): - (0-2.5m) silty, some coarse gravel, brown, firm.		
	-1	99						
	-2	98						
	-3	97				~~CLAY (TILL): - (2.5-10.9m) pebbles <2cm in diameter,~~ brown, firm, siltstone bedrock clasts, weakly calcareous.		
	-4	96						
	-5	95						
	-6	94						
10-20 Filter Sand	-7	93				@ 7.0-8.0m grey mottling.		
	-8	92						
	-9	91						
	-10	90						

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 3
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-4
Start Time: 10:30
Finish Time: 11:45
Driller: Peace Drilling

Top of Sand Pack: 4.6m
Base of Sand Pack: 10.9m
Screened Interval: 4.9 - 10.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 10.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay	Silt	Fine (0.125mm)	Medium (0.25mm)	Coarse (0.5mm)	>2mm	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1, 10, 100, 1000, 10000)	EC uS/cm
10-20 filter sand	-11	89									CLAY (TILL) continues. @ 10.0-10.9m brown.		
	-12	88									TD = 10.9m		
	-13	87											
	-14	86											
	-15	85											
	-16	84											
	-17	83											
	-18	82											
	-19	81											
	-20	80											

Solutions Inc.

Geologic Log

Project/Site: 2914-502 / Silverberry
Well Location: REL 4
Logged By: BB
Sample Method: -

Date: June 29, 2003
Well Number: 03-5
Start Time: 11:50
Finish Time: 13:30
Driller: Peace Drilling

Top of Sand Pack: 2.6m
Base of Sand Pack: 8.9m
Screened Interval: 2.9 - 8.9m
Screen Size: -
Drill Equipment: solid stem auger rig

Compiled By: DC
Ground Elev: -
Top of Casing: -
Total Depth: 8.9m
Boring Diameter: 6 "
Casing Diameter: 2 "

Well Completion Data	Depth (m)	Elevation (relative)	Lithology	Grain Size: Clay	Silt	Fine (0.125mm)	Medium (0.25mm)	Coarse (0.5mm)	>2mm	Sample Depth / MSI# (B = Bag J = Jar)	Soil Description: LITHOLOGY: - (interval), texture, colour, consistency, moisture, odours, staining.	OVA ppm (1 / 10 / 100)	EC uS/cm (1000 / 10000)
Bentonite Chips	0	100											
	-1	99									CLAY (FILL): - (0-2.3m) silty, dark brown, firm, moist.		
	-2	98											
	-3	97									CLAY (TILL): - (2.3-8.9m) silty, increasing plasticity with depth, brown, firm, smooth, carbonate inclusions, weakly calcareous.		
	-4	96											
	-5	95									@ 5.0-8.0m grey.		
10-20 Filter Sand	-6	94											
	-7	93											
	-8	92									@ 8.0-8.9m brown.		
	-9	91											
	-10	90									TD = 8.9m		

APPENDIX C
Previous Investigations

APPENDIX C

PREVIOUS INVESTIGATIONS

Groundwater monitoring and sampling programs have been conducted regularly since landfill commissioning. Key findings from the 2013 groundwater monitoring and sampling program (NLR /AE 2013) are summarized below:

- The magnesium, sulphate, and total dissolved solids concentrations, which exceeded British Columbia *Environmental Management Act* Contaminated Sites Regulation (CSR) standards in the shallow groundwater beneath the site, were interpreted to be naturally occurring. Sodium concentrations also exceeded British Columbia CSR standards in samples collected from background well BH-103 and deeper downgradient well MW92-7. All general and inorganic parameters measured in 2013 were generally consistent with historical data.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells.

- The 2013 dissolved cadmium concentration in the sample collected from background well BH-103 exceeded the British Columbia CSR standard. Dissolved uranium concentrations also exceeded the standard at more than half of the monitoring wells and the leak detection system sampled in 2013. The dissolved uranium and cadmium concentrations were low and consistent across the site, and were considered naturally occurring.

- Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected in 2013.

- In 2013, dissolved petroleum hydrocarbons (PHCs) and polycyclic aromatic hydrocarbons (PAHs) were not detected in any of the samples collected from monitoring wells and did not exceed British Columbia CSR standards in samples collected from the leak detection system. Dissolved PHC and PAH concentrations were consistent with historical data.

- Dissolved PHC and PAH concentrations exceeded standards in the samples collected from the leachate vault; some were detected at concentrations several orders of magnitude above those recorded at the monitoring well network.

Key findings from the 2014 groundwater monitoring and sampling program (Matrix 2015) are summarized as follows:

- The shallow groundwater flow at the landfill was to the northwest. The calculated horizontal velocity in the shallow groundwater was less than 1 m/year. Vertical groundwater gradients indicated recharging conditions across the site.

- The magnesium and sulphate concentrations exceeded British Columbia CSR standards in the shallow groundwater beneath the site, and were interpreted to be naturally occurring. Sodium concentrations also exceeded the British Columbia CSR standard in samples collected from

background well BH-103 and downgradient wells MW92-7 and MW92-7A. All general and inorganic parameters measured in 2014 were generally consistent with historical data.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells.

- The dissolved boron and cadmium concentrations in the samples collected from background well BH-103 exceeded the British Columbia CSR standards. Dissolved boron and cadmium were below the standards in all other samples collected at the site.

- Dissolved uranium concentrations exceeded the standard at more than half of the monitoring wells sampled in 2014. The dissolved uranium concentrations were low and consistent across the site, and may be considered naturally occurring.

- Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected from the monitoring wells in 2014.

- In 2014, dissolved PHCs and PAHs were not detected in any of the samples collected from monitoring wells, and did not exceed British Columbia CSR standards in samples collected from the leak detection system (with the exception of benzo[a]pyrene, which exceeded the British Columbia CSR standard in the sample collected from the leak detection system in September 2014). Dissolved PHC and PAH concentrations were consistent with historical data, with select dissolved PHC and PAH concentrations exceeding their respective standards in the samples collected from the leachate vault.

Key findings from the 2015 groundwater monitoring and sampling program (Matrix 2016) are summarized as follows:

- Five monitoring wells were installed downgradient and west of the landfill cells in 2015, two of which were replacement wells for monitoring wells BH-104 and BH-105. Geology encountered during the installation of all the wells was consistent with the historical information at the landfill and of the surrounding area.

- The shallow groundwater flow at the landfill was to the northwest. The calculated horizontal velocity in the shallow groundwater was less than 0.3 m/year in 2015, similar to historical calculations.

- The vertical groundwater gradients indicated recharge conditions across the landfill.

- The sodium, magnesium, and sulphate concentrations that exceeded British Columbia CSR standards in the shallow groundwater beneath the site were interpreted to be naturally occurring.

- Chloride concentrations at monitoring well BH-104 exceeded the British Columbia CSR (irrigation water use) standard in April and June 2015 but met the standard in September. This monitoring well was replaced with BH-104(R) in 2015. The anomalous chloride concentrations at BH-104 may be attributed to the low well volumes encountered. BH-104 was replaced in 2015 to ensure

representative samples could be collected on a frequent basis and chloride concentrations could be closely monitored in future sampling events.

- Nitrate-nitrogen concentrations exceeding the British Columbia CSR standard were detected in samples collected from background well BH-103 in three of the four monitoring events in 2015. A general increasing trend in nitrate-nitrogen concentration was displayed at the background well and appeared related to an offsite source.

- All general and inorganic parameters measured in 2015 were generally consistent with historical data.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells.

- The 2015 dissolved boron and cadmium concentrations in the samples collected from background well BH-103 exceeded the British Columbia CSR standards; dissolved cadmium appeared to be displaying an apparent increasing trend at well BH-103. Dissolved boron and cadmium were below the standards in all other samples collected at the site.

- Dissolved uranium concentrations exceeded the standard at more than half of the monitoring wells sampled in 2015. The dissolved uranium concentrations were low and consistent across the site, and may be considered naturally occurring.

- Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected from the monitoring wells in 2015.

- In 2015, dissolved PHCs were not detected in any of the samples collected from monitoring wells, and did not exceed British Columbia CSR standards in samples collected from the leak detection system. Dissolved PAHs benzo[a]pyrene and pyrene were detected above British Columbia CSR standards in three downgradient wells in 2015; these concentrations were consistent with historical data, displayed no discernible trends, and may have been caused by the presence of sediment in the groundwater samples. Dissolved PAH concentrations above standards were also detected in samples collected from the leak detection system in April but dropped back below laboratory detection limits the following sampling event. Dissolved PHC and PAH concentrations were consistent with historical data.

- Select dissolved PHC and PAH concentrations exceeded the British Columbia CSR standards in the samples collected from the leachate vault in 2015.

- Based on the results of the groundwater chemistry data collected in 2015, the activities of the Silverberry Landfill did not appear to have impacted the groundwater below the site. It was concluded that the 2015 chloride concentrations above the standard downgradient from the landfill cells should be monitored closely in 2016. Although PAH concentrations were detected above standards in both monitoring well and leak detection samples, there was a lack of any discernible trends. A review of the leak detection sample data suggested that the current leachate collection and containment system was operating properly.

Key findings from the 2016 groundwater monitoring and sampling program (Matrix 2017) are summarized as follows:

- The shallow groundwater flow at the landfill was to the northwest. The calculated horizontal velocity in the shallow groundwater was less than 0.4 m/year in 2017, which is similar to historical calculations.

- The sodium, magnesium, and sulphate concentrations that exceeded British Columbia CSR standards in the shallow groundwater beneath the site were interpreted to be naturally occurring, with the exception of up-gradient monitoring well BH-103.

- The increasing and decreasing trends in inorganic parameters at BH-103 observed since the 2013 sampling events were confirmed with the 2017 data. The trending data were believed to be the result of till material oxidation at this location. Pre-2013 data from this well were stable and were used to establish background conditions at the site.

- Chloride concentrations were below the British Columbia CSR (IW) standard at all monitoring wells sampled in 2017.

- Nitrate-nitrogen concentrations exceeding the British Columbia CSR standard were detected in samples collected from well BH-103 in 2017. An increasing trend in nitrate-nitrogen concentration is displayed at the background well and appears related to an offsite source.

- All general and inorganic parameters measured in 2017 were generally consistent with historical data, with the exception of BH-103 and the June and September 2017 data at well MW92-1A, which were abnormally low when compared to historical data. The inorganic parameters will be monitored closely in MW92-1A in the coming sampling events.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells.

- The 2017 dissolved boron and cadmium concentrations in the samples collected from well BH-103 exceeded the British Columbia CSR standards; dissolved boron was within historical range, while cadmium concentrations appeared to be displaying an increasing trend at well BH-103. Dissolved boron and cadmium were below the standards in all other samples collected at the site.

- Concentrations of dissolved selenium and uranium have been detected at monitoring wells across the landfill historically and display no discernible increasing or decreasing trends.

- Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected from the monitoring wells in 2017.

- In 2017, dissolved PHCs and PAHs were either not detected or were below the British Columbia CSR standards in samples collected from all onsite wells. Dissolved PHC and PAH concentrations were consistent with historical data.

- Several dissolved PHC and PAH concentrations exceeded the British Columbia CSR standards in the samples collected from the leachate vault in 2017.

Key findings from the 2017 groundwater monitoring and sampling program (Matrix 2018) are summarized as follows:

- The shallow groundwater flow direction and velocities were consistent with previous interpretations.

- The ongoing changes in inorganic parameters at BH-103 observed since the 2013 sampling events were not observed with the 2017 data; inorganic parameter concentrations generally returned to their pre-2013 background levels. The trending data that started in 2013 is believed to be the result of till material oxidation at this location; data observed in 2017 could be the result of the oxidation effects beginning to wane. Pre-2013 data from this well was used to establish background conditions at the site until further sampling confirms if concentrations at the background well have returned to original compositions.

- Chloride concentrations were below the British Columbia CSR (IW) standard at all monitoring wells sampled in 2017. The November chloride concentration at 15-9 appears to be anomalous when compared to historical data. Chloride concentrations at downgradient well 92-6A are increasing but continue to remain well below the standard.

- All general and inorganic parameters and dissolved metal concentrations measured in 2017 were generally consistent with historical data at all non-background monitoring wells.

- In 2017, dissolved petroleum hydrocarbons (PHCs) and PAHs were either not detected or were below the British Columbia CSR standards in samples collected from all onsite wells. These concentrations were consistent with historical data.

- Some general and inorganic parameters concentrations measured in samples collected from the leachate vault were several orders of magnitude higher than the concentrations measured in the samples collected from the onsite wells. Several dissolved metal concentrations exceeded standards in the leachate vault samples but were either not detected or in lower concentrations in the groundwater samples collected from the monitoring wells in 2017.

- Several dissolved PHC and PAH concentrations exceeded the British Columbia CSR standards in the samples collected from the leachate vault in 2017.

- LDS results in 2017 were consistent with historical data.

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APPENDIX D
Groundwater Monitoring and Sampling Methods

APPENDIX D

GROUNDWATER MONITORING AND SAMPLING METHODS

Matrix Solutions Inc. followed the following sampling protocol at each well:

1. The water level was measured relative to the top of the PVC pipe using a Solinst® electronic water level tape. Groundwater elevations at each well were calculated by subtracting measured depths to water from the surveyed top of PVC casing elevations. The water elevation data were contoured to produce flow maps that were used to estimate groundwater flow directions and horizontal hydraulic head gradients.

2. Wells that may contain free product were monitored in a similar manner. The depth to free product and the depth to groundwater beneath the free product were measured with the Solinst® electronic interface tape. The thickness of free product in the monitoring well was determined as the difference between the two readings. Piezometric (potentiometric) elevations were calculated at each well as follows:

$$PE = WE + \left(SG \times thickness\ of\ free\ product\right)$$

   where *PE* and *WE* are the piezometric and groundwater elevations, respectively, and *SG* is the specific gravity of the free product.

3. Monitoring wells were purged before groundwater sampling to obtain samples that represent the water quality in the formation. The optimal method for purging before sampling is a subject of debate among scientists; however, the method adopted to purge a well is probably less important than maintaining a consistent method between sampling events. In general, purging is accomplished in one of two ways: removing a known volume of water from the well, e.g., a minimum of three casing volumes (CCME 1994), or purging from the well until indicator parameters (temperature, pH, electrical conductivity [EC], and/or dissolved oxygen) achieve stabilization (ASTM 1999). Matrix used the Canadian Council of Ministers of the Environment method (CCME 1994) for collecting groundwater samples. Monitoring wells were developed historically using similar purging methods to ensure the removal of fine-grained sediments from the vicinity of the well screens, allowing water to flow freely from the formation into the well and reduce turbidity.

4. The field-measured parameters included pH, EC, and temperature. These measurements were conducted on groundwater samples collected from the wells once purging was complete. The instruments were calibrated before measuring the field parameters.

5. For each routine analysis, a clean 500 mL plastic bottle (provided by the laboratory) was filled to within 5 to 15 mm of the top, then capped.

6. Dissolved organic carbon analysis was performed on water from the routine analyses bottle. A portion of the sample was filtered and preserved upon arrival at the laboratory.

7. For each phenol analysis, a clean 125 mL glass bottle (provided by the laboratory) was filled to within 5 to 15 mm of the top, then 2 mL of 12.5% sulphuric acid solution preservative was added, and the bottle was capped and shaken.

8. Three 40 mL glass vials were used for the benzene, toluene, ethylbenzene, and xylenes and styrene analyses. The vials were filled from the bottom of the bailer using the bailer spout until a positive meniscus was formed at the lip of each vial. The vials were then capped and checked for entrapped air by inverting the vials and inspecting them for air bubbles. If air bubbles were present, the procedure was repeated until entrapped air was eliminated.

9. For the total extractable hydrocarbon and polycyclic aromatic hydrocarbon analyses, one laboratory-cleaned, 1,000 mL amber glass bottle was used. Bottles were filled to within 5 to 15 mm of the top, then capped.

10. For dissolved metal analyses of groundwater samples, a clean 500 mL plastic bottle (provided by the laboratory) was filled to within 5 to 15 mm of the top, then capped. The laboratory filtered and preserved each sample immediately upon arrival at the laboratory.

11. Upon completion of the required sampling at each well, all equipment was thoroughly rinsed with distilled water to reduce the potential for cross-contamination between wells.

12. All samples were each labelled with a unique sample number. Sample codes usually follow the form SITEYYMMDDNUM, where SITE is a five-digit project code, YYMMDD is the sampling date, and NUM is a three-digit number indicating the sample number for that date. For example, a sample labelled 01444130201001 was the first sample collected at Site 01444 on February 1, 2013. The sample numbers were recorded and cross-referenced with the sample location in Matrix's log book.

13. Samples were submitted to ALS Environmental and AGAT Laboratories for analysis. An appropriate chain-of-custody form indicating sample numbers was submitted to and signed at the laboratory. Copies of the signed forms were placed in the project files and are available upon request.

14. Blind replicate samples were submitted to the laboratory as part of the site quality control program.

15. Results of laboratory analyses were downloaded into Matrix's database management system from data provided by the analytical laboratory. Matrix's database management system was used to construct the data tables and figures provided in the report.

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APPENDIX E
Descriptions and Rationale for Use of Selected Field Tests and Laboratory Analyses

APPENDIX E

DESCRIPTIONS AND RATIONALE FOR USE OF SELECTED FIELD TESTS AND LABORATORY ANALYSES

Soil and water quality characterization employs a number of field-screening tests and laboratory analyses. Analytical programs depend on the type of media being assessed (i.e., soil or water), the identity and nature of the contaminants being investigated, the results of previous analyses, and other site-specific factors, such as the physical and hydrogeological setting.

The following are brief descriptions and rationales for the use of some of the most common measures of soil and water quality. Measurement of pH, electrical conductivity (EC), temperature, and dissolved oxygen (DO) concentrations is routinely performed in the field; the remaining parameters are subcontracted to qualified analytical laboratories.

- ***Water levels*** in each monitoring well are measured from the top of well casing and converted to a relative elevation with respect to a surveyed site datum. Relative groundwater elevations are mapped and used to determine rates and patterns of groundwater flow.

- ***pH*** is defined as the negative log activity of hydrogen ions in a medium (soil or water). pH values less than 7 indicate acidic conditions, while pH values greater than 7 indicate basic conditions. At sour gas plants or sulphur handling facilities, acidic conditions can be created by the oxidation of elemental sulphur to sulphate that, in turn, creates sulphuric acid in water. Generally, acidic conditions are seen only after the natural buffering capacity of the soil has been lost by the depletion of calcium-carbonate. Values in the acidic range can also indicate the presence of process chemicals, such as glycols. In addition to reducing the availability of some nutrients to most plants and animals, low pH conditions can result in the dissolution and mobilization of metals that are otherwise either adsorbed to or comprise part of the mineral composition of soil particles.

- ***Electrical conductivity (EC)*** is a measurement of the ability of a medium (soil or water) to conduct electricity. The EC of water samples can be measured directly, but for soils, a soil-water paste must first be prepared. Water becomes more conductive with increasing concentrations of certain dissolved constituents that are usually inorganic in nature and include sodium, chloride, calcium, magnesium, bicarbonate, sulphate, metals, and nutrients. The EC of water is generally proportional to the total dissolved solids (TDS) content; therefore, the EC measurement is commonly used as a field analog for TDS. Because EC increases 1% to 3% for every 1°C increase in temperature, all readings are usually standardized to 25°C.

- ***Temperature*** is a measure of a medium's heat transfer potential and is usually expressed on a relative scale, such as in degrees Celsius (°C). Water temperature affects physical, biological, and chemical processes in the environment, as well as EC, the solubility of chemical constituents, and the availability of DO necessary for aquatic life. Groundwater and surface water bodies exhibit seasonal (and sometimes diurnal) temperature fluctuations in response to climatic changes. Surface water temperatures can range from 0°C under ice cover to 40°C near hot springs. Groundwater temperatures generally exhibit less variability than surface water temperatures. In summer, groundwater temperatures are typically cooler than air temperatures, whereas in winter, the opposite is true.

- ***Total dissolved solids (TDS)*** is the sum of the concentrations of major cations and anions dissolved in water. It is an indicator of elevated concentrations of major ions, such as sodium, chloride, magnesium, and sulphate. Fresh, non-saline water exhibits TDS concentrations less than 1,000 mg/L. Because TDS analysis does not reveal the identity of dissolved ions, water exhibiting high TDS concentrations may warrant analysis for specific major ions.

- ***Chloride*** is often present at high concentrations at locations where chloride salts or brines have been stored or handled. Many petroleum processing plants and batteries handle produced formation water, which is typically a sodium-chloride brine. Chloride is usually present in concentrations ranging from 5,000 to over 50,000 mg/L in the formation waters of Western Canada (RPCL 1996). Therefore, chloride may be used as an indicator parameter at oil and gas production facilities. Chloride can also enter groundwater as a result of infiltration from feedlots, septic tanks, snow removal activities, and landfills. In shallow groundwater, natural chloride concentrations are usually less than 50 mg/L. Chloride is generally considered a conservative (non-reactive) constituent in groundwater and can be used as a tracer of groundwater flow.

- ***Sulphate*** concentrations are used as indicators of sulphur species. Elemental sulphur in soils is readily oxidized to sulphate, which is highly soluble and percolates to the water table. High sulphate concentrations are not uncommon at sour gas processing plants and sulphur storage and handling facilities but can also result from the leaching of minerals, such as gypsum and anhydrite. Excessive sulphate in groundwater can lower the pH of the water. The use of sulphate as an indicator of groundwater contamination is complicated by the fact that sulphate participates in chemical reactions in the subsurface. However, in the presence of dissolved hydrocarbons, sulphate concentrations can be abnormally low. It is believed that biodegradation of the hydrocarbons consumes the available DO in the subsurface. When the system becomes anoxic, anaerobic bacteria can reduce the sulphate to hydrogen-sulphide. The organic matter (hydrocarbons) acts as a source of energy for the sulphate reducing bacteria and will be oxidized to bicarbonate and eventually carbon dioxide.

- ***Iron and manganese*** are both more soluble in their reduced states than in their oxidized states. The presence of iron and/or manganese is also used to demonstrate the occurrence of natural attenuation of dissolved hydrocarbons. Because aerobic biodegradation of hydrocarbons often leads to strong reducing conditions, relatively high concentrations of iron and/or manganese may be present in groundwater.

- ***Uranium*** occurs naturally and is widespread in nature, occurring in granites and various other mineral deposits. Uranium concentrations of up to 0.7 mg/L have been found in private groundwater supplies in Canada (Moss 1985). It often enters water supplies as a result of leaching from natural deposits or from human activity, such as mill tailings and phosphate fertilizers. In water, uranium is usually hexavalent and is present as the uranyl ion (McNeely et al. 1979). Most uranyl salts are soluble in water and form soluble ion complexes. The uranyl salts impart an objectionable taste and colour to water and may cause kidney damage (McNeely et al. 1979). Uranium can be studied from a chemical or a radiological aspect of toxicity. The maximum acceptable concentration (MAC) for uranium in drinking water (0.02 mg/L) is a toxicological guideline based on the chemical aspects of uranium (Health Canada 2014). Additionally, there are guidelines for uranium that are based on radiological effects; however, the guidelines are greater than the chemical toxicology MAC guideline.

- ***Calcium, magnesium, and sodium*** are the three most prevalent cations in natural groundwater systems. Of the three, sodium is usually the dominant cation, but because the main source of naturally occurring calcium, magnesium, and sodium is from the weathering of rocks and minerals, concentrations vary according to local geology. Both calcium and magnesium contribute to water hardness. Commercial or industrial use of concentrated calcium, magnesium, and sodium products (e.g., lime, soda ash, and caustic soda) can lead to increased concentrations in soil and groundwater.

- ***Hardness*** of a water supply affects the amount of lather generated by soap. The chief constituents implicated with water hardness are calcium and magnesium. In addition, iron, manganese, and aluminum may also contribute to hardness, but these are usually present at much lower concentrations. Hardness is expressed as a total calcium-carbonate equivalent. Water with a hardness less than 60 mg/L is considered soft, whereas water with a hardness exceeding 120 mg/L is considered hard.

- ***Alkalinity*** is a measure of the ability of soil or water to neutralize an acid and indicates the presence of compounds with some degree of acid buffering capacity. To employ a relative scale, alkalinity is expressed as a total calcium-carbonate equivalent. However, the contributing compounds could include not only carbonates and bicarbonates, but also hydroxides, borates, silicates, phosphates, and some organic substances. Natural surface waters typically exhibit alkalinity of less than 500 mg/L, with most of the alkalinity attributed to bicarbonates.

- ***Carbonate and bicarbonate*** together with carbonic acid are the three forms that inorganic carbon exists as in natural groundwater systems. The speciation of inorganic carbon depends on pH; at pH 7 to 8, bicarbonate will predominate and account for 60% to 90% of total inorganic carbon in water samples. Bicarbonate ions are the main buffer in freshwater aqueous systems and provide carbon-dioxide for photosynthesis. At higher pH, carbonate will predominate, and at lower pH, carbonic acid will be present. In surface water, bicarbonate concentrations are usually less than 500 mg/L and carbonate is typically absent (because the pH of surface water rarely exceeds 9). Groundwater is more likely to exhibit alkalinity and contain 10 mg/L or more of carbonate.

- ***Dissolved nitrite/nitrate-nitrogen*** is a measure of soluble oxidized nitrogen. Nitrite/nitrate-nitrogen can be derived from natural oxidation and weathering of clay minerals in till material (Hendry et al. 1984), as well as from animal wastes, sewage discharge, and the surface application of fertilizers (McNeely et al. 1979). In gas plants, elevated nitrite/nitrate-nitrogen can occur from the oxidation of organic nitrogen in amines. In the presence of hydrocarbons, nitrite/nitrate-nitrogen concentrations can be decreased due to microbial reduction.

- ***Dissolved organic carbon (DOC)*** is often used as an indicator of DOC constituents in shallow groundwater from both naturally occurring organic matter and introduced compounds containing organic carbon (such as glycols and dissolved hydrocarbons). It is Matrix's experience that at concentrations above 100 mg/L, DOC typically correlates to the presence of dissolved extractable hydrocarbon constituents or process chemicals containing organic carbon. In the analysis for DOC, groundwater is filtered first to remove any contribution of organic carbon from suspended solids. Due to the nature of the analytical procedures, volatile organic carbon compounds are not usually detected in DOC analyses. Concentrations of DOC are naturally variable, particularly in the presence of natural organic soils, such as peat and muskeg; therefore, it is recommended that a background groundwater sample also be analyzed for DOC. DOC is a more convenient and direct expression of total organic content than either biological oxygen demand or chemical oxygen demand.

- ***Phenols*** are aromatic organic compounds in which one or more hydroxy groups are attached directly to a benzene ring. Phenolic compounds may impart an undesirable taste and odour. Phenols can occur naturally in groundwater, usually in low amounts associated with decomposing organic matter. Sources of phenolic compounds are widespread, as it may be released as a by-product from many major industry sectors, including pulp, paper, and wood products, chemical plants, steel and metal products, petroleum refining and products, animal and human wastes, and municipal wastewater treatment facilities. Fish and fish-food organisms may be adversely affected by phenolic substances due to oxygen depletion in water and production of undesirable flavours in the edible flesh of fish.

- ***Benzene, toluene, ethylbenzene, and xylenes (BTEX)*** are monoaromatic compounds that are often present in petroleum hydrocarbon (PHC) mixtures. These constituents make up a small fraction of petroleum mixtures and are of most concern due to their toxicological, chemical, and physical characteristics. In Canada, gasoline typically contains 1% to 2% benzene and approximately 30% total BTEX. Relative to most hydrocarbon compounds, BTEX constituents are more soluble in water, and, therefore, more mobile in the environment.

- ***Volatile petroleum hydrocarbon (VPH)*** is the total concentration of volatile hydrocarbon components ranging from C_6-C_{10} (i.e., hydrocarbon compounds containing 6 to 10 carbon atoms). The hydrocarbons are extracted from the medium (soil or water) using a solvent. The resulting extract is then analyzed using gas chromatography with flame ionization detection (GC/FID). This range captures the majority of most unweathered gasolines, mineral spirits, and paint thinners. The VPH analysis is also used as an indicator for condensate and the light fractions of oil or other process chemicals.

- ***Light extractable petroleum hydrocarbon ($LEPH_{10-19}$) and heavy extractable petroleum hydrocarbon ($HEPH_{19-32}$)*** is calculated using results from GC/FID that determines the total concentration of hydrocarbons in the C_{10}-C_{19} and C_{19}-C_{32} ranges (i.e., hydrocarbon compounds containing 10 to 19 and 19 to 32 carbon atoms). The hydrocarbons are extracted from the medium (soil or water) using a solvent. The resulting extract is then analyzed using GC/FID. PHCs are detected as the gas chromatograph separates the extract into distinct groups based on boiling point, which is related to the number of carbons atoms present in each component. This range captures the majority of most furnace and diesel fuel, lubricating oils, and hydraulic oils.

- ***Polycyclic aromatic hydrocarbons (PAHs)*** are analyzed by solvent extraction, followed by cleanup and analysis by a gas chromatograph equipped with a mass spectrometer. PAHs are hydrocarbon compounds consisting of multiple benzene rings. Eight of the PAHs are carcinogenic, and the carcinogenic potency of each compound is expressed relative to benzo[a]pyrene. Lighter hydrocarbons, such as gasoline, condensate, and petroleum solvents, do not generally include significant concentrations of PAHs. Heavier hydrocarbons, including crude oil, fuel oil, diesel, and waste oil, and unknown hydrocarbon mixtures may contain PAHs. Examples of upstream facilities or components of facilities where PAH contamination could be expected include but are not limited to flare pits, sumps, tank bottom sludges, soil subjected to flare stack carry-over, landfills, and drilling sumps where diesel based mud was used.

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APPENDIX F
Historical Groundwater and Leachate Quality Results

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
Background					
BH-103	31-May-12	17507120531001	4.5	6.1	1660
BH-103	23-Oct-12	17507121023001	6.5	7.4	4350
BH-103	19-Jun-13	17507130619012	7.1	6.2	3380
BH-103	01-Oct-13	not sampled	---	---	---
BH-103	21-May-14	17507140521006	10.1	6.3	5260
BH-103	11-Sep-14	17507140911005	11.6	5.8	4980
BH-103	15-Apr-15	17507150415003	4.6	6.1	5150
BH-103	03-Jun-15	17507150603009	14.4	6.0	4170
BH-103	02-Sep-15	insufficient water	---	---	---
BH-103	05-Nov-15	insufficient water	---	---	---
BH-103	29-Apr-16	17507160429001	8.5	5.5	5150
BH-103	15-Jun-16	17507160615001	6.7	6.1	5490
BH-103	09-Sep-16	insufficient water	---	---	---
BH-103	15-Nov-16	insufficient water	---	---	---
BH-103	08-May-17	17507170508001	8.8	5.5	5010
BH-103	06-Jul-17	17507170706014	13.1	6.3	3850
BH-103	19-Sep-17	17507170919013	9.3	6.1	4580
BH-103	15-Nov-17	17507171115002	3.9	7.4	4520
BH-103	15-May-18	17507180515009	10.0	5.7	4660
BH-103	27-Jul-18	17507180727009	16.3	6.0	4530
BH-103	11-Sep-18	insufficient water	---	---	---
MW92-1	31-May-12	17507120531004	5.5	6.7	1450
MW92-1	22-Oct-12	17507121022003	5.8	7.0	3690
MW92-1	19-Jun-13	insufficient water	---	---	---
MW92-1	01-Oct-13	17507131001006	---	---	---
MW92-1	21-May-14	17507140521004	6.7	6.7	3920
MW92-1	11-Sep-14	17507140911010	12.0	6.9	3900
MW92-1	15-Apr-15	17507150415009	5.4	6.7	4030
MW92-1	03-Jun-15	17507150603001	16.1	7.1	3780
MW92-1	02-Sep-15	17507150902008	3.0	8.6	4100
MW92-1	05-Nov-15	17507151105011	3.2	6.8	3750
MW92-1	29-Apr-16	17507160429005	11.3	7.0	3860
MW92-1	15-Jun-16	17507160615012	8.1	7.0	3980
MW92-1	09-Sep-16	17507160909012	11.1	7.0	4110
MW92-1	15-Nov-16	17507161115005	4.6	6.9	3970
MW92-1	08-May-17	17507170508012	10.1	7.0	3950
MW92-1	06-Jul-17	17507170706011	15.6	6.7	3810
MW92-1	19-Sep-17	17507170919003	8.9	7.1	4090
MW92-1	15-Nov-17	17507171115013	0.0	7.8	2540
MW92-1	15-May-18	17507180515001	12.8	6.7	3850
MW92-1	27-Jul-18	17507180727001	25.0	6.8	4010
MW92-1	11-Sep-18	17507180911001	5.4	6.2	3570

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
MW92-1A	31-May-12	17507120531005	3.5	7.0	1160
MW92-1A	22-Oct-12	17507121022004	5.9	7.2	2790
MW92-1A	19-Jun-13	17507130619002	8.2	6.5	1890
MW92-1A	01-Oct-13	17507131001003	5.6	6.9	2320
MW92-1A	21-May-14	17507140521002	8.9	6.7	3210
MW92-1A	11-Sep-14	17507140911011	10.9	6.7	3290
MW92-1A	15-Apr-15	17507150415008	5.2	6.5	3140
MW92-1A	03-Jun-15	17507150603002	15.8	7.3	2600
MW92-1A	02-Sep-15	17507150902009	2.9	8.7	3640
MW92-1A	05-Nov-15	17507151105010	5.0	6.4	3000
MW92-1A	29-Apr-16	17507160429006	9.2	6.8	2950
MW92-1A	15-Jun-16	17507160615003	9.7	7.2	680
MW92-1A	09-Sep-16	17507160909001	12.9	8.0	1150
MW92-1A	15-Nov-16	17507161115004	6.0	6.7	3420
MW92-1A	08-May-17	17507170508013	8.4	7.5	950
MW92-1A	06-Jul-17	17507170706010	15.3	7.1	2460
MW92-1A	19-Sep-17	17507170919004	9.1	7.5	3790
MW92-1A	15-Nov-17	17507171115012	0.7	7.9	1170
MW92-1A	15-May-18	17507180515002	12.5	6.8	1720
MW92-1A	27-Jul-18	17507180727002	16.3	6.7	3170
MW92-1A	11-Sep-18	17507180911002	4.5	5.5	3250
MW92-6A	31-May-12	17507120531006	4.5	6.8	990
MW92-6A	22-Oct-12	17507121022005	5.3	7.5	2520
MW92-6A	19-Jun-13	17507130619011	8.0	7.1	1150
MW92-6A	01-Oct-13	17507131001005	5.4	6.8	890
MW92-6A	21-May-14	17507140521007	7.1	6.8	2110
MW92-6A	11-Sep-14	17507140911006	10.8	6.7	2400
MW92-6A	15-Apr-15	17507150415004	4.8	6.6	1600
MW92-6A	03-Jun-15	17507150603003	10.6	7.5	1550
MW92-6A	02-Sep-15	17507150902002	6.7	5.8	1980
MW92-6A	05-Nov-15	17507151105007	5.4	5.6	2170
MW92-6A	29-Apr-16	17507160429002	9.4	6.0	2340
MW92-6A	15-Jun-16	17507160615011	11.9	7.1	2060
MW92-6A	09-Sep-16	17507160909006	9.5	5.8	1810
MW92-6A	15-Nov-16	17507161115008	5.5	6.6	2210
MW92-6A	08-May-17	17507170508002	8.8	6.7	2150
MW92-6A	06-Jul-17	17507170706001	15.3	6.7	2300
MW92-6A	19-Sep-17	17507170919006	10.6	7.3	2650
MW92-6A	15-Nov-17	17507171115006	0.1	8.2	2400
MW92-6A	15-May-18	17507180515003	8.3	6.8	2080
MW92-6A	27-Jul-18	17507180727003	23.2	6.7	1976
MW92-6A	11-Sep-18	17507180911003	5.8	5.6	2070

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
MW92-7	31-May-12	17507120531007	5.3	7.0	1580
MW92-7	22-Oct-12	17507121022006	6.3	7.2	4270
MW92-7	19-Jun-13	17507130619007	7.6	7.0	3010
MW92-7	01-Oct-13	17507131001002	4.5	7.2	2730
MW92-7	21-May-14	17507140521010	10.5	7.0	4460
MW92-7	11-Sep-14	17507140911008	14.3	7.1	4430
MW92-7	15-Apr-15	insufficient water	---	---	---
MW92-7	03-Jun-15	17507150603004	16.5	7.5	4100
MW92-7	02-Sep-15	17507150902006	4.4	7.2	4460
MW92-7	05-Nov-15	17507151105009	4.4	6.3	4220
MW92-7	29-Apr-16	17507160429004	11.6	7.0	4320
MW92-7	15-Jun-16	17507160615010	8.4	7.1	4360
MW92-7	09-Sep-16	17507160909007	7.7	6.8	4530
MW92-7	15-Nov-16	17507161115007	4.2	7.2	4480
MW92-7	08-May-17	17507170508010	9.7	7.2	5210
MW92-7	06-Jul-17	17507170706012	14.5	7.4	4280
MW92-7	19-Sep-17	17507170919002	8.3	7.2	4500
MW92-7	15-Nov-17	17507171115010	2.2	7.8	4140
MW92-7	15-May-18	17507180515004	12.3	7.2	4320
MW92-7	27-Jul-18	17507180727005	24.8	6.1	4800
MW92-7	11-Sep-18	insufficient water	---	---	---
MW92-7A	31-May-12	17507120531008	4.4	6.9	1360
MW92-7A	22-Oct-12	17507121022007	6.8	7.4	3680
MW92-7A	19-Jun-13	17507130619004	8.4	6.8	3050
MW92-7A	01-Oct-13	dry	---	---	---
MW92-7A	21-May-14	17507140521009	10.6	6.6	4570
MW92-7A	11-Sep-14	17507140911009	13.7	6.8	4690
MW92-7A	15-Apr-15	17507150415006	4.7	7.0	4840
MW92-7A	03-Jun-15	17507150603005	15.6	7.2	4450
MW92-7A	02-Sep-15	17507150902007	5.0	7.1	4660
MW92-7A	05-Nov-15	17507151105008	4.8	6.8	4470
MW92-7A	29-Apr-16	17507160429003	9.0	6.5	4330
MW92-7A	15-Jun-16	17507160615009	8.3	6.9	4350
MW92-7A	09-Sep-16	17507160909004	8.2	7.3	3870
MW92-7A	15-Nov-16	17507161115006	4.9	6.6	4890
MW92-7A	08-May-17	17507170508011	9.0	7.1	3080
MW92-7A	06-Jul-17	17507170706013	15.1	6.8	2540
MW92-7A	19-Sep-17	17507170919001	8.4	7.2	4290
MW92-7A	15-Nov-17	17507171115011	0.0	7.9	4440
MW92-7A	15-May-18	17507180515005	13.0	6.6	4230
MW92-7A	27-Jul-18	17507180727004	---	---	---
MW92-7A	11-Sep-18	17507180911005	4.9	6.6	4590

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
03-3	31-May-12	17507120531002	5.2	6.8	1260
03-3	22-Oct-12	17507121022001	4.7	7.5	3530
03-3	19-Jun-13	insufficient water	---	---	---
03-3	01-Oct-13	17507131001007	---	---	---
03-3	21-May-14	insufficient water	---	---	---
03-3	11-Sep-14	insufficient water	---	---	---
03-3	15-Apr-15	insufficient water	---	---	---
03-3	03-Jun-15	17507150603006	---	---	---
03-3	02-Sep-15	insufficient water	---	---	---
03-3	05-Nov-15	insufficient water	---	---	---
03-3	29-Apr-16	insufficient water	---	---	---
03-3	15-Jun-16	insufficient water	---	---	---
03-3	09-Sep-16	17507160909002	10.0	7.3	3840
03-3	15-Nov-16	17507161115002	6.1	6.7	3860
03-3	08-May-17	17507170508015	9.0	7.3	3810
03-3	06-Jul-17	17507170706008	11.5	7.1	3850
03-3	19-Sep-17	insufficient water	---	---	---
03-3	15-Nov-17	insufficient sample	---	---	---
03-3	15-May-18	17507180515006	10.2	6.2	4550
03-3	27-Jul-18	17507180727006	---	---	---
03-3	11-Sep-18	insufficient water	---	---	---
03-4	19-Jun-13	dry	---	---	---
03-4	01-Oct-13	dry	---	---	---
03-4	21-May-14	dry	---	---	---
03-4	11-Sep-14	dry	---	---	---
03-4	15-Apr-15	dry	---	---	---
03-4	03-Jun-15	dry	---	---	---
03-4	02-Sep-15	dry	---	---	---
03-4	05-Nov-15	dry	---	---	---
03-4	29-Apr-16	dry	---	---	---
03-4	15-Jun-16	dry	---	---	---
03-4	09-Sep-16	dry	---	---	---
03-4	15-Nov-16	dry	---	---	---
03-4	08-May-17	dry	---	---	---
03-4	06-Jul-17	dry	---	---	---
03-4	19-Sep-17	dry	---	---	---
03-4	15-Nov-17	dry	---	---	---
03-4	15-May-18	dry	---	---	---
03-4	27-Jul-18	unable to sample	---	---	---
03-5	31-May-12	17507120531003	5.9	6.8	1130
03-5	22-Oct-12	17507121022002	4.7	7.2	3690
03-5	19-Jun-13	17507130619009	7.6	6.8	2680
03-5	01-Oct-13	17507131001004	---	---	---
03-5	21-May-14	insufficient water	---	---	---

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
03-5	11-Sep-14	17507140911002	10.1	6.8	4160
03-5	15-Apr-15	17507150415007	6.1	6.5	4180
03-5	03-Jun-15	dry	---	---	---
03-5	02-Sep-15	insufficient water	---	---	---
03-5	05-Nov-15	insufficient water	---	---	---
03-5	29-Apr-16	17507160429007	9.7	6.8	3970
03-5	15-Jun-16	17507160615002	8.7	6.8	4200
03-5	09-Sep-16	17507160909003	10.9	7.2	4240
03-5	15-Nov-16	17507161115003	5.8	6.4	3880
03-5	08-May-17	17507170508014	9.4	7.1	3980
03-5	06-Jul-17	17507170706009	12.5	7.2	3760
03-5	19-Sep-17	17507170919005	8.6	7.1	4190
03-5	15-Nov-17	17507171115014	1.1	7.7	2880
03-5	15-May-18	17507180515008	10.4	6.5	4230
03-5	27-Jul-18	17507180727008	---	---	---
03-5	11-Sep-18	insufficient water	---	---	---
BH-104	19-Jun-13	dry	---	---	---
BH-104	01-Oct-13	dry	---	---	---
BH-104	21-May-14	dry	---	---	---
BH-104	11-Sep-14	dry	---	---	---
BH-104	15-Apr-15	17507150415011	5.8	6.3	3870
BH-104	03-Jun-15	17507150603011	12.1	7.1	370
BH-104	02-Sep-15	insufficient water	---	---	---
BH-104	05-Nov-15	decomissioned	---	---	---
BH-104	29-Apr-16	decomissioned	---	---	---
BH-104(R)	05-Nov-15	dry	---	---	---
BH-104(R)	29-Apr-16	dry	---	---	---
BH-104(R)	15-Jun-16	dry	---	---	---
BH-104(R)	09-Sep-16	dry	---	---	---
BH-104(R)	15-Nov-16	dry	---	---	---
BH-104(R)	08-May-17	dry	---	---	---
BH-104(R)	06-Jul-17	dry	---	---	---
BH-104(R)	19-Sep-17	dry	---	---	---
BH-104(R)	15-Nov-17	dry	---	---	---
BH-104(R)	15-May-18	dry	---	---	---
BH-104(R)	27-Jul-18	dry	---	---	---
BH-104(R)	11-Sep-18	dry	---	---	---
BH-105	19-Jun-13	dry	---	---	---
BH-105	01-Oct-13	damaged	---	---	---
BH-105	21-May-14	damged/dry	---	---	---
BH-105	11-Sep-14	damged/dry	---	---	---
BH-105	15-Apr-15	not sampled	---	---	---
BH-105	03-Jun-15	dry	---	---	---

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
BH-105	02-Sep-15	dry	---	---	---
BH-105	05-Nov-15	decomissioned	---	---	---
BH-105	29-Apr-16	decomissioned	---	---	---
BH-105(R)	05-Nov-15	17507151105004	3.5	6.8	3850
BH-105(R)	29-Apr-16	17507160429010	8.5	6.9	3880
BH-105(R)	15-Jun-16	17507160615013	12.2	7.0	3980
BH-105(R)	09-Sep-16	17507160909008	8.1	6.8	4160
BH-105(R)	15-Nov-16	17507161115010	5.8	7.3	3960
BH-105(R)	08-May-17	17507170508004	8.7	6.8	4000
BH-105(R)	06-Jul-17	17507170706003	11.9	7.1	3980
BH-105(R)	19-Sep-17	17507170919009	8.2	7.1	4150
BH-105(R)	15-Nov-17	17507171115005	0.1	9.0	4030
BH-105(R)	15-May-18	17507180515012	10.7	6.9	4070
BH-105(R)	27-Jul-18	17507180727012	19.4	6.5	4510
BH-105(R)	11-Sep-18	17507180911012	8.5	6.8	3800
15-9	05-Nov-15	insufficient water	---	---	---
15-9	29-Apr-16	17507160429011	11.5	6.9	4830
15-9	15-Jun-16	17507160615015	8.6	7.0	4790
15-9	09-Sep-16	17507160909010	7.1	6.6	5420
15-9	15-Nov-16	17507161115012	5.3	7.2	5380
15-9	08-May-17	17507170508006	9.3	7.0	5570
15-9	06-Jul-17	17507170706006	11.6	7.0	5320
15-9	19-Sep-17	17507170919011	7.7	6.7	5550
15-9	15-Nov-17	insufficient sample	---	---	---
15-9	15-May-18	17507180515013	11.2	6.5	5390
15-9	27-Jul-18	17507180727013	20.6	6.8	5610
15-9	11-Sep-18	17507180911013	6.3	6.7	5540
15-10	05-Nov-15	insufficient water	---	---	---
15-10	29-Apr-16	17507160429012	9.2	6.9	4020
15-10	15-Jun-16	17507160615016	9.1	7.1	4210
15-10	09-Sep-16	17507160909011	7.2	6.6	4220
15-10	15-Nov-16	17507161115013	3.7	7.3	4350
15-10	08-May-17	17507170508008	7.8	6.9	4330
15-10	06-Jul-17	17507170706007	12.0	6.8	4200
15-10	19-Sep-17	17507170919010	8.2	6.2	4470
15-10	15-Nov-17	insufficient sample	---	---	---
15-10	15-May-18	17507180515014	10.6	6.8	4280
15-10	27-Jul-18	17507180727014	15.2	6.7	4360
15-10	11-Sep-18	17507180911014	5.5	6.5	5070

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC^{25} µS/cm
15-11	03-Oct-15	dry	---	---	---
15-11	05-Nov-15	insufficient water	---	---	---
15-11	29-Apr-16	17507160429019	9.4	6.9	4190
15-11	15-Jun-16	23458160615001	8.2	7.0	4290
15-11	09-Sep-16	23458160909001	7.3	7.3	4370
15-11	15-Nov-16	insufficient water	---	---	---
15-11	15-Nov-17	not sampled	---	---	---
15-11	15-May-18	17507180515015	10.8	6.6	4330
15-11	27-Jul-18	17507180727015	18.2	6.6	4410
15-11	11-Sep-18	17507180911015	4.6	6.3	4120
Leachate Vault 1	31-May-12	17507120531009	18.0	6.5	1970
Leachate Vault 1	01-Oct-13	17507131001010	---	---	---
Leachate Vault 1	21-May-14	17507140521011	---	---	---
Leachate Vault 1	11-Sep-14	17507140911003	18.2	6.9	30000
Leachate Vault 1	15-Apr-15	no field screening	---	---	---
Leachate Vault 1	03-Jun-15	no field screening	---	---	---
Leachate Vault 1	02-Sep-15	sheen	---	---	---
Leachate Vault 1	05-Nov-15	sheen	---	---	---
Leachate Vault 1	29-Apr-16	sheen	---	---	---
Leachate Vault 1	15-Jun-16	sheen	---	---	---
Leachate Vault 1	15-Jun-16	sheen	---	---	---
Leachate Vault 1	09-Sep-16	sheen	---	---	---
Leachate Vault 1	15-Nov-16	17507161115011	---	---	---
Leachate Vault 1	08-May-17	no field screen	---	---	---
Leachate Vault 1	06-Jul-17	sheen	---	---	---
Leachate Vault 1	19-Sep-17	sheen	---	---	---
Leachate Vault 1	15-Nov-17	insufficient sample	---	---	---
Leachate Vault 1	15-May-18	sheen	---	---	---
Leachate Vault 1	27-Jul-18	17507180727016	---	---	---
Leachate Vault 1	11-Sep-18	sheen	---	---	---
Leak Detection System	31-May-12	17507120531010	7.1	6.5	1490
Leak Detection System	22-Oct-12	17507121022008	5.8	7.6	3200
Leak Detection System	01-Oct-13	17507131001001	6.6	6.3	2290
Leak Detection System	21-May-14	17507140521001	3.8	6.7	3600
Leak Detection System	11-Sep-14	17507140911004	10.9	6.7	3930
Leak Detection System	15-Apr-15	17507150415002	4.9	6.7	3570
Leak Detection System	03-Jun-15	17507150603014	22.2	5.3	210
Leak Detection System	02-Sep-15	17507150902004	4.2	6.4	3370
Leak Detection System	05-Nov-15	17507151105005	3.1	6.5	3300
Leak Detection System	29-Apr-16	17507160429009	8.1	6.8	3440
Leak Detection System	15-Jun-16	17507160615018	11.3	7.0	2860
Leak Detection System	09-Sep-16	17507160909013	10.0	7.0	3950
Leak Detection System	15-Nov-16	17507161115009	5.5	6.7	4120
Leak Detection System	08-May-17	17507170508003	7.2	6.8	3560

TABLE F1

2008-2018 Groundwater and Leachate Quality Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC[25] µS/cm
Leak Detection System	06-Jul-17	17507170706002	12.9	6.8	3570
Leak Detection System	19-Sep-17	17507170919008	10.0	7.0	3780
Leak Detection System	15-Nov-17	frozen	---	---	---
Leak Detection System	15-May-18	17507180515016	11.0	6.7	3750
Leak Detection System	27-Jul-18	17507180727017	18.4	6.5	5450
Leak Detection System	11-Sep-18	sheen	---	---	---

Notes:

Bold - background well

--- - not analyzed

[25] - field EC corrected to 25°C

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
Background																				
BH-103	08-Jun-08	17507080608001	7.06	4220	412	316.0	366	8	0.8	2820	---	<0.02	0.08	0.08	131	159	2330	4000	<0.001	10.9
BH-103	14-Oct-08	17507081014001	7.31	4420	420	333.0	326	7	0.8	2890	---	<0.02	0.51	0.51	172	209	2420	4080	0.002	9.1
BH-103	15-Jun-09	17507090615001	6.96	4540	431	391.0	389	7.6	<0.4	3200	---	<0.02	0.75	0.75	126	153	2690	4500	0.003	5.8
BH-103	22-Sep-09	17507090922001	7.24	4640	428	363.0	414	8.4	0.9	3180	---	<1	0.629	<1	128	157	2560	4470	0.0039	8.1
BH-103	08-Jun-10	17507100608001	7.08	4620	389	385.0	379	8.19	<5	3030	---	<0.5	<0.5	<0.71	110	134	2560	4260	0.0024	6.5
BH-103	12-Oct-10	17507101012001	7.53	4590	402	376.0	344	6.68	<0.5	3010	---	<0.05	0.451	0.451	126	153	2550	4220	<0.001	10.5
BH-103	08-Nov-11	17507111108008	7.12	4730	392	389.0	402	10.8	<5	3050	---	<0.5	<0.5	<0.71	132	161	2580	4320	0.0012	7.6
BH-103	31-May-12	17507120531001	7.00	4670	402	372.0	366	8.09	<0.5	3230	---	<0.25	0.54	0.54	114	140	2540	4450	---	5.2
BH-103	23-Oct-12	17507121023001	6.86	4620	396	340.0	340	9.1	<5	3080	---	<0.5	<0.5	<0.71	136	166	2390	4250	---	6.4
BH-103	19-Jun-13	17507130619012	6.50	5210	299	314.0	449	9.1	0.5	3190	---	<0.05	0.431	0.431	108	132	2040	4330	<0.001	6.6
BH-103	21-May-14	17507140521006	6.94	5050	348	331.0	538	10.7	0.3	3200	---	<0.02	1.74	1.74	104	127	2230	4500	0.0012	5.4
BH-103	11-Sep-14	17507140911005	6.71	5030	364	337.0	494	9.29	0.4	3330	---	0.055	8.51	8.56	67	81.8	2300	4620	<0.001	5.2
BH-103	15-Apr-15	17507150415003	6.90	5100	355	338.0	597	11.2	<2.5	3350	0.11	<0.05	6.09	6.09	56.7	69.2	2280	4710	<0.001	4.5
BH-103	03-Jun-15	17507150603009	6.56	3090	266	250.0	493	9.8	<2.5	2910	<0.1	<0.05	10.8	10.8	49.8	60.7	1690	4010	<0.001	6.3
BH-103	02-Sep-15	17507150902001	6.86	4990	248	263.0	722	12.2	<5.0	3440	<0.2	<0.1	14	14	114	139	1700	4820	<0.001	5.9
BH-103	05-Nov-15	17507151105001	7.37	5710	289	264.0	795	12.3	<2.5	3330	<0.1	<0.05	17.9	17.9	79.1	96.5	1810	4820	<0.001	4.7
BH-103	29-Apr-16	17507160429001	7.12	5080	308	295.0	604	10.6	<2.5	3210	0.1	<0.050	14.8	14.8	51.8	63.2	1980	4520	<0.0010	5.5
BH-103	15-Jun-16	17507160615001	6.05	5340	294	290.0	759	12.3	<2.5	3320	<0.10	<0.050	12.3	12.3	81.3	99.2	1930	4780	---	---
BH-103	09-Sep-16	17507160909005	6.78	5040	275	275.0	836	11.7	<2.5	3530	<0.10	<0.050	16.1	16.1	82.7	101	1820	5050	---	---
BH-103	15-Nov-16	17507161115001	6.36	5380	299	301.0	742	11.9	<2.5	3340	<0.10	<0.050	20.1	20.1	52.3	63.8	1990	4810	---	---
BH-103	08-May-17	17507170508001	5.99	4620	311	308.0	587	10.9	<5.0	3190	<0.20	<0.10	10.4	10.4	32.6	39.8	2040	4470	<0.0010	6.9
BH-103	06-Jul-17	17507170706014	6.48	3950	343	309.0	303	8.4	<2.5	2410	0.15	<0.050	2.47	2.47	68.8	83.9	2130	3430	<0.0010	<1.0
BH-103	19-Sep-17	17507170919013	6.80	4560	416	338.0	351	7.9	<2.5	3200	0.17	<0.050	2.47	2.47	108	132	2430	4390	<0.0010	9.3
BH-103	15-Nov-17	17507171115002	7.90	4450	425	372.0	398	8.4	<2.5	3270	0.23	<0.050	1.07	1.07	125	153	2600	4550	<0.0010	7.9
BH-103	15-May-18	17507180515009	7.91	4730	428	363.0	378	8.2	<2.5	3120	0.36	<0.050	0.48	0.48	74	90.3	2560	4340	<0.0010	6.4
BH-103	27-Jul-18	17507180727009	6.96	4840	382	355.0	422	8.5	1.0	3230	0.34	<0.01	0.63	0.63	122	149	2420	4470	0.002	6
BH-103	11-Sep-18	17507180911009	6.53	5070	385	346.0	594	10.8	<0.6	3200	0.28	<0.01	1.99	1.99	87	107	2390	4600	0.003	6
MW92-1	08-Jun-08	17507080608003	7.79	3850	464	317.0	228	8	4.6	1860	---	<0.02	<0.05	<0.07	857	1040	2460	3390	<0.001	10.4
MW92-1	15-Jun-09	17507090615004	---	---	439	304.0	214	10	---	---	---	---	---	---	---	---	---	---	0.003	---
MW92-1	22-Sep-09	17507090922004	7.96	3950	394	244.0	200	6.89	2.7	1690	---	<0.05	<0.05	<0.071	832	1020	1990	3040	---	---
MW92-1	08-Jun-10	17507100608005	7.61	3910	466	319.0	224	7.72	<5	1900	---	<0.5	<0.5	<0.71	859	1050	2480	3430	0.0012	4.4
MW92-1	12-Oct-10	17507101012005	7.92	3850	427	293.0	190	6.05	2.4	1910	---	<0.05	1.31	1.31	801	977	2270	3310	<0.001	4.6
MW92-1	14-Jun-11	17507110614001	7.79	4000	429	285.0	201	7.55	2.4	1950	---	<0.05	0.595	0.595	858	1050	2240	3390	<0.001	3.6
MW92-1	08-Nov-11	17507111108001	7.66	4050	433	272.0	239	8.92	<5	1940	---	<0.5	1.13	1.13	823	1000	2200	3390	<0.001	3.9
MW92-1	31-May-12	17507120531004	7.69	3900	473	304.0	215	7.99	3.1	2040	---	<0.25	1.35	1.35	873	1070	2430	3570	---	3.1
MW92-1	22-Oct-12	17507121022003	7.55	3840	486	302.0	221	9.74	<5	1840	---	<0.5	<0.5	<0.71	768	937	2460	3320	---	3.5
MW92-1	19-Jun-13	17507130619003	7.26	3990	399	304.0	200	7.18	2.5	1950	---	<0.05	0.254	0.254	869	1060	2250	3390	<0.001	4.4
MW92-1	01-Oct-13	17507131001006	7.70	3930	462	284.0	197	7	2.5	1940	---	<0.05	0.324	0.324	856	1040	2320	3410	<0.001	3.9
MW92-1	21-May-14	17507140521004	7.93	3810	440	290.0	214	7.65	2.2	1880	---	<0.02	0.429	0.429	875	1070	2290	3360	<0.001	3.6
MW92-1	11-Sep-14	17507140911010	7.71	3840	457	301.0	205	6.86	2.3	2020	---	<0.02	1.07	1.07	850	1040	2380	3510	<0.001	3.1
MW92-1	15-Apr-15	17507150415009	7.80	3970	476	299.0	215	8	<2.5	2030	<0.1	<0.05	0.59	0.59	826	1010	2420	3530	<0.001	3.1
MW92-1	03-Jun-15	17507150603001	7.63	3990	482	302.0	241	8.7	<2.5	2160	<0.1	<0.05	0.79	0.79	865	1060	2450	3720	<0.001	3.5
MW92-1	02-Sep-15	17507150902008	7.44	3860	431	293.0	211	7.7	<2.5	2090	<0.1	<0.05	0.95	0.95	826	1010	2280	3530	<0.001	3.3
MW92-1	05-Nov-15	17507151105011	7.88	3630	461	299.0	216	7.5	<2.5	2080	<0.1	<0.05	0.74	0.74	731	891	2380	3510	<0.001	2.8
MW92-1	29-Apr-16	17507160429005	7.71	3800	476	311.0	217	7.8	<2.5	1980	<0.10	<0.050	0.34	0.34	790	963	2470	3470	<0.0010	2.8
MW92-1	15-Jun-16	17507160615012	7.05	3810	459	303.0	218	8.4	<2.5	1980	<0.10	<0.050	0.31	0.31	823	1000	2390	3460	<0.0010	2.9
MW92-1	09-Sep-16	17507160909012	6.65	3360	445	287.0	222	7.4	<2.5	2040	<0.10	<0.050	0.22	0.22	842	1030	2290	3510	<0.0010	4.6
MW92-1	15-Nov-16	17507161115005	7.34	3830	490	315.0	233	8.4	<2.5	1960	<0.10	<0.050	0.21	0.21	848	1030	2520	3520	<0.0010	3.3
MW92-1	08-May-17	17507170508012	7.18	3770	417	296.0	200	7.6	<2.5	1950	<0.10	<0.050	<0.10	<0.11	823	1000	2260	3360	<0.0010	3.2
MW92-1	06-Jul-17	17507170706011	7.05	3970	421	316.0	232	8.2	<2.5	1900	<0.10	<0.050	<0.10	<0.11	879	1070	2350	3400	<0.0010	3
MW92-1	19-Sep-17	17507170919003	7.75	3680	431	298.0	203	7.3	<2.5	2040	<0.10	<0.050	<0.10	<0.11	646	788	2300	3370	<0.0010	3.1
MW92-1	15-Nov-17	17507171115013	7.80	3420	472	322.0	225	7.5	<2.5	2050	<0.10	<0.050	0.13	0.13	612	746	2500	3440	<0.0010	4.1
MW92-1	15-May-18	17507180515001	7.72	3900	486	298.0	217	7.62	3.1	1890	<0.10	<0.050	0.12	0.12	830	1010	2440	3400	<0.0010	3.7
MW92-1	27-Jul-18	17507180727001	7.50	4080	457	294.0	230	7.5	3.4	1860	<0.03	<0.01	<0.02	<0.02	873	1070	2350	3380	0.004	4
MW92-1	11-Sep-18	17507180911001	7.04	3920	507	312.0	230	7.6	2.4	1920	0.03	<0.01	<0.02	<0.02	871	1060	2550	3500	<0.002	3
MW92-1	07-Dec-18	17507181207001	7.53	3930	478	294.0	209	7.1	3.8	2050	0.09	<0.01	0.08	0.08	896	1090	2400	3580	<0.002	4

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
MW92-1A	08-Jun-08	17507080608004	7.64	3750	430	362	121	11	1.4	2280	---	<0.02	<0.05	<0.07	392	478	2560	3440	0.001	7.6
MW92-1A	08-Oct-08	17507081008002	7.79	3480	494	306	81	9	0.6	2270	---	<0.02	0.05	0.05	315	384	2490	3350	0.002	7.3
MW92-1A	15-Jun-09	17507090615005	7.69	2770	420	250	65.8	5.7	1.0	1860	---	<0.02	0.18	0.18	243	296	2080	2750	0.003	7.7
MW92-1A	22-Sep-09	17507090922005	7.75	3560	521	317	81.1	8.14	<0.5	2290	---	<1	0.057	<1	308	376	2610	3400	<0.001	7.8
MW92-1A	08-Jun-10	17507100608006	7.64	3370	462	278	69.9	5.73	<5	2120	---	<0.5	<0.5	<0.71	290	354	2300	3110	0.0062	14.1
MW92-1A	12-Oct-10	17507101012006	7.94	3500	475	320	84.8	9.14	<0.5	2210	---	<0.05	<0.05	<0.071	305	372	2500	3280	<0.001	8.2
MW92-1A	14-Jun-11	17507110614002	7.80	3150	377	260	71.5	8.47	0.5	1870	---	<0.05	0.054	<0.071	272	332	2010	2750	0.0012	6.9
MW92-1A	08-Nov-11	17507111108002	7.79	3200	425	222	67.1	7.11	<5	1910	---	<0.5	<0.5	<0.71	219	267	1980	2760	<0.001	6.9
MW92-1A	31-May-12	17507120531005	7.72	1920	298	112	29.3	2.85	11.7	1150	---	<0.25	<0.25	<0.35	111	136	1210	1670	---	5.6
MW92-1A	22-Oct-12	17507121022004	7.52	2910	435	248	61.4	7.12	<5	1800	---	<0.5	<0.5	<0.71	194	236	2110	2670	---	13.1
MW92-1A	19-Jun-13	17507130619002	7.22	2700	313	227	61.9	6.79	0.8	1650	---	<0.25	<0.25	<0.35	218	266	1720	2390	<0.001	6.9
MW92-1A	01-Oct-13	17507131001003	7.63	3440	439	335	101	10.4	<5	2150	---	<0.5	<0.5	<0.71	344	420	2480	3240	<0.001	6.6
MW92-1A	21-May-14	17507140521002	7.67	2740	325	229	68.9	8	0.6	1650	---	<0.02	0.118	0.118	255	311	1750	2440	<0.001	6.6
MW92-1A	11-Sep-14	17507140911011	7.55	3480	441	333	90.8	9.42	0.9	2260	---	<0.02	0.237	0.237	336	410	2470	3340	<0.001	6.3
MW92-1A	15-Apr-15	17507150415008	7.81	3270	312	167	40.7	5.3	<2.5	2050	0.13	<0.05	0.14	0.14	287	350	1470	2750	<0.001	5.7
MW92-1A	03-Jun-15	17507150603002	7.54	3160	373	241	74	8.6	<2.5	2080	0.12	<0.05	0.12	0.12	276	337	1920	2940	<0.001	6.3
MW92-1A	02-Sep-15	17507150902009	7.46	3580	404	328	97.8	10	<2.5	2490	<0.1	<0.05	0.23	0.23	365	445	2360	3550	<0.001	6
MW92-1A	05-Nov-15	17507151105010	8.00	3420	423	292	87.4	9.9	<2.5	2200	0.13	<0.05	0.19	0.19	358	436	2260	3230	<0.001	5.4
MW92-1A	29-Apr-16	17507160429006	7.75	3420	432	331	98.9	9.9	<2.5	2220	0.12	<0.050	0.21	0.21	313	382	2440	3280	<0.0010	6.4
MW92-1A	15-Jun-16	17507160615003	6.94	576	87.4	28	10.2	1.03	<0.50	259	0.37	<0.010	0.03	<0.050	36.2	44.2	334	408	0.001	15.7
MW92-1A	09-Sep-16	17507160909001	6.95	1010	168	48	14.9	1.19	<0.50	547	0.593	<0.010	0.02	<0.050	84.7	103	616	830	<0.0010	12.2
MW92-1A	15-Nov-16	17507161115004	7.19	3600	461	363	121	12.4	<2.5	2180	0.12	<0.050	0.14	0.14	351	428	2650	3350	<0.0010	7.5
MW92-1A	08-May-17	17507170508013	7.37	768	128	46	13.2	1.8	<0.50	359	0.205	<0.010	0.054	0.054	52.1	63.6	510	580	<0.0010	10.8
MW92-1A	06-Jul-17	17507170706010	7.29	2500	314	155.0	35.8	5	<2.5	1450	0.13	<0.050	<0.10	<0.11	195	237	1420	2080	<0.0010	6
MW92-1A	19-Sep-17	17507170919004	8.04	3510	422	352.0	105	11	<2.5	2380	0.11	<0.050	<0.10	<0.11	322	393	2500	3460	<0.0010	6.6
MW92-1A	15-Nov-17	17507171115012	8.27	3080	481	280.0	67.7	7.1	<2.5	2210	0.13	<0.050	<0.10	<0.11	262	319	2350	3200	<0.0010	7.8
MW92-1A	15-May-18	17507180515002	8.21	2120	301	141.0	32.7	4.64	<2.5	1200	0.2	<0.050	<0.10	<0.11	133	163	1330	1760	<0.0010	7
MW92-1A	27-Jul-18	17507180727002	7.50	2360	298	166.0	47.9	6.1	<0.6	1270	0.28	<0.01	0.06	0.06	180	220	1430	1900	0.007	7
MW92-1A	11-Sep-18	17507180911002	7.14	3480	460	324.0	98.2	10.2	<0.6	2180	0.1	<0.01	0.16	0.16	325	396	2480	3270	<0.002	8
MW92-1A	07-Dec-18	17507181207002	7.52	3600	464	338.0	103	10.3	1.1	2390	0.16	<0.01	0.13	0.13	323	394	2550	3500	0.003	7
MW92-6A	08-Jun-08	17507080608005	7.56	1070	128	63.2	18.4	4.4	6.2	510	---	<0.005	0.21	0.21	92	112	580	786	0.002	6.5
MW92-6A	14-Oct-08	17507081014002	7.72	2460	319	173.0	47	9	5.6	1330	---	<0.02	0.59	0.59	239	292	1510	2030	0.001	7.9
MW92-6A	15-Jun-09	17507090615006	7.44	1730	252	123.0	27.7	5.8	12.8	1040	---	<0.005	0.42	0.42	87	106	1140	1510	0.003	12.5
MW92-6A	22-Sep-09	17507090922006	7.44	1850	304	125.0	25.2	5.12	9.7	1160	---	<1	0.226	<1	87.9	107	1270	1680	0.0048	12.8
MW92-6A	08-Jun-10	17507100608007	7.43	2270	394	152.0	21.7	3.27	9.9	1370	---	<0.5	<0.5	<0.71	91.3	111	1610	2010	0.0018	14.3
MW92-6A	12-Oct-10	17507101012007	7.91	2530	405	142.0	20	2.39	10.8	1530	---	<0.05	<0.05	<0.071	146	178	1600	2200	<0.001	11.3
MW92-6A	14-Jun-11	17507110614003	7.79	2510	399	170.0	33.7	6.2	12.8	1490	---	<0.05	<0.05	<0.071	122	149	1700	2180	0.0028	10
MW92-6A	08-Nov-11	17507111108003	7.81	2690	425	142.0	27.3	4.39	11.5	1580	---	<0.05	<0.05	<0.071	174	212	1650	2290	0.0024	11.2
MW92-6A	31-May-12	17507120531006	7.24	1530	249	87.6	15.9	3.75	21.2	841	---	<0.05	<0.05	<0.071	48.3	58.9	982	1250	---	13.6
MW92-6A	22-Oct-12	17507121022005	7.54	2560	404	185.0	34.1	7.08	13.9	1520	---	<0.5	<0.5	<0.71	167	204	1770	2260	---	9.7
MW92-6A	19-Jun-13	17507130619011	7.36	1850	240	100.0	17.2	4.19	11.5	998	---	<0.05	0.066	<0.071	103	126	1010	1430	0.0013	12
MW92-6A	01-Oct-13	17507131001005	7.59	2190	351	130.0	22.8	12.8	15.8	1240	---	<0.05	<0.05	<0.071	162	197	1410	1870	<0.001	11
MW92-6A	21-May-14	17507140521007	7.69	2080	360	101.0	14.4	2.52	11.4	1240	---	<0.02	0.22	0.22	128	156	1310	1810	0.001	7.8
MW92-6A	11-Sep-14	17507140911006	7.66	2380	432	120.0	17.1	5.95	12.9	1470	---	<0.02	0.162	0.162	151	185	1570	2150	<0.001	10.1
MW92-6A	15-Apr-15	17507150415004	7.74	1550	257	76.5	13.4	3.14	32.2	758	0.18	0.083	2.73	2.81	127	155	957	1230	0.0011	14.9
MW92-6A	03-Jun-15	17507150603003	7.56	1820	304	88.1	14.1	4.2	34.1	1010	0.19	<0.05	2.3	2.3	142	174	1120	1550	<0.001	18.3
MW92-6A	02-Sep-15	17507150902002	7.13	2010	302	89.9	16.5	6.5	18.5	1240	0.12	<0.05	<0.1	<0.11	136	166	1120	1760	0.0045	17.9
MW92-6A	05-Nov-15	17507151105007	7.56	2350	407	113.0	18	5.5	23.1	1360	0.2	<0.05	<0.1	<0.11	172	210	1480	2030	<0.001	13.5
MW92-6A	29-Apr-16	17507160429002	7.90	2270	444	110.0	16.7	3.8	22.2	1360	0.24	<0.050	0.26	0.26	161	196	1560	2050	<0.0010	10.3
MW92-6A	15-Jun-16	17507160615011	6.99	2040	371	120.0	18.8	5.49	19.7	1260	0.14	<0.050	0.39	0.39	90	110	1420	1850	<0.0010	14.8
MW92-6A	09-Sep-16	17507160909006	6.29	1590	295	93.0	16.4	3.68	10.7	1010	<0.10	<0.050	<0.10	<0.11	105	128	1120	1490	<0.0010	25.2
MW92-6A	15-Nov-16	17507161115008	7.19	2040	370	118.0	22.5	5	11.3	1190	0.12	<0.050	<0.10	<0.11	123	150	1410	1790	<0.0010	13.7
MW92-6A	08-May-17	17507170508002	6.77	2040	337	109.0	17.5	3.4	17.2	1260	<0.10	<0.050	<0.10	<0.11	76.5	93.3	1290	1790	<0.0010	15.7
MW92-6A	06-Jul-17	17507170706001	7.12	2330	402	117.0	19.6	4.1	11.0	1360	0.14	<0.050	<0.10	<0.11	169	206	1490	2020	<0.0010	11.1
MW92-6A	19-Sep-17	17507170919006	8.23	2510	462	150.0	22.8	5	13.6	1610	0.22	<0.050	0.14	0.14	186	227	1770	2380	<0.0010	11.7
MW92-6A	15-Nov-17	17507171115006	8.15	2260	446	128.0	20.4	3.6	13.3	1510	0.15	<0.050	0.16	0.16	144	176	1640	2210	<0.0010	11.1

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
MW92-6A	15-May-18	17507180515003	8.18	2110	360	107.0	15.8	2.29	11.8	1260	0.3	<0.050	0.27	0.27	109	133	1340	1820	<0.0010	10.6
MW92-6A	27-Jul-18	17507180727003	7.27	1930	313	93.2	18	3.4	10.3	1160	0.24	<0.01	0.09	0.09	97	118	1170	1660	0.005	15
MW92-6A	11-Sep-18	17507180911003	7.22	2290	454	122.0	20.3	3.8	9.6	1360	0.25	<0.01	0.07	0.07	156	191	1640	2060	<0.002	11
MW92-6A	07-Dec-18	17507181207003	7.58	2110	396	110.0	17.2	3	13.6	1300	0.26	<0.01	0.07	0.07	110	134	1440	1910	0.003	12
MW92-7	08-Jun-08	17507080608006	7.90	4520	389	301.0	511	10	9.4	2200	---	<0.02	0.11	0.11	887	1080	2210	3950	<0.001	4.2
MW92-7	15-Jun-09	17507090615007	7.73	4390	401	309.0	482	11	9.0	2300	---	<0.02	0.26	0.26	872	1060	2270	4040	0.002	7.5
MW92-7	22-Sep-09	17507090922007	8.17	4310	358	275.0	457	9.55	8.9	2380	---	<1	0.592	<1	529	645	2030	3810	<0.001	7.9
MW92-7	08-Jun-10	17507100608008	7.71	4530	392	312.0	477	10.4	8.2	2240	---	<0.5	<0.5	<0.71	840	1020	2260	3940	<0.001	6.4
MW92-7	12-Oct-10	17507101012008	7.98	4460	371	292.0	415	8.13	8.0	2250	---	<0.05	0.256	0.256	818	998	2130	3840	0.001	5.6
MW92-7	14-Jun-11	17507110614004	7.86	4630	379	297.0	463	10.4	8.2	2250	---	<0.05	0.443	0.443	855	1040	2170	3920	0.0029	4.6
MW92-7	08-Nov-11	17507111108004	7.82	4670	359	302.0	494	11.8	7.9	2340	---	<0.5	0.76	0.76	821	1000	2140	4010	<0.001	5.3
MW92-7	31-May-12	17507120531007	7.77	4480	393	292.0	455	9.94	6.9	1890	---	<0.25	<0.25	<0.35	876	1070	2180	3570	---	10.3
MW92-7	22-Oct-12	17507121022006	7.61	4500	397	291.0	467	11.5	7.7	2230	---	<0.5	<0.5	<0.71	778	949	2190	3870	---	4.1
MW92-7	19-Jun-13	17507130619007	7.46	4660	327	279.0	407	9.11	7.0	2270	---	<0.05	0.159	0.159	837	1020	1970	3800	<0.001	5.2
MW92-7	01-Oct-13	17507131001002	7.82	4480	400	291.0	423	9.02	7.3	2250	---	<0.5	<0.5	<0.71	856	1040	2200	3890	<0.001	4.2
MW92-7	21-May-14	17507140521010	7.88	4350	358	270.0	438	9.62	7.1	2240	---	<0.02	0.743	0.743	1050	1050	2010	3960	<0.001	3.6
MW92-7	11-Sep-14	17507140911008	7.75	4380	386	295.0	416	8.78	8.9	2290	---	0.142	1.34	1.48	840	1030	2180	3920	<0.001	3.4
MW92-7	15-Apr-15	17507150415005	8.12	4400	371	295.0	400	10.2	7.2	2280	0.12	<0.05	1.69	1.69	746	911	2140	3820	---	---
MW92-7	03-Jun-15	17507150603004	7.97	4420	361	281.0	381	9.6	7.5	2460	<0.1	<0.05	2.16	2.16	800	976	2060	3990	<0.001	---
MW92-7	02-Sep-15	17507150902006	7.58	4320	367	287.0	388	9.7	7.3	2380	<0.1	<0.05	2.42	2.42	813	992	2100	3940	<0.001	2.9
MW92-7	05-Nov-15	17507151105009	7.93	4220	389	268.0	423	9.5	7.3	2310	<0.1	<0.05	2.11	2.11	778	949	2070	3880	<0.001	3.1
MW92-7	29-Apr-16	17507160429004	7.91	4240	386	301.0	395	9.6	7.0	2250	<0.10	<0.050	1.88	1.88	714	872	2200	3790	<0.0010	3.1
MW92-7	15-Jun-16	17507160615010	7.24	4240	376	294.0	387	9.7	7.0	2260	<0.10	<0.050	2	2	755	921	2150	3800	<0.0010	2.9
MW92-7	09-Sep-16	17507160909007	6.82	3890	379	282.0	436	9.3	6.9	2340	<0.10	<0.050	1.96	1.96	786	959	2110	3930	<0.0010	6.8
MW92-7	15-Nov-16	17507161115007	7.59	4300	412	311.0	436	10.6	7.0	2180	<0.10	<0.050	1.79	1.79	741	904	2310	3810	<0.0010	3.6
MW92-7	08-May-17	17507170508010	7.61	4260	358	300.0	404	9.7	9.9	2210	<0.10	<0.050	1.73	1.73	773	943	2130	3760	0.0012	3.2
MW92-7	06-Jul-17	17507170706012	7.41	4430	378	324.0	373	9.2	6.7	2190	<0.10	<0.050	1.57	1.57	801	977	2280	3770	<0.0010	3
MW92-7	19-Sep-17	17507170919002	7.74	4120	367	300.0	388	9.3	6.9	2310	<0.10	<0.050	1.76	1.76	616	752	2150	3760	<0.0010	3.3
MW92-7	15-Nov-17	17507171115010	7.84	3830	384	319.0	383	9.2	9.4	2240	<0.10	<0.050	1.82	1.82	540	659	2270	3680	0.001	4.2
MW92-7	15-May-18	17507180515004	7.83	4240	389	293.0	396	9.74	8.7	2130	0.1	<0.050	1.66	1.66	578	705	2180	3580	<0.0010	3.3
MW92-7	27-Jul-18	17507180727005	7.58	5170	441	492.0	225	12.1	1.9	3110	0.32	<0.01	3.43	3.43	5.28	644	3130	4610	0.005	7
MW92-7	07-Dec-18	17507181207004	7.83	4360	398	295.0	388	9.2	8.0	2340	0.08	<0.01	1.75	1.75	783	955	2210	3920	0.006	4
MW92-7A	08-Jun-08	17507080608007	7.57	4770	436	514.0	248	14	2.7	2940	---	<0.02	0.14	0.14	555	676	3200	4490	<0.001	6
MW92-7A	15-Jun-09	17507090615008	7.40	4650	470	543.0	263	13	1.6	3180	---	<0.05	0.58	0.58	540	658	3410	4800	0.003	6.4
MW92-7A	22-Sep-09	17507090922008	7.55	4890	403	493.0	262	13.5	1.6	3220	---	<1	1.66	1.7	515	628	3040	4710	<0.001	8.6
MW92-7A	08-Jun-10	17507100608009	7.45	4860	449	557.0	256	14	<5	3030	---	<0.5	0.89	0.89	516	630	3410	4620	<0.001	8.8
MW92-7A	12-Oct-10	17507101012009	7.86	4760	425	515.0	231	10.5	1.4	2940	---	<0.05	1.84	1.84	500	610	3180	4430	<0.001	6.2
MW92-7A	14-Jun-11	17507110614005	7.74	4860	425	488.0	233	14.5	1.3	3010	---	<0.05	0.809	0.809	529	645	3070	4490	<0.001	14
MW92-7A	08-Nov-11	17507111108005	7.58	4760	411	539.0	269	16.8	<5	2920	---	<0.5	1.47	1.47	477	582	3250	4450	<0.001	6.7
MW92-7A	31-May-12	17507120531008	7.54	4600	443	460.0	208	12	1.3	3050	---	<0.25	1.15	1.15	523	638	3000	4490	---	4.6
MW92-7A	22-Oct-12	17507121022007	7.44	4010	353	327.0	176	10	<5	2410	---	<0.5	<0.5	<0.71	417	509	2230	3530	---	7
MW92-7A	19-Jun-13	17507130619004	7.20	4670	386	445.0	196	11.6	1.3	2840	---	<0.05	0.131	0.131	506	617	2800	4180	<0.001	6.2
MW92-7A	21-May-14	17507140521009	7.60	4460	415	439.0	208	12.4	0.9	2500	---	<0.02	0.383	0.383	527	643	2840	3890	<0.001	5.2
MW92-7A	11-Sep-14	17507140911009	7.65	4590	455	495.0	213	12.2	1.1	2990	---	<0.02	0.731	0.731	527	643	3170	4490	<0.001	4.9
MW92-7A	15-Apr-15	17507150415006	7.77	4820	428	493.0	214	12.6	<2.5	3070	0.11	<0.05	1.04	1.04	504	615	3100	4520	<0.001	4.6
MW92-7A	03-Jun-15	17507150603005	7.39	3710	423	470.0	230	12.7	<2.5	3320	<0.1	<0.05	1.57	1.57	515	629	2990	4770	<0.001	5.3
MW92-7A	02-Sep-15	17507150902007	7.59	4380	421	474.0	212	12.1	<2.5	3030	<0.1	<0.05	1.17	1.17	501	611	3000	4450	<0.001	4.9
MW92-7A	05-Nov-15	17507151105008	8.01	4660	445	485.0	236	13.2	<2.5	3010	0.11	<0.05	1.33	1.33	537	655	3110	4520	<0.001	5
MW92-7A	29-Apr-16	17507160429003	7.82	4340	464	465.0	216	11.7	<2.5	2800	0.11	<0.050	0.72	0.72	456	556	3070	4230	<0.0010	4.9
MW92-7A	15-Jun-16	17507160615009	6.95	4340	433	441.0	205	11	<2.5	2850	0.11	<0.050	0.78	0.78	444	542	2900	4210	<0.0010	4.7
MW92-7A	09-Sep-16	17507160909004	6.57	3530	353	318.0	193	8.2	<2.5	2660	<0.10	<0.050	0.7	0.7	444	541	2190	3800	<0.0010	7.9
MW92-7A	15-Nov-16	17507161115006	7.04	4650	379	341.0	216	9.5	<2.5	2930	<0.10	<0.050	0.12	0.12	524	639	2350	4190	<0.0010	6.1
MW92-7A	08-May-17	17507170508011	7.17	3020	320	358.0	203	9.6	<2.5	1660	<0.10	<0.050	0.21	0.21	431	526	2270	2810	0.0018	14.6
MW92-7A	06-Jul-17	17507170706013	6.97	3250	385	434.0	214	11.1	<2.5	1710	<0.10	<0.050	0.13	0.13	419	511	2750	3010	<0.0010	13.2
MW92-7A	19-Sep-17	17507170919001	8.01	4080	405	386.0	191	10	<2.5	2590	<0.10	<0.050	0.43	0.43	427	521	2600	3840	<0.0010	7.9
MW92-7A	15-Nov-17	17507171115011	8.19	4110	444	505.0	237	12.9	<2.5	2900	<0.10	<0.050	<0.10	<0.11	478	583	3190	4390	<0.0010	6.7

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
MW92-7A	15-May-18	17507180515005	8.14	4300	461	450.0	203	12.1	<2.5	2580	0.13	<0.050	0.3	0.3	432	527	3000	3970	<0.0010	6.1
MW92-7A	27-Jul-18	17507180727004	7.90	4740	351	303.0	499	10	7.3	2390	1.49	<0.01	2.17	2.17	757	924	2120	4020	---	---
MW92-7A	11-Sep-18	17507180911005	7.18	4900	468	518.0	249	13	2.8	3090	0.09	<0.01	0.44	0.44	555	677	3300	4680	0.005	5
MW92-7A	07-Dec-18	17507181207005	7.55	4850	455	503.0	237	12.7	2.4	3220	0.13	<0.01	0.59	0.59	539	657	3210	4760	0.006	6
03-3	15-Jun-09	17507090615002	7.82	3840	491	426.0	106	9.4	0.6	2560	---	<0.02	0.63	0.63	436	532	2980	3860	0.003	4.4
03-3	22-Sep-09	17507090922002	7.90	4030	474	406.0	110	9.13	0.6	2620	---	<1	0.86	<1	410	501	2860	3870	---	5.7
03-3	08-Jun-10	17507100608003	7.70	3990	478	429.0	110	10.3	<5	2410	---	<0.5	0.54	<0.71	414	505	2960	3690	0.0027	13.1
03-3	12-Oct-10	17507101012003	7.91	3970	450	421.0	99.6	9.65	<0.5	2420	---	<0.05	0.565	0.565	428	522	2860	3660	<0.001	9.8
03-3	14-Jun-11	17507110614006	7.85	4110	421	374.0	96	10.3	<0.5	2510	---	<0.05	0.652	0.652	441	539	2590	3680	<0.001	8.6
03-3	08-Nov-11	17507111108006	7.74	3920	456	311.0	167	10.7	<5	2360	---	<0.5	<0.50	<0.71	389	474	2420	3540	0.0015	9.2
03-3	31-May-12	17507120531002	7.65	3760	459	337.0	99.7	8.52	<0.5	2360	---	<0.25	0.26	<0.35	417	509	2530	3520	---	7.3
03-3	22-Oct-12	17507121022001	7.44	3810	420	345.0	110	10.6	<5	2340	---	<0.5	<0.50	<0.71	368	449	2470	3450	---	7.7
03-3	19-Jun-13	17507130619008	7.67	4080	472	423.0	114	10.5	0.7	2480	---	<0.05	0.472	0.472	419	511	2920	3750	<0.001	6.9
03-3	01-Oct-13	17507131001007	7.65	3970	464	378.0	95.1	8.56	<5	2540	---	<0.5	0.75	0.75	425	518	2720	3740	<0.001	5.0
03-3	21-May-14	17507140521003	8.03	3870	455	392.0	105	9.8	1.8	2400	---	<0.02	1.28	1.28	436	532	2750	3630	<0.001	5.2
03-3	11-Sep-14	17507140911001	7.76	3920	449	395.0	96.7	8.34	1.4	2590	---	<0.02	1.00	1.00	435	530	2750	3810	---	---
03-3	15-Apr-15	17507150415010	7.87	4020	470	397.0	102	9.6	<2.5	2610	<0.1	<0.05	0.94	0.94	402	491	2810	3830	---	---
03-3	02-Sep-15	17507150902011	7.61	3900	439	407.0	108	9.5	<2.5	2720	<0.1	<0.05	0.97	0.97	443	540	2770	3950	<0.001	4.0
03-3	05-Nov-15	17507151105013	8.13	3970	493	395.0	114	10.1	<2.5	2540	<0.1	<0.05	1.10	1.10	474	578	2860	3840	---	---
03-3	29-Apr-16	17507160429008	7.92	3900	481	418.0	106	9.7	<2.5	2560	<0.10	<0.050	0.93	0.93	415	506	2920	3830	<0.0010	4.2
03-3	09-Sep-16	17507160909002	6.72	3300	454	368.0	103	8.8	<2.5	2530	<0.10	<0.050	0.78	0.78	392	478	2650	3700	<0.0010	9.3
03-3	15-Nov-16	17507161115002	7.49	3570	500	400.0	112	10.4	<2.5	2300	<0.10	<0.050	0.5	0.5	358	437	2900	3540	<0.0010	8.5
03-3	08-May-17	17507170508015	7.35	3820	444	378.0	93.3	9.4	<2.5	2510	<0.10	<0.050	0.56	0.56	419	511	2670	3690	<0.0010	6.2
03-3	06-Jul-17	17507170706008	7.18	4000	462	441.0	98.3	9.5	<2.5	2520	<0.10	<0.050	0.61	0.61	432	527	2970	3790	<0.0010	5.3
03-3	19-Sep-17	17507170919007	7.88	3860	484	419.0	106	9.2	<2.5	2660	<0.10	<0.050	0.52	0.52	324	395	2930	3870	---	---
03-3	15-May-18	17507180515006	8.16	4060	499	410.0	105	9.64	<2.5	2600	<0.10	<0.050	0.87	0.87	390	476	2930	3860	---	---
03-3	27-Jul-18	17507180727006	7.61	4090	440	382.0	103	8.8	1.6	2430	<0.03	<0.01	0.68	0.68	410	500	2670	3610	<0.002	7
03-3	11-Sep-18	17507180911007	7.34	3990	509	414.0	110	9.5	<0.6	2510	0.07	<0.01	0.73	0.73	406	495	2980	3800	---	---
03-3	07-Dec-18	17507181207008	7.87	3690	496	340.0	92.8	8.3	1.1	2380	0.1	<0.01	0.38	0.38	378	461	2640	3550	0.004	12
03-5	08-Jun-08	17507080608002	7.70	3740	494	370.0	98	10	1.4	2340	---	<0.02	0.22	0.22	457	557	2760	3590	<0.001	3.3
03-5	08-Oct-08	17507081008001	7.63	3880	485	392.0	112	11	1.1	2490	---	<0.02	0.9	0.9	446	544	2830	3760	0.001	3.3
03-5	15-Jun-09	17507090615003	7.62	3790	495	427.0	129	9.9	0.9	2590	---	<0.02	1.07	1.07	445	543	2990	3920	0.002	3.0
03-5	22-Sep-09	17507090922003	7.70	4060	488	404.0	140	10.1	0.9	2590	---	<1	1.21	1.2	429	523	2880	3900	<0.001	4.6
03-5	08-Jun-10	17507100608004	7.71	3900	491	413.0	114	10.4	6.2	2390	---	<0.5	1.08	1.08	418	510	2930	3680	0.0039	4.0
03-5	12-Oct-10	17507101012004	7.89	3880	434	373.0	98.8	6.65	0.8	2530	---	<0.05	1.09	1.09	426	519	2620	3700	<0.001	3.7
03-5	14-Jun-11	17507110614007	7.78	4120	448	387.0	113	10.5	0.8	2490	---	<0.05	0.402	0.402	475	580	2710	3740	<0.001	3.0
03-5	08-Nov-11	17507111108007	7.62	4070	446	398.0	119	12	<5	2460	---	<0.5	1.12	1.12	425	519	2750	3690	<0.001	3.8
03-5	31-May-12	17507120531003	7.66	3870	473	369.0	98.8	9.32	1.2	2550	---	<0.25	1.57	1.57	441	538	2700	3770	---	2.6
03-5	22-Oct-12	17507121022002	7.41	3990	451	372.0	113	10.9	<5	2470	---	<0.5	0.85	0.85	412	503	2660	3670	---	3.1
03-5	19-Jun-13	17507130619009	7.24	4250	409	386.0	111	9.49	1.1	2550	---	<0.05	0.8	0.8	473	578	2610	3750	<0.001	3.3
03-5	01-Oct-13	17507131001004	7.90	4070	468	385.0	120	9.08	<5	2580	---	<0.5	0.95	0.95	447	546	2750	3830	<0.001	3.5
03-5	21-May-14	17507140521005	7.77	4000	447	399.0	125	10.2	0.8	2510	---	<0.02	1.06	1.06	466	569	2760	3780	<0.001	2.5
03-5	11-Sep-14	17507140911002	7.52	4040	475	425.0	133	9.32	1.0	2640	---	<0.02	1.24	1.24	462	563	2940	3970	<0.001	2.5
03-5	15-Apr-15	17507150415007	7.78	4150	453	398.0	119	9.9	<2.5	2640	0.11	<0.05	1.05	1.05	441	538	2770	3890	<0.001	2.2
03-5	02-Sep-15	17507150902010	7.51	3960	448	411.0	133	10	<2.5	2750	<0.1	<0.05	1.45	1.45	459	560	2810	4030	<0.001	3.4
03-5	05-Nov-15	17507151105012	8.07	4120	479	397.0	134	10	<2.5	2700	<0.1	<0.05	0.86	0.86	526	642	2830	4040	<0.001	2.3
03-5	29-Apr-16	17507160429007	7.90	3950	475	408.0	118	10	<2.5	2560	0.1	<0.050	1.51	1.51	406	495	2870	3820	<0.0010	2.3
03-5	15-Jun-16	17507160615002	6.92	4090	462	411.0	134	10.2	<2.5	2640	<0.10	<0.050	0.87	0.87	462	564	2850	3940	<0.0010	2.5
03-5	09-Sep-16	17507160909003	6.61	3490	441	395.0	133	9.4	<2.5	2700	<0.10	<0.050	1	1	447	545	2730	3950	<0.0010	4.1
03-5	15-Nov-16	17507161115003	7.69	3590	512	359.0	122	10.7	<2.5	2240	0.11	<0.050	1.28	1.28	373	455	2760	3470	<0.0010	6.5
03-5	08-May-17	17507170508014	7.59	3660	453	357.0	98.7	9.8	<2.5	2400	<0.10	<0.050	1.59	1.59	394	480	2600	3560	<0.0010	4.9
03-5	06-Jul-17	17507170706009	7.28	4010	452	412.0	115	9.7	<2.5	2470	<0.10	<0.050	1.35	1.35	434	529	2830	3730	<0.0010	3.4
03-5	19-Sep-17	17507170919005	7.85	4010	461	420.0	126	10.1	<2.5	2650	<0.10	<0.050	0.97	0.97	366	446	2880	3890	<0.0010	3.1
03-5	15-Nov-17	17507171115014	8.03	3780	475	434.0	138	9.9	<2.5	2710	<0.10	<0.050	0.56	0.56	421	513	2970	4020	<0.0010	3.7
03-5	15-May-18	17507180515008	8.09	4120	483	404.0	123	10.1	<2.5	2610	0.12	<0.050	1.02	1.02	387	473	2870	3870	<0.0010	3.2
03-5	27-Jul-18	17507180727008	7.49	4310	461	406.0	142	9.7	22.5	2850	0.22	<0.01	7.82	7.82	465	567	2820	4200	0.003	3

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
BH-104	08-Jun-10	17507100608002	7.80	3730	449	385.0	112	12.5	<5	2260	---	<0.5	0.52	<0.71	395	482	2710	3460	0.0065	4.8
BH-104	12-Oct-10	17507101012002	7.91	3960	458	402.0	119	13.6	<0.5	2440	---	<0.05	0.78	0.78	434	529	2800	3700	0.0016	---
BH-104	15-Apr-15	17507150415011	7.95	3820	486	316.0	134	12.9	166	2150	0.14	<0.05	0.42	0.42	308	376	2510	3450	<0.001	11.2
BH-104	03-Jun-15	17507150603011	7.71	3910	450	315.0	122	12.6	124	2420	<0.1	<0.05	0.5	0.5	353	431	2420	3660	<0.001	7.9
BH-104	02-Sep-15	17507150902003	7.46	3830	426	357.0	122	12.8	64.5	2540	<0.1	<0.05	0.9	0.9	403	491	2530	3770	0.001	6.5
BH-105(R)	05-Nov-15	17507151105004	7.97	3820	470	206.0	292	9.4	<2.5	2110	<0.1	<0.05	<0.1	<0.11	686	837	2020	3500	<0.001	1.1
BH-105(R)	29-Apr-16	17507160429010	7.85	3860	483	215.0	329	8.4	<2.5	2040	<0.10	<0.050	<0.10	<0.11	656	800	2090	3470	<0.0010	<1.0
BH-105(R)	15-Jun-16	17507160615013	7.10	3900	474	216.0	304	9.1	<2.5	2090	<0.10	<0.050	<0.10	<0.11	706	861	2070	3520	<0.0010	<1.0
BH-105(R)	09-Sep-16	17507160909008	6.68	3480	477	210.0	331	8.1	<2.5	2100	<0.10	<0.050	<0.10	<0.11	707	863	2060	3550	<0.0010	2.1
BH-105(R)	15-Nov-16	17507161115010	7.46	3860	535	230.0	345	9.4	<2.5	1990	<0.10	<0.050	<0.10	<0.11	693	845	2280	3530	<0.0010	<1.0
BH-105(R)	08-May-17	17507170508004	7.29	3820	447	215.0	282	8.0	<2.5	2020	<0.10	<0.050	<0.10	<0.11	672	820	2000	3380	0.0015	1
BH-105(R)	06-Jul-17	17507170706003	7.20	4090	448	238.0	324	9.7	<2.5	2070	<0.10	<0.050	<0.10	<0.11	705	860	2100	3510	<0.0010	1.6
BH-105(R)	19-Sep-17	17507170919009	7.64	3730	481	220.0	308	8.4	<2.5	2170	<0.10	<0.050	<0.10	<0.11	667	813	2110	3430	<0.0010	1.1
BH-105(R)	15-Nov-17	17507171115005	7.86	3630	486	224.0	331	8.1	<2.5	2160	<0.10	<0.050	<0.10	<0.11	503	614	2140	3510	<0.0010	2.1
BH-105(R)	15-May-18	17507180515012	7.83	3900	510	211.0	327	8.4	2.5	2040	0.11	<0.050	<0.10	<0.11	542	661	2140	3420	<0.0010	<1.0
BH-105(R)	27-Jul-18	17507180727012	7.73	4200	458	205.0	355	8.1	14.4	2170	1.39	<0.01	<0.02	<0.02	711	868	1990	3640	0.003	1
BH-105(R)	11-Sep-18	17507180911012	7.37	4160	503	220.0	362	8.3	1.8	2050	0.07	<0.01	<0.02	<0.02	709	865	2160	3570	<0.002	1
BH-105(R)	07-Dec-18	17507181207011	7.62	4120	498	211.0	340	7.9	2.7	2210	0.08	<0.01	0.07	0.07	734	896	2110	3710	---	---
BH-105(R) dup	07-Dec-18	17507181207012	7.72	4070	503	212.0	343	7.8	3.0	2190	0.08	<0.01	0.06	0.06	641	782	2130	3640	0.003	1
15-9	05-Nov-15	17507151105003	8.10	4490	454	341.0	342	17.8	8.0	2750	0.17	<0.05	0.23	0.23	603	736	2540	4280	---	---
15-9	29-Apr-16	17507160429011	7.81	4780	471	438.0	337	17	<2.5	2970	0.13	<0.050	0.77	0.77	598	730	2980	4600	<0.0010	9
15-9	15-Jun-16	17507160615015	7.08	4810	457	444.0	330	17.1	<2.5	3020	<0.10	<0.050	0.85	0.85	614	749	2970	4640	<0.0010	8.9
15-9	09-Sep-16	17507160909010	6.67	4380	453	436.0	382	15.6	<2.5	3230	<0.10	<0.050	1.6	1.6	604	737	2930	4890	<0.0010	12.2
15-9	15-Nov-16	17507161115012	7.45	5260	499	494.0	455	18.6	<2.5	3210	0.12	<0.050	2.09	2.09	596	728	3280	5040	<0.0010	10.5
15-9	08-May-17	17507170508006	7.33	5320	408	465.0	430	16.1	<5.0	3440	<0.20	<0.10	2.32	2.32	623	760	2930	5140	<0.0010	10.8
15-9	06-Jul-17	17507170706006	7.19	5590	449	518.0	442	18.7	<5.0	3420	<0.20	<0.10	2.23	2.23	651	794	3250	5250	<0.0010	10
15-9	19-Sep-17	17507170919011	7.88	5310	444	473.0	412	15.9	<5.0	3400	<0.20	<0.10	2.42	2.42	504	615	3060	5060	<0.0010	11
15-9	15-Nov-17	17507171115004	8.00	4980	473	479.0	428	15.5	76.0	3270	<0.10	<0.050	2.37	2.37	612	746	3150	5120	---	---
15-9	15-May-18	17507180515013	8.11	5570	468	446.0	475	16.5	<2.5	3460	0.13	<0.050	2.55	2.55	525	641	3010	5190	<0.0010	12.9
15-9	27-Jul-18	17507180727013	7.57	5740	443	465.0	507	16.2	1.1	3300	0.03	<0.01	2.19	2.19	627	765	3020	5120	<0.002	10
15-9	11-Sep-18	17507180911013	7.22	5560	508	491.0	497	16.2	1.2	3350	0.24	<0.01	2.06	2.06	622	759	3290	5250	<0.002	10
15-9	07-Dec-18	17507181207013	7.73	5640	481	480.0	470	15.4	3.4	3540	0.21	<0.01	2.07	2.07	624	761	3180	5370	<0.002	12
15-10	05-Nov-15	17507151105002	8.04	4170	514	306.0	241	17.2	7.0	2540	0.2	<0.05	0.3	0.3	492	600	2540	3920	---	---
15-10	29-Apr-16	17507160429012	7.92	4070	489	347.0	213	15.2	<2.5	2510	0.2	0.07	0.2	0.27	474	579	2650	3860	<0.0010	2.3
15-10	15-Jun-16	17507160615016	7.13	4090	478	350.0	218	15	<2.5	2540	0.15	<0.050	0.79	0.79	499	609	2630	3900	<0.0010	2
15-10	09-Sep-16	17507160909011	6.67	3550	465	333.0	221	13.5	<2.5	2670	0.14	<0.050	2.03	2.03	484	590	2530	4000	<0.0010	3.6
15-10	15-Nov-16	17507161115013	7.53	4100	529	373.0	241	15.8	<2.5	2480	0.17	<0.050	1.81	1.81	473	577	2860	3930	<0.0010	1.7
15-10	08-May-17	17507170508008	7.34	4110	443	367.0	219	13.9	<2.5	2570	0.12	<0.050	1.55	1.55	496	606	2620	3920	0.0012	1.9
15-10	06-Jul-17	17507170706007	7.17	4320	438	394.0	254	16.3	<2.5	2580	0.13	<0.050	1.18	1.18	515	628	2720	4000	<0.0010	2
15-10	19-Sep-17	17507170919010	7.90	4130	475	362.0	220	13.5	<2.5	2660	0.16	<0.050	1.16	1.16	376	459	2680	3960	<0.0010	1.6
15-10	15-May-18	17507180515014	8.07	4280	499	365.0	227	13.9	<2.5	2610	0.19	<0.050	1.65	1.65	414	505	2750	3970	<0.0010	8.8
15-10	27-Jul-18	17507180727014	7.62	4450	483	361.0	254	14.5	1.5	2490	0.1	<0.01	1.09	1.09	507	619	2690	3910	<0.002	2
15-10	11-Sep-18	17507180911014	7.26	4290	512	374.0	238	13.3	<0.6	2590	0.16	<0.01	0.82	0.82	509	621	2820	4040	<0.002	1
15-10	07-Dec-18	17507181207014	7.65	4340	503	350.0	221	12.3	1.4	2750	0.25	<0.01	1.25	1.25	509	621	2700	4150	<0.002	2
15-11	05-Nov-15	17507151105100	7.63	4290	491	278.0	234	15.9	8.1	2630	0.17	<0.05	0.18	0.18	601	733	2370	4020	0.0028	---
15-11	15-Jun-16	23458160615001	7.10	4200	515	357.0	236	15.2	<2.5	2530	0.11	<0.050	<0.10	<0.11	547	667	2760	3980	<0.0010	4
15-11	09-Sep-16	23458160909001	6.57	3900	485	333.0	250	13	<2.5	2700	<0.10	<0.050	1.09	1.09	521	635	2580	4100	<0.0010	4.7
15-11	15-May-18	17507180515015	8.00	4380	497	354.0	234	12.8	42.6	2620	0.18	<0.050	2.39	2.39	464	566	2700	4050	<0.0010	10.1
15-11	27-Jul-18	17507180727015	7.52	4550	486	363.0	262	12.4	1.5	2510	0.05	<0.01	1.64	1.64	579	706	2710	3990	<0.002	3
15-11	11-Sep-18	17507180911015	7.15	4410	519	381.0	255	12.5	0.7	2550	0.11	<0.01	1.49	1.49	581	709	2860	4070	<0.002	3
15-11	07-Dec-18	17507181207015	7.60	4460	479	362.0	230	11.7	2.0	2780	0.13	<0.01	1.6	1.6	602	735	2690	4230	<0.002	4

TABLE F2

2008-2018 Groundwater and Leachate Quality Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L	Phenol mg/L	DOC mg/L
Leachate Vault 1	14-Jun-11	17507110614008	7.32	13100	1360	201.0	1090	207	3810	253	---	<0.5	<0.05	<0.5	1190	1460	4220	7640	2.99	349
Leachate Vault 1	08-Nov-11	17507111108009	7.37	18900	1650	254.0	1590	343	5710	31.2	---	<0.5	<0.5	<0.71	1380	1680	5170	10400	4.51	412
Leachate Vault 1	31-May-12	17507120531009	7.35	19000	1770	226.0	1680	434	6400	281	---	<1	<1	<1.4	1040	1260	5350	11400	---	349
Leachate Vault 1	19-Jun-13	17507130619001	6.97	48000	4220	157.0	6370	471	18300	750	---	8.15	18.5	26.6	1670	2040	11200	31400	5.91	1700
Leachate Vault 1	01-Oct-13	17507131001010	6.25	32700	3440	141.0	3620	311	11900	475	---	3.1	8	11.1	639	779	9170	20300	1.88	844
Leachate Vault 1	21-May-14	17507140521011	7.28	29500	3240	315.0	3390	284	10800	704	---	6.6	<2.5	6.6	1730	1730	9390	19800	2.69	886
Leachate Vault 1	11-Sep-14	17507140911003	7.21	28100	3200	340.0	3540	307	10600	39	---	2.9	0.74	3.64	1570	1920	9390	19000	3.28	486
Leachate Vault 1	03-Jun-15	17507150603013	7.23	22900	2760	298.0	2810	297	8900	<600	<40	<20	<40	<45	1580	1920	8120	16000	4.25	404
Leachate Vault 1	02-Sep-15	17507150902012	7.01	13100	1320	113.0	1100	130	4640	527	0.81	<0.2	<0.40	<0.45	592	723	3760	8190	0.883	395
Leachate Vault 1	29-Apr-16	17507160429013	7.26	24400	2380	409.0	2620	278	9400	642	1.66	<0.20	<0.40	<0.45	1320	1610	7630	16500	2.06	690
Leachate Vault 1	15-Jun-16	17507160615014	6.80	5910	624	86.4	517	103	1780	486	0.8	<0.050	<0.10	<0.11	284	346	1910	3770	0.13	123
Leachate Vault 1	09-Sep-16	17507160909009	6.80	10900	1290	155.0	1260	183	4400.0	301	0.44	<0.10	<0.20	<0.22	1073.6	1309.8	3860	7590	1.03	284
Leachate Vault 1	15-Nov-16	17507161115011	7.14	19400	2300	226.0	2240	417	6990.0	119	1.27	<0.20	<0.40	<0.45	1230	1500	6670	13000	1.55	399
Leachate Vault 1	08-May-17	17507170508005	7.03	19200	1900	294.0	1830	148	7282.0	707	1.02	<0.20	<0.40	<0.45	1380	1680	5950	13000	0.41	452
Leachate Vault 1	06-Jul-17	17507170706005	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	<1.0	---
Leachate Vault 1	19-Sep-17	17507170919012	7.40	15600	1850	206.0	1180	237	5520.0	398	0.99	7.33	<0.40	7.33	356	434	5470	9640	0.439	276
Leachate Vault 1	15-Nov-17	17507171115009	7.12	18700	2270	338.0	2410	310	7940.0	164	0.8	<0.25	<0.50	<0.56	869	1060	7060	14000	0.76	270
Leachate Vault 1	15-May-18	17507180515007	6.88	34400	4770	318.0	2440	625	14300.0	666	3.72	6.47	60.8	67.2	1200	1460	13200	24100	1.09	1010
Leachate Vault 1	27-Jul-18	17507180727016	7.01	34500	5080	255.0	2230	612	13800.0	436	0.61	22.9	14.8	37.7	1250	1530	13700	23300	1.29	790
Leachate Vault 1	11-Sep-18	17507180911016	6.96	24100	3420	186.0	1780	577	8780.0	335	<0.1	29.4	54.2	83.6	770	939	9310	15900	0.79	821
Leachate Vault 1	07-Dec-18	17507181207016	6.93	38100	5160	300.0	2690	705	14500.0	303	0.9	28	18	46	1220	1490	14100	24600	0.71	1410
Leak Detection System	14-Jun-11	17507110614009	7.79	2930	459	241.0	73.8	4.95	33.2	1570	---	<0.05	<0.05	<0.071	335	408	2140	2580	<0.001	17.5
Leak Detection System	08-Nov-11	17507111108010	7.44	3680	467	260.0	80.4	5.09	42.8	1940	---	<0.5	<0.5	<0.71	426	519	2240	3050	0.0019	19.2
Leak Detection System	31-May-12	17507120531010	7.31	3440	518	252.0	62.7	4.27	28.2	2010	---	<0.25	0.41	0.41	468	571	2330	3160	---	16.9
Leak Detection System	22-Oct-12	17507121022008	7.45	3470	553	256.0	69.2	5.7	24.8	2010	---	<0.5	<0.5	<0.71	424	518	2440	3170	---	15.8
Leak Detection System	19-Jun-13	17507130619010	7.09	3630	464	255.0	64.2	3.79	30.0	2000	---	<0.05	0.181	0.181	445	543	2210	3080	0.0017	19.2
Leak Detection System	01-Oct-13	17507131001001	7.55	3560	550	256.0	67	3.63	37.8	2060	---	<0.5	<0.5	<0.71	474	578	2430	3260	0.0011	16.7
Leak Detection System	21-May-14	17507140521001	7.53	3460	505	279.0	80	4.09	41.5	2060	---	<0.02	0.999	0.999	399	487	2410	3210	<0.001	17.7
Leak Detection System	11-Sep-14	17507140911004	7.55	3880	549	296.0	104	4.68	209.0	2130	---	<0.02	<0.05	<0.054	405	494	2590	3540	0.016	20.5
Leak Detection System	15-Apr-15	17507150415002	7.67	3500	519	266.0	68.9	3.6	41.8	2050	0.21	<0.05	0.1	<0.11	425	518	2390	3200	<0.001	16.6
Leak Detection System	03-Jun-15	17507150603014	6.88	213	29.9	7.0	<5.0	<2.5	<2.5	54.8	<0.1	<0.05	0.19	0.19	32	39	104	112	0.0148	58.7
Leak Detection System	02-Sep-15	17507150902004	7.41	3290	459	237.0	59.3	3.6	32.1	2040	0.14	<0.05	<0.1	<0.11	461	562	2120	3110	<0.001	15.6
Leak Detection System	05-Nov-15	17507151105005	8.02	3430	521	252.0	73.4	4.1	44.0	2050	0.22	<0.05	<0.1	<0.11	446	544	2340	3210	<0.001	16.6
Leak Detection System	29-Apr-16	17507160429009	7.77	3440	544	281.0	74.8	4.0	31.1	2090	0.22	<0.050	<0.10	<0.11	428	522	2520	3280	<0.0010	18.6
Leak Detection System	15-Jun-16	17507160615018	7.04	2780	404	198.0	55.6	4.4	55.4	1530	0.21	<0.050	0.81	0.81	319	390	1820	2440	0.0034	18.1
Leak Detection System	09-Sep-16	17507160909013	6.66	2910	504	247.0	84.8	3.8	114.0	1880	0.2	<0.050	0.13	0.13	430	525	2280	3090	<0.0010	25.1
Leak Detection System	15-Nov-16	17507161115009	7.35	3960	602	314.0	141	9.3	237.0	2100	0.17	0.623	1.3	1.92	329	401	2800	3610	0.0212	29.7
Leak Detection System	08-May-17	17507170508003	7.17	3340	463	257.0	63.3	3.7	43.2	1960	0.19	<0.050	<0.10	<0.11	467	570	2210	3070	0.0013	18.7
Leak Detection System	06-Jul-17	17507170706002	6.89	3640	526	303.0	80.2	4.2	59.0	2050	0.15	<0.050	0.38	0.38	464	567	2560	3300	<0.0010	17.3
Leak Detection System	19-Sep-17	17507170919008	7.87	3530	531	277.0	77.4	5.2	74.4	2020	0.18	<0.050	<0.10	<0.11	384	469	2470	3220	0.0027	20.9
Leak Detection System	15-May-18	17507180515016	8.06	3760	539	311.0	91.8	5.2	36.2	2320	0.26	<0.050	0.25	0.25	305	372	2630	3490	<0.0010	17.7
Leak Detection System	27-Jul-18	17507180727017	7.30	5730	799	293.0	201	16.2	831.0	1970	0.16	6.18	5.76	11.9	483	590	3200	4450	0.009	42
Leak Detection System	11-Sep-18	17507180911017	6.87	3930	577	283.0	91	6.3	121.0	2130	<0.03	<0.01	1.79	1.79	456	556	2610	3490	0.003	20
Leak Detection System	07-Dec-18	17507181207017	7.56	3930	547	317.0	93.9	5.7	67.9	2450	0.28	<0.01	0.15	0.15	409	499	2670	3730	0.003	21

Notes:

Bold - background well

--- - not analyzed

^ - all data after 2012 are no longer considered to represent background conditions

TABLE F3

2008-2018 Groundwater and Leachate Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
Background																													
BH-103	08-Jun-08	17507080608001	<0.05	<0.002	0.002	0.02	<0.001	<0.005	0.76	0.0033	<0.005	0.034	0.01	0.69	<0.001	0.37	3.020	<0.0001	<0.01	0.083	<0.002	5.7	<0.0001	1.75	0.0006	<0.01	0.112	<0.005	0.001	0.17
BH-103	14-Oct-08	17507081014001	<0.05	<0.002	<0.002	0.01	<0.001	<0.005	0.78	0.0032	<0.005	0.003	<0.01	<0.1	<0.001	0.36	0.340	<0.0001	<0.01	0.043	<0.002	5.3	<0.0001	1.61	<0.0005	<0.01	0.053	<0.005	0.002	0.06
BH-103	15-Jun-09	17507090615001	0.061	0.002	0.001	0.01	<0.0005	<0.002	0.80	0.0038	<0.002	0.003	0.006	<0.05	<0.0005	0.42	0.561	<0.0001	<0.005	0.043	<0.001	5.54	<0.00005	1.59	<0.0002	<0.005	0.0853	<0.002	0.002	0.078
BH-103	22-Sep-09	17507090922001	0.049	<0.0008	<0.0008	0.0101	<0.001	<0.001	0.91	0.0025	<0.005	<0.002	0.0044	<0.03	<0.005	0.337	0.290	<0.0001	<0.005	0.0461	0.00136	4.96	<0.005	1.54	<0.05	<0.05	0.0022	0.00016	<0.001	0.0453
BH-103	08-Jun-10	17507100608001	0.045	<0.0008	<0.0008	0.01	<0.001	<0.001	0.74	0.0037	<0.025	<0.002	0.0072	<0.03	<0.005	0.373	0.344	<0.0001	<0.005	0.0536	<0.004	5.27	<0.005	2.4	<0.05	<0.05	0.0016	0.00016	<0.005	0.0633
BH-103	12-Oct-10	17507101012001	0.038	<0.0008	<0.0008	0.011	<0.001	<0.001	0.79	0.00284	<0.005	<0.002	0.0017	0.037	<0.005	0.327	0.139	<0.0001	<0.005	0.0304	<0.0008	4.74	<0.0001	1.64	<0.05	<0.05	<0.001	0.00019	<0.001	0.0428
BH-103	08-Nov-11	17507111108008	0.029	<0.0008	<0.0008	0.0153	<0.001	<0.001	0.78	0.00315	<0.005	<0.002	<0.001	<0.03	<0.005	0.345	0.246	<0.0001	<0.005	0.0392	<0.0008	5.68	<0.0001	1.5	<0.05	<0.05	<0.001	0.00018	<0.001	0.0566
BH-103	31-May-12	17507120531001	<0.05	<0.001	<0.001	0.0095	<0.005	<0.005	0.76	0.00357	<0.005	<0.001	0.0039	<0.03	<0.001	0.376	0.271	<0.00005	<0.0005	0.0485	<0.01	4.83	<0.0001	1.55	<0.001	<0.001	0.083	<0.0001	<0.01	0.075
BH-103	23-Oct-12	17507121023001	0.047	<0.0008	<0.0008	0.0175	<0.001	<0.001	0.70	0.00231	<0.005	<0.002	<0.001	<0.060	<0.005	0.311	0.079	<0.0001	<0.005	0.0266	<0.0008	4.81	<0.0001	1.6	<0.05	<0.05	<0.001	0.00036	<0.001	0.0609
BH-103	19-Jun-13	17507130619012	0.037	<0.0005	<0.001	---	---	---	---	0.00641	0.0016	0.0161	<0.001	0.04	<0.001	---	1.970	<0.00005	<0.001	0.0889	<0.002	---	<0.00005	---	0.0005	---	---	<0.0002	---	---
BH-103	21-May-14	17507140521006	0.058	<0.001	<0.001	0.00993	<0.005	---	0.75	0.00673	<0.001	0.0132	0.0016	<0.03	<0.0005	0.443	2.090	<0.00005	<0.0005	0.0891	<0.001	---	<0.0001	---	0.00057	<0.001	<0.003	0.00011	<0.001	0.192
BH-103	11-Sep-14	17507140911005	0.102	<0.001	<0.001	0.0112	<0.005	---	0.83	0.00747	<0.001	0.0108	0.003	<0.03	<0.0005	0.434	1.600	<0.00005	<0.0005	0.0958	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	<0.0001	<0.001	0.271
BH-103	15-Apr-15	17507150415003	0.156	<0.001	<0.001	0.0141	<0.001	---	0.77	0.0116	<0.001	0.0167	0.002	<0.15	<0.0005	0.353	2.820	<0.00005	<0.0005	0.118	<0.0005	---	<0.0001	---	0.0006	<0.001	0.0046	0.00015	<0.005	0.25
BH-103	03-Jun-15	17507150603009	0.106	<0.001	<0.001	0.0113	<0.001	---	0.78	0.00993	<0.001	0.0146	0.0037	<0.15	<0.0005	0.429	2.070	<0.00005	<0.0005	0.101	<0.0005	---	<0.0001	2.01	0.00047	<0.001	<0.003	<0.0001	<0.005	0.248
BH-103	05-Nov-15	17507151105001	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
BH-103	29-Apr-16	17507160429001	0.198	<0.001	<0.001	0.0111	<0.001	---	0.97	0.0118	<0.001	0.0138	<0.002	<0.15	<0.0005	0.439	2.360	<0.000005	<0.0005	0.128	0.00069	---	<0.0001	2.55	0.00051	<0.001	<0.003	<0.0001	<0.005	0.306
BH-103	15-Jun-16	17507160615001	0.048	<0.001	<0.001	0.0114	<0.001	---	0.96	0.0129	<0.001	0.0195	<0.002	<0.15	<0.0005	0.501	3.630	<0.000005	<0.0005	0.118	<0.0005	---	<0.0001	2.94	0.00055	<0.001	<0.003	<0.0001	<0.005	0.221
BH-103	09-Sep-16	17507160909005	<0.01	<0.001	<0.001	0.0120	<0.001	---	0.91	0.0122	<0.001	0.0200	<0.002	<0.15	<0.0005	0.530	4.200	<0.000005	<0.0005	0.109	0.00081	---	<0.0001	3.02	0.00050	<0.001	<0.003	0.00012	<0.005	0.158
BH-103	08-May-17	17507170508001	0.263	<0.0010	<0.0010	0.00985	<0.0010	---	0.86	0.0103	<0.0010	0.0091	<0.0020	<0.15	<0.00050	0.457	2.000	0.0000056	<0.00050	0.121	0.00079	---	<0.00010	2.35	0.00039	<0.0010	<0.0030	<0.00010	<0.0050	0.303
BH-103	06-Jul-17	17507170706014	0.0883	<0.00050	<0.00050	0.00898	<0.00050	---	0.63	0.00287	<0.00050	0.00138	0.0015	<0.15	<0.00025	0.312	0.299	<0.0000050	<0.00025	0.0422	0.00137	---	<0.000050	1.44	0.000159	<0.00050	<0.0015	0.000132	<0.0025	0.117
BH-103	19-Sep-17	17507170919013	0.0289	<0.00050	<0.00050	0.00883	<0.00050	---	0.68	0.00201	<0.00050	0.00141	0.0012	<0.15	<0.00025	0.343	0.305	<0.0000050	<0.00025	0.0302	0.00125	---	<0.000050	1.83	0.000177	<0.00050	<0.0015	0.000238	<0.0025	0.0639
BH-103	15-Nov-17	17507171115002	0.0325	<0.00050	<0.00050	0.00975	<0.00050	---	0.94	0.00245	<0.00050	0.00125	0.0018	<0.15	<0.00025	0.406	0.285	<0.0000050	<0.00025	0.0316	0.00122	---	<0.000050	2.06	0.000188	<0.00050	<0.0015	0.000223	<0.0025	0.0709
BH-103	15-May-18	17507180515009	0.062	<0.0010	<0.0010	0.0094	<0.0010	---	0.76	0.00196	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	0.405	0.054	<0.0000050	<0.00050	0.031	0.00089	---	<0.00010	1.73	0.00012	<0.0010	<0.0030	<0.00010	<0.0050	0.075
BH-103	27-Jul-18	17507180727009	0.056	<0.001	<0.001	<0.05	<0.001	---	1.36	0.00236	<0.001	0.0014	0.0049	<0.1	<0.0005	0.381	0.250	<0.000025	<0.001	0.043	0.0042	---	<0.0001	---	0.0002	---	0.002	<0.001	<0.001	0.065
BH-103	11-Sep-18	17507180911009	0.067	<0.001	<0.001	<0.05	<0.001	---	0.88	0.00777	<0.001	0.0104	0.0014	0.1	<0.0005	0.482	1.990	<0.000025	<0.001	0.092	0.0015	---	<0.0001	---	0.0005	---	0.002	<0.001	0.002	0.169
MW92-1	08-Jun-08	17507080608003	---	---	---	---	---	---	---	---	---	---	---	<0.1	---	---	2.390	---	---	---	---	5.4	---	---	---	---	---	---	---	---
MW92-1	15-Jun-09	17507090615004	<0.005	0.0011	0.0016	0.011	<0.0001	<0.0005	0.32	0.00002	0.0021	0.0004	0.003	0.2	<0.0001	0.035	2.700	---	<0.001	0.0077	0.001	4.9	<0.00001	3.18	<0.00005	<0.001	0.0193	0.0324	0.0062	0.004
MW92-1	22-Sep-09	17507090922004	---	---	---	---	---	---	---	---	---	---	---	<0.03	---	---	2.560	---	---	---	---	4.48	---	---	---	---	---	---	---	---
MW92-1	08-Jun-10	17507100608005	<0.01	<0.0008	<0.0008	0.01	<0.001	<0.001	0.38	0.0022	<0.025	0.0028	0.0034	0.081	<0.005	0.0301	2.730	<0.0001	<0.005	0.0307	<0.004	5.02	<0.005	4.39	<0.05	<0.05	0.0012	0.0361	<0.005	0.0135
MW92-1	12-Oct-10	17507101012005	<0.01	<0.0008	<0.0008	0.0094	<0.001	<0.001	0.35	0.00121	<0.005	<0.002	0.0031	<0.03	<0.005	0.0282	0.420	<0.0001	<0.005	0.0117	0.00312	4.02	<0.0001	3.09	<0.05	<0.05	<0.001	0.0375	<0.001	0.0123
MW92-1	14-Jun-11	17507110614001	<0.01	<0.0008	<0.0008	0.0082	<0.001	<0.001	0.35	0.00118	<0.005	<0.002	0.0017	<0.03	<0.005	0.0251	0.583	<0.0001	<0.005	0.0109	0.00119	3.86	<0.0001	3.04	<0.05	<0.05	<0.001	0.0351	<0.001	0.0161
MW92-1	08-Nov-11	17507111108001	<0.01	<0.0008	<0.0008	0.0087	<0.001	<0.001	0.37	0.000268	<0.005	<0.002	<0.001	0.038	<0.005	0.0276	<0.005	<0.0001	<0.005	0.0022	0.0031	4.86	<0.0001	2.98	<0.05	<0.05	<0.001	0.0347	<0.001	0.0049
MW92-1	31-May-12	17507120531004	<0.05	<0.001	<0.001	0.00803	<0.005	<0.005	0.36	0.00103	<0.005	<0.001	0.0043	<0.03	<0.001	<0.05	0.131	<0.00005	<0.0005	0.0078	<0.01	4.61	<0.0001	3.16	<0.001	<0.001	0.047	0.0348	<0.01	<0.05
MW92-1	22-Oct-12	17507121022003	<0.01	<0.0008	<0.0008	0.0171	<0.001	<0.001	0.34	0.0018	<0.005	<0.002	<0.001	0.063	<0.005	0.0313	0.902	<0.0001	<0.005	0.0139	<0.0008	5.18	<0.0001	2.96	<0.05	<0.05	<0.001	0.0319	<0.001	0.0198
MW92-1	19-Jun-13	17507130619003	<0.01	<0.0005	<0.001	---	---	---	---	0.001	<0.001	0.00189	0.0015	<0.03	<0.001	---	1.470	<0.00005	<0.001	0.0146	<0.002	---	<0.00005	---	<0.0002	---	---	0.0352	---	---
MW92-1	01-Oct-13	17507131001006	<0.01	<0.0005	<0.0005	0.0084	<0.0025	---	0.33	0.00056	<0.005	<0.002	0.0018	<0.05	<0.00025	0.022	0.583	<0.0001	<0.005	0.0083	0.0012	---	<0.0001	---	<0.00025	<0.05	<0.0015	0.0322	<0.001	0.0117
MW92-1	21-May-14	17507140521004	0.013	<0.001	<0.001	0.00913	<0.005	---	0.35	0.0007	<0.001	<0.001	0.0067	<0.03	<0.0005	<0.05	0.586	<0.00005	0.00063	0.0106	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0378	<0.001	<0.04
MW92-1	11-Sep-14	17507140911010	0.028	<0.001	<0.001	0.00805	<0.005	---	0.36	0.00025	<0.001	<0.001	0.002	0.04	<0.0005	<0.05	0.161	<0.00005	<0.0005	0.008	0.0019	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0346	<0.001	<0.04
MW92-1	15-Apr-15	17507150415009	<0.01	<0.001	<0.001	0.00823	<0.001	---	0.34	0.000162	<0.001	<0.002	0.0019	<0.15	<0.0005	0.025	<0.025	<0.00005	<0.0005	<0.005	0.00092	---	<0.0001	---	<0.0001	<0.001	<0.003	0.0347	<0.005	<0.01
MW92-1	03-Jun-15	17507150603001	<0.01	<0.001	<0.001	0.00823	<0.001	---	0.38	0.000356	<0.001	<0.001	0.0021	<0.15	<0.0005	0.041	0.092	<0.00005	<0.0005	<0.005	0.00145	---	<0.0001	3.16	<0.0001	<0.001	<0.003	0.0352	<0.005	<0.01
MW92-1	02-Sep-15	17507150902008	<0.01	<0.001	<0.001	0.0103	<0.001	---	0.33	0.00031	<0.001	<0.001	0.0033	<0.15	<0.0005	0.018	0.038	<0.000005	<0.0005	0.0057	0.00166	---	<0.0001	3.13	<0.0001	<0.001	<0.003	0.0322	<0.005	<0.01
MW92-1	05-Nov-15	17507151105011	<0.01	<0.001	<0.001	0.0103	<0.001	---	0.37	0.000686	<0.001	<0.001	<0.002	<0.15	<0.0005	0.035	0.197	<0.000005	<0.0005	0.0068	0.00138	---	<0.0001	3.08	<0.0001	<0.001	<0.003	0.0338	<0.005	0.013
MW92-1	29-Apr-16	17507160429005	<0.01	<0.001	<0.001	0.00853	<0.001	---	0.39	0.000828	<0.001	<0.001	<0.002	<0.15	<0.0005	0.027	0.425	<0.000005	0.00244	0.0113	0.00066	---	<0.0001	3.42	<0.0001	<0.001	<0.003	0.0347	<0.005	0.012
MW92-1	15-Jun-16	17507160615012	<0.01	<0.001	<0.001	0.00953	<0.001	---	0.39	0.000936	<0.001	<0.001	0.0036	<0.15	<0.0005	0.032	0.548	<0.000005	<0.0005	0.013	0.00057	---	<0.0001	3.24	<0.0001	<0.001	<0.003	0.0334	<0.005	0.017
MW92-1	09-Sep-16	17507160909012	0.0224	<0.0005	<0.0005	0.00887	<0.0005	---	0.38	0.000948	<0.0005	<0.0005	0.003	<0.15	<0.00025	0.0339	0.743	<0.000005	0.00045	0.0133	0.00074	---	<0.00005	3.01	<0.00005	<0.0005	<0.0015	0.0313	<0.0025	0.0144
MW92-1	15-Nov-16	17507161115005	<0.010	<0.0010	<0.0010	0.00800	<0.0010	---	0.37	0.000984	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.032	0.871	<0.0000050	<0.00050	0.0139	<0.00050	---	<0.00010	3.12	<0.00010	<0.0010	<0.0030	0.0326	<0.0050	0.012
MW92-1	08-May-17	17507170508012	<0.010	<0.0010	<0.0010	0.00822	<0.0010	---	0.36	0.001110	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.035	1.020	<0.0000050	<0.00050	0.0170	<0.00050	---	<0.00010	3.00	<0.00010	<0.0010	<0.0030	0.0286	<0.0050	0.012
MW92-1	06-Jul-17	17507170706011	0.0676	<0.00050	<0.00050	0.00861	<0.00050	---	0.38	0.00119	<0.00050	<0.00050	0.0013	<0.15	<0.00025	0.0338	1.220	<0.0000050	0.00046	0.0186	0.00043	---	<0.000050	3.14	<0.000050	<0.00050	0.0019	0.0332	<0.0025	0.0138
MW92-1	19-Sep-17	17507170919003	<0.0050	<0.00050	<0.00050	0.00766	<0.00050	---	0.36	0.00112	<0.00050	<0.00050	0.0017	<0.15	<0.00025	0.0283	1.390	<0.0000050	0.00059	0.0198	0.00042	---	<0.000050	3.35	<0.000050	<0.00050	<0.0015	0.0297	<0.0025	0.013
MW92-1	15-Nov-17	17507171115013	<0.010	<0.0010	<0.0010	0.0081	<0.0010	---	0.39	0.00137	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.033	1.480	<0.0000050	0.00056	0.0226	0.00054	---	<0.00010	3.21	<0.00010	<0.0010	<0.0030	0.0358	<0.0050	0.016
MW92-1	15-May-18	17507180515001	<0.0050	0.00056	<0.00050	0.00706	<0.00050	---	0.38	0.00117	<0.00050	<0.00050	<0.0010	<0.050	<0.00025	0.0323	1.960	0.0000089	0.00054	0.019	0.00047	---	<0.000050	3.33	<0.000050	<0.00050	<0.0015	0.0291	<0.0025	0.0114
MW92-1	27-Jul-18	17507180727001	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.61	0.00115	<0.001	<0.0009	0.0035	<0.1	<0.0005	0.034	1.850	<0.000025	<0.001	0.023	0.00130	---	<0.0001	---	<0.0001	---	0.003	0.034	<0.001	0.014
MW92-1	11-Sep-18	17507180911001	0.056	<0.001	0.002	<0.05	<0.001	---	0.44	0.00123	<0.001	<0.0009	0.0013	<0.1	<0.0005	0.035	2.160	<0.000025	<0.001	0.021	0.00130	---	<0.0001	---	<0.0001	---	0.003	0.036	0.002	0.013
MW92-1	07-Dec-18	17507181207001	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.45	0.00112	<0.001	<0.0009	0.0013	<0.1	<0.0005	0.033	2.200	<0.000025	<0.001	0.02	0.00180	---	<0.0001	3.34	<0.0001	<0.0005	0.018	0.037	<0.001	0.013
MW92-1A	08-Jun-08	17507080608004	<0.05	<0.002	<0.002	0.01	<0.001	<0.005	0.30	0.0006	<0.005	0.001	0.03	0.49	<0.001	0.18	1.120	<0.0001	<0.01	0.014	<0.002	5.3	<0.0001	2.63	<0.0005	<0.01	0.1	0.012	0.001	0.02
MW92-1A	08-Oct-08	17507081008002	<0.05	<0.002	<0.002	<0.01	<0.001	<0.005	0.31	0.0009	<0.005	<0.001	<0.01	0.14	<0.001	0.2	<0.05	<0.0001	<0.01	<0.005	0.006	6.3	<0.0001	2.34	<0.0005	<0.01	0.063	0.018	0.002	0.02
MW92-1A	15-Jun-09	17507090615005	0.02	0.001	0.0008	0.02	<0.0002	<0.001	0.23	0.0007	<0.001	<0.0002	0.006	<0.02	0.0005	0.17	0.010	<0.0001	<0.002	0.0032	0.0034	5.56	<0.00002	1.87	<0.0001	<0.002	0.0492	0.017	0.002	0.02
MW92-1A	22-Sep-09	17507090922005	<0.01	<0.0008	<0.0008	0.0083	<0.001	<0.001	0.34	<0.001	<0.005	<0.002	0.0024	0.039	<0.005	0.198	0.042	<0.0001	<0.005	0.0156	0.00281	6.01	<0.005	2.22	<0.05	<0.05	0.0015	0.0234	<0.001	0.005
MW92-1A	08-Jun-10	17507100608006	<0.01	<0.0008	<0.0008	0.0113	<0.001	<0.001	0.22	0.0011	<0.025	<0.002	0.0023	<0.03	<0.005	0.162	<0.005	<0.0001	<0.005	0.0137	0.0066	6.04	<0.005	2.75	<0.05	<0.05	0.0013	0.0196	<0.005	0.006
MW92-1A	12-Oct-10	17507101012006	<0.01	<0.0008	<0.0008	0.0091	<0.001	<0.001	0.27	0.000674	<0.005	<0.002	0.0022	<0.03	<0.005	0.182	<0.005	<0.0001	<0.005	0.0056	0.00243	5.9	<0.0001	2.3	<0.05	<0.05	<0.001	0.0225	<0.001	0.0047
MW92-1A	14-Jun-11	17507110614002	<0.01	<0.0008	<0.0008	0.0076	<0.001	<0.001	0.20	0.000461	<0.005	<0.002	0.0016	<0.03	<0.005	0.13	<0.005	<0.0001	<0.005	0.0041	0.00241	4.54	<0.0001	1.87	<0.05	<0.05	<0.001	0.0159	<0.001	0.0126
MW92-1A	08-Nov-11	17507111108002	<0.01	<0.0008	<0.0008	0.012	<0.001	<0.001	0.22	0.000965	<0.005	<0.002	0.0011	<0.03	<0.005	0.136	<0.005	<0.0001	<0.005	0.0032	0.00763	5.95	<0.0001	1.78	<0.05	<0.05	<0.001	0.0126	<0.001	0.0021
MW92-1A	31-May-12	17507120531005	0.052	<0.0005	<0.0005	0.0123	<0.0025	<0.0025	0.09	0.00041	<0.0025	<0.0005	0.00255	<0.03	<0.0005	0.06	<0.005	<0.00005	<0.00025	0.0042	<0.005	3.44	<0.00005	0.932	<0.0005	<0.0005	0.026	0.00539	<0.005	0.037
MW92-1A	22-Oct-12	17507121022004	<0.01	<0.0008	<0.0008	0.015	<0.001	<0.001	0.19	0.000831	<0.005	<0.002	0.0012	<0.03	<0.005	0.123	<0.005	<0.0001	<0.005	0.0038	0.00825	6.67	<0.0001	1.71	<0.05	<0.05	<0.001	0.0109	<0.001	0.0089

TABLE F3

2008-2018 Groundwater and Leachate Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
MW92-1A	19-Jun-13	17507130619002	<0.01	<0.0005	<0.001	---	---	---	---	0.00144	<0.001	<0.0005	0.0014	0.077	<0.001	---	0.200	<0.00005	<0.001	0.0085	0.0044	---	<0.00005	---	<0.0002	---	---	0.0116	---	---
MW92-1A	01-Oct-13	17507131001003	0.01	<0.0005	<0.0005	0.0088	<0.0025	---	0.27	0.00075	<0.005	<0.002	0.0015	0.196	<0.00025	0.169	0.206	<0.0001	<0.005	0.012	0.00217	---	<0.0001	---	<0.00025	<0.05	<0.0015	0.0134	<0.001	0.0124
MW92-1A	21-May-14	17507140521002	0.008	<0.0005	<0.0005	0.00729	<0.0025	---	0.19	0.000423	<0.0005	<0.0005	0.0021	0.031	<0.00025	0.144	0.049	<0.00005	<0.00025	0.0058	0.00287	---	<0.00005	---	<0.00025	<0.0005	<0.0015	0.00988	<0.0005	<0.02
MW92-1A	11-Sep-14	17507140911011	<0.01	<0.001	<0.001	0.00834	<0.005	---	0.27	0.00057	<0.001	<0.001	0.0019	0.041	<0.0005	0.192	0.072	<0.00005	<0.0005	0.0073	0.0014	---	<0.0001	---	<0.0005	<0.001	<0.003	0.016	<0.001	<0.04
MW92-1A	15-Apr-15	17507150415008	<0.005	<0.0005	<0.0005	0.00549	<0.0005	---	0.14	0.000324	<0.0005	<0.001	0.00181	<0.15	<0.00025	0.101	<0.025	<0.00005	<0.00025	0.0033	0.00581	---	<0.00005	---	<0.00005	<0.0005	<0.0015	0.0095	<0.0025	<0.005
MW92-1A	03-Jun-15	17507150603002	<0.005	<0.0005	<0.0005	0.00768	<0.0005	---	0.21	0.000596	<0.0005	<0.0005	0.0023	0.19	<0.00025	0.161	0.131	<0.00005	<0.00025	0.0052	0.00367	---	<0.00005	1.88	0.000072	<0.0005	<0.0015	0.0112	<0.0025	0.0098
MW92-1A	02-Sep-15	17507150902009	0.019	<0.001	<0.001	0.0172	<0.001	---	0.25	0.000409	<0.001	<0.001	0.0023	0.45	<0.0005	0.144	0.460	<0.000005	<0.0005	0.0102	0.0017	---	<0.0001	2.48	<0.0001	<0.001	<0.003	0.0147	<0.005	<0.01
MW92-1A	05-Nov-15	17507151105010	0.034	<0.001	<0.001	0.00948	<0.001	---	0.26	0.000676	<0.001	<0.001	<0.002	<0.15	<0.0005	0.169	0.119	<0.000005	<0.0005	0.0057	0.00297	---	<0.0001	2.05	<0.0001	<0.001	<0.003	0.012	<0.005	<0.01
MW92-1A	29-Apr-16	17507160429006	<0.01	<0.001	<0.001	0.00821	<0.001	---	0.26	0.0004	<0.001	<0.001	<0.002	0.3	<0.0005	0.142	0.351	<0.000005	0.0018	0.0076	0.00225	---	<0.0001	2.58	<0.0001	<0.001	<0.003	0.0133	<0.005	<0.01
MW92-1A	15-Jun-16	17507160615003	0.212	<0.001	<0.001	0.014	<0.001	---	<0.1	<0.00005	0.0012	<0.001	0.0039	0.257	<0.0005	0.019	<0.005	<0.000005	<0.0005	0.0059	0.00126	---	<0.0001	0.252	<0.0001	<0.001	0.006	0.00038	<0.005	<0.01
MW92-1A	09-Sep-16	17507160909001	0.0487	0.00056	<0.0005	0.0229	<0.0005	---	0.10	0.000132	<0.0005	<0.0005	0.0023	0.048	<0.00025	0.035	<0.005	<0.000005	0.00067	0.0048	0.00185	---	<0.00005	0.465	<0.00005	<0.0005	<0.0015	0.00187	<0.0025	<0.005
MW92-1A	15-Nov-16	17507161115004	0.3320	<0.0010	<0.0010	0.0105	<0.0010	---	0.29	0.000301	<0.0010	<0.0010	<0.0020	0.720	<0.00050	0.177	0.458	<0.0000050	<0.00050	0.0085	0.00082	---	0.00137	2.52	0.00011	<0.0010	0.0097	0.0127	<0.0050	<0.010
MW92-1A	08-May-17	17507170508013	0.0313	<0.00050	<0.00050	0.0121	<0.000050	---	0.06	0.000137	<0.00050	<0.00050	0.0026	0.075	<0.00025	0.0272	<0.0050	<0.0000050	<0.00025	0.0033	0.00150	---	<0.000050	0.372	<0.000050	<0.00050	<0.0015	0.000834	<0.0025	<0.0050
MW92-1A	06-Jul-17	17507170706010	0.0051	<0.00010	0.00017	0.00618	<0.00010	---	0.12	0.000238	0.00012	0.00013	0.00168	<0.15	<0.000050	0.0869	<0.025	<0.0000050	0.000359	0.00291	0.00381	---	<0.000010	1.2	0.000031	<0.00010	<0.00030	0.00618	<0.00050	0.0017
MW92-1A	19-Sep-17	17507170919004	0.0072	<0.00050	<0.00050	0.00749	<0.00050	---	0.25	0.000361	<0.00050	<0.00050	0.0011	0.78	<0.00025	0.158	0.577	<0.0000050	<0.00025	0.0102	0.00045	---	<0.000050	2.54	0.000093	<0.00050	<0.0015	0.011	<0.0025	0.0069
MW92-1A	15-Nov-17	17507171115012	<0.010	<0.0010	<0.0010	0.011	<0.0010	---	0.23	0.000339	<0.0010	<0.0010	0.0021	<0.15	<0.00050	0.161	<0.025	<0.0000050	<0.00050	0.0065	0.00196	---	<0.00010	2.02	<0.00010	<0.0010	<0.0030	0.0169	<0.0050	<0.010
MW92-1A	15-May-18	17507180515002	<0.0050	<0.00050	<0.00050	0.00454	<0.00050	---	0.12	0.000302	<0.00050	<0.00050	0.0015	<0.050	<0.00025	0.0925	0.022	<0.0000050	0.00026	0.0031	0.00291	---	<0.000050	1.22	<0.000050	<0.00050	<0.0015	0.00495	<0.0025	<0.0050
MW92-1A	27-Jul-18	17507180727002	0.006	<0.001	<0.001	<0.05	<0.001	---	0.29	0.00034	<0.001	<0.0009	0.002	<0.1	<0.0005	0.125	0.015	<0.000025	<0.001	0.004	0.00260	---	<0.0001	---	<0.0001	---	0.002	0.007	<0.001	<0.005
MW92-1A	11-Sep-18	17507180911002	0.007	<0.001	0.002	<0.05	<0.001	---	0.31	0.00081	<0.001	<0.0009	0.0012	<0.1	<0.0005	0.201	0.259	<0.000025	<0.001	0.007	0.00200	---	0.0002	---	0.0001	---	0.002	0.014	0.002	0.005
MW92-1A	07-Dec-18	17507181207002	0.014	<0.001	<0.001	<0.05	<0.001	---	0.33	0.00058	<0.001	<0.0009	0.0022	0.5	0.0008	0.19	0.786	<0.000025	<0.001	0.009	0.00200	---	<0.0001	2.57	0.0001	<0.0005	0.009	0.015	<0.001	0.017
MW92-6A	08-Jun-08	17507080608005	<0.0005	<0.0002	0.0005	0.034	<0.0001	<0.0005	0.12	0.00025	<0.0005	0.0061	0.008	<0.01	<0.0001	0.027	0.780	<0.0001	<0.001	0.0086	0.0004	3.91	<0.00001	0.673	<0.00005	<0.001	0.0216	<0.0005	0.0003	0.014
MW92-6A	14-Oct-08	17507081014002	0.09	<0.002	<0.002	0.02	<0.001	<0.005	0.22	0.0015	<0.005	<0.001	<0.01	<0.1	0.004	0.07	0.070	<0.0001	<0.01	0.008	<0.002	3.5	<0.0001	1.44	<0.0005	<0.01	0.032	<0.005	0.003	0.03
MW92-6A	15-Jun-09	17507090615006	0.039	0.0016	0.0004	0.02	<0.0001	<0.0005	0.12	0.00037	0.0006	0.0005	0.006	0.03	0.0022	0.035	0.024	<0.0001	<0.001	0.0049	0.0006	3.2	<0.00001	1.05	<0.00005	<0.001	0.0286	0.0005	0.0011	0.009
MW92-6A	22-Sep-09	17507090922006	<0.01	<0.0008	<0.0008	0.0243	<0.001	<0.001	0.16	<0.001	<0.005	<0.002	0.0019	0.0116	<0.005	0.0389	0.084	<0.0001	<0.005	0.0151	0.00208	3.77	<0.005	0.949	<0.05	<0.05	<0.001	0.00116	<0.001	0.0064
MW92-6A	08-Jun-10	17507100608007	0.016	<0.0008	<0.0008	0.0161	<0.001	<0.001	0.11	<0.001	<0.025	<0.002	0.0027	<0.03	<0.005	0.0356	0.044	<0.0001	<0.005	0.0214	<0.004	3.51	<0.005	1.52	<0.05	<0.05	<0.001	0.00158	<0.005	0.0133
MW92-6A	12-Oct-10	17507101012007	0.01	<0.0008	<0.0008	0.018	<0.001	<0.001	0.15	0.000269	<0.005	<0.002	0.0018	<0.03	<0.005	0.0596	<0.005	<0.0001	<0.005	0.0063	<0.0008	3.62	<0.0001	1.28	<0.05	<0.05	<0.001	0.00358	<0.001	0.0064
MW92-6A	14-Jun-11	17507110614003	<0.01	<0.0008	<0.0008	0.0128	<0.001	<0.001	0.12	0.000439	<0.005	<0.002	0.0018	<0.03	<0.005	0.0319	0.186	<0.0001	<0.005	0.0078	<0.0008	3.44	<0.0001	1.36	<0.05	<0.05	<0.001	0.00247	<0.001	0.0199
MW92-6A	08-Nov-11	17507111108003	<0.01	<0.0008	<0.0008	0.017	<0.001	<0.001	0.16	0.000654	<0.005	<0.002	0.0014	<0.03	<0.005	0.0503	0.172	<0.0001	<0.005	0.011	<0.0008	4.19	<0.0001	1.29	<0.05	<0.05	<0.001	0.0046	<0.001	0.0049
MW92-6A	31-May-12	17507120531006	<0.025	<0.0005	<0.0005	0.0179	<0.0025	<0.0025	0.06	0.00049	<0.0025	<0.0005	0.00264	<0.03	<0.0005	<0.025	0.063	<0.00005	<0.00025	0.0138	<0.005	2.73	<0.00005	0.626	<0.0005	<0.0005	0.0206	0.000255	<0.005	<0.025
MW92-6A	22-Oct-12	17507121022005	0.085	<0.0008	<0.0008	0.0156	<0.001	<0.001	0.15	0.000326	<0.005	<0.002	0.0012	0.043	<0.005	0.0467	<0.005	<0.0001	<0.005	0.0042	<0.0008	4.45	<0.0001	1.35	<0.05	<0.05	0.0057	0.00352	<0.001	0.0212
MW92-6A	19-Jun-13	17507130619011	<0.01	<0.0005	<0.001	---	---	---	---	0.000286	<0.0005	0.00084	0.0018	<0.03	<0.001	---	0.121	<0.00005	<0.001	0.0054	<0.001	---	<0.00005	---	<0.0002	---	---	0.00108	---	---
MW92-6A	01-Oct-13	17507131001005	0.012	<0.0004	<0.0004	0.0163	<0.001	---	0.14	0.00026	<0.005	<0.002	0.0013	<0.02	<0.0001	0.0389	0.175	<0.0001	<0.005	0.0066	<0.0004	---	<0.0001	---	<0.0001	<0.05	0.001	0.0024	<0.001	0.0031
MW92-6A	21-May-14	17507140521007	0.0053	<0.0005	<0.0005	0.014	<0.0025	---	0.08	0.000212	<0.0005	<0.0005	0.00205	<0.03	<0.00025	0.033	0.005	<0.00005	<0.00025	0.00496	0.00102	---	<0.00005	---	<0.00025	<0.0005	<0.0015	0.00278	<0.0005	<0.02
MW92-6A	11-Sep-14	17507140911006	<0.01	<0.001	<0.001	0.0165	<0.005	---	0.13	0.00023	<0.001	<0.001	0.0016	<0.03	<0.0005	<0.05	0.028	<0.00005	<0.0005	0.0043	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.00444	<0.001	<0.04
MW92-6A	15-Apr-15	17507150415004	0.0111	<0.0005	<0.0005	0.0277	<0.0005	---	0.07	0.000427	<0.0005	0.0168	0.00164	<0.03	<0.00025	0.0149	1.170	<0.00005	<0.00025	0.0175	0.0004	---	<0.00005	---	<0.00005	<0.0005	<0.0015	0.00176	<0.0025	0.0075
MW92-6A	03-Jun-15	17507150603003	0.0079	<0.0005	<0.0005	0.0289	<0.0005	---	0.09	0.000874	<0.0005	0.00055	0.0154	<0.15	<0.00025	0.0263	0.089	<0.00005	<0.00025	0.0086	0.00036	---	<0.00005	0.778	<0.00005	<0.0005	<0.0015	0.00238	<0.0025	0.0094
MW92-6A	02-Sep-15	17507150902002	0.0442	0.00055	0.0028	0.0564	<0.0005	---	0.11	0.0003	<0.0005	0.0435	0.0013	8.98	<0.00025	0.0199	3.040	<0.000005	0.00034	0.0342	0.0009	---	<0.00005	1.01	0.000096	<0.0005	<0.0015	0.00129	<0.0025	0.0129
MW92-6A	05-Nov-15	17507151105007	0.014	<0.001	<0.001	0.0299	<0.001	---	0.11	0.000861	<0.001	0.003	<0.002	<0.15	<0.0005	0.039	0.785	<0.000005	<0.0005	0.012	<0.0005	---	<0.0001	1.03	<0.0001	<0.001	<0.003	0.00286	<0.005	<0.01
MW92-6A	29-Apr-16	17507160429002	0.046	<0.001	<0.001	0.0172	<0.001	---	<0.1	0.000503	<0.001	0.0016	<0.002	<0.15	<0.0005	0.032	0.224	<0.000005	0.00066	0.0103	<0.0005	---	<0.0001	1.13	<0.0001	<0.001	<0.003	0.00494	<0.005	<0.01
MW92-6A	15-Jun-16	17507160615011	<0.01	<0.001	<0.001	0.0272	<0.001	---	<0.1	0.000435	<0.001	<0.001	0.0028	<0.03	<0.0005	0.02	0.020	<0.000005	<0.0005	0.0086	<0.0005	---	<0.0001	0.971	<0.0001	<0.001	<0.003	0.00147	<0.005	<0.01
MW92-6A	09-Sep-16	17507160909006	0.0136	<0.0005	0.00059	0.0280	<0.0005	---	0.06	0.000759	<0.0005	0.00743	0.0025	<0.03	<0.00025	<0.005	1.310	<0.000005	0.00025	0.0175	0.00036	---	<0.00005	0.692	<0.00005	<0.0005	<0.0015	0.00060	<0.0025	0.0061
MW92-6A	15-Nov-16	17507161115008	<0.010	<0.0010	<0.0010	0.0164	<0.0010	---	<0.10	0.000603	<0.0010	0.0057	<0.0020	<0.15	<0.00050	0.015	1.080	<0.0000050	<0.00050	0.0129	<0.00050	---	<0.00010	0.921	<0.00010	<0.0010	<0.0030	0.00101	<0.0050	<0.010
MW92-6A	08-May-17	17507170508002	0.0091	<0.00050	<0.00050	0.0301	<0.000050	---	0.05	0.00103	<0.00050	<0.00050	0.0022	<0.15	<0.00025	0.0052	0.037	<0.0000050	<0.00025	0.0143	0.00038	---	<0.000050	0.823	<0.000050	<0.00050	<0.0015	0.000494	<0.0025	<0.0050
MW92-6A	06-Jul-17	17507170706001	0.0063	<0.00010	0.00036	0.016	<0.00010	---	0.09	0.000439	<0.00010	0.00252	0.00131	<0.15	<0.000050	0.0304	0.402	<0.0000050	0.000189	0.00875	0.000183	---	<0.000010	1.05	0.000034	<0.00010	<0.00030	0.00305	<0.00050	0.004
MW92-6A	19-Sep-17	17507170919006	0.0293	<0.00050	<0.00050	0.014	<0.00050	---	0.12	0.000259	<0.00050	<0.00050	0.0018	<0.15	<0.00025	0.0403	0.056	<0.0000050	<0.00025	0.0073	<0.00025	---	<0.000050	1.34	<0.000050	<0.00050	0.0016	0.00402	<0.0025	<0.0050
MW92-6A	15-Nov-17	17507171115006	0.0089	<0.00050	<0.00050	0.0135	<0.00050	---	0.13	0.000219	<0.00050	<0.00050	0.0019	<0.15	<0.00025	0.0376	<0.025	<0.0000050	<0.00025	0.0046	0.00029	---	<0.000050	1.26	<0.000050	<0.00050	<0.0015	0.00325	<0.0025	<0.0050
MW92-6A	15-May-18	17507180515003	<0.0050	<0.00050	<0.00050	0.0133	<0.00050	---	0.07	0.000239	<0.00050	<0.00050	0.0012	<0.050	<0.00025	0.0232	0.004	<0.0000050	<0.00025	0.004	0.00058	---	<0.000050	0.935	<0.000050	<0.00050	<0.0015	0.00172	<0.0025	<0.0050
MW92-6A	27-Jul-18	17507180727003	0.011	<0.001	<0.001	<0.05	<0.001	---	0.16	0.00051	<0.001	0.003	0.0022	<0.1	<0.0005	0.016	0.168	<0.000025	<0.001	0.012	0.0012	---	<0.0001	---	<0.0001	---	0.001	<0.001	<0.001	<0.005
MW92-6A	11-Sep-18	17507180911003	0.121	<0.001	0.001	<0.05	<0.001	---	0.15	0.00045	<0.001	<0.0009	0.0019	0.2	<0.0005	0.041	0.077	<0.000025	<0.001	0.006	0.0007	---	<0.0001	---	<0.0001	---	0.003	0.003	0.002	0.008
MW92-6A	07-Dec-18	17507181207003	0.007	<0.001	<0.001	<0.05	<0.001	---	0.10	0.00026	<0.001	<0.0009	0.0016	<0.1	<0.0005	0.032	0.007	<0.000025	<0.001	0.005	0.001	---	<0.0001	1.01	<0.0001	<0.0005	0.002	0.003	<0.001	<0.005
MW92-7	08-Jun-08	17507080608006	<0.05	<0.002	<0.002	0.01	<0.001	<0.005	0.47	0.0004	<0.005	0.006	<0.01	<0.1	<0.001	0.04	2.270	<0.0001	<0.01	0.013	<0.002	4.8	<0.0001	5.11	<0.0005	<0.01	0.086	0.054	0.002	0.02
MW92-7	15-Jun-09	17507090615007	<0.02	0.001	0.002	0.01	<0.0005	<0.002	0.51	0.0005	<0.002	0.0065	0.01	<0.05	<0.0005	0.04	2.290	<0.0001	<0.005	0.0092	<0.001	4.8	<0.00005	5.3	<0.0002	<0.005	0.0644	0.0625	0.004	0.02
MW92-7	22-Sep-09	17507090922007	<0.01	<0.0008	<0.0008	0.0091	<0.001	<0.001	0.50	<0.001	<0.005	0.0056	0.0074	<0.03	<0.005	0.0315	2.030	<0.0001	<0.005	0.0197	0.00214	3.66	<0.005	4.85	<0.05	<0.05	0.0015	0.0622	<0.001	0.0094
MW92-7	08-Jun-10	17507100608008	<0.01	<0.0008	<0.0008	0.0093	<0.001	<0.001	0.45	0.0024	<0.025	0.0061	0.0068	0.069	<0.005	0.0288	2.260	<0.0001	<0.005	0.0213	<0.004	4.48	<0.005	6.97	<0.05	<0.05	0.0011	0.0635	<0.005	0.0083
MW92-7	12-Oct-10	17507101012008	<0.01	<0.0008	<0.0008	0.0094	<0.001	<0.001	0.41	0.00204	<0.005	0.0046	0.0026	<0.03	<0.005	0.024	1.980	<0.0001	<0.005	0.0115	0.00206	3.34	<0.0001	5.06	<0.05	<0.05	<0.001	0.07	<0.001	0.0082
MW92-7	14-Jun-11	17507110614004	<0.01	<0.0008	<0.0008	0.009	<0.001	<0.001	0.40	0.00138	<0.005	0.0047	0.0042	<0.03	<0.005	0.018	2.000	<0.0001	<0.005	0.0134	0.0018	3.27	<0.0001	4.92	<0.05	<0.05	<0.001	0.0698	<0.001	0.0169
MW92-7	08-Nov-11	17507111108004	<0.01	<0.0008	<0.0008	0.0106	<0.001	<0.001	0.47	0.00138	<0.005	0.0037	0.0033	<0.03	<0.005	0.0278	1.750	<0.0001	<0.005	0.013	0.00101	4.57	<0.0001	4.75	<0.05	<0.05	<0.001	0.0629	<0.001	0.01
MW92-7	31-May-12	17507120531007	<0.05	<0.001	<0.001	0.00825	<0.005	<0.005	0.45	0.00088	<0.005	0.0043	0.0035	<0.03	<0.001	<0.05	1.960	<0.00005	0.00307	0.0146	<0.01	4.2	<0.0001	4.97	<0.001	<0.001	0.058	0.0664	<0.01	<0.05
MW92-7	22-Oct-12	17507121022006	<0.01	<0.0008	<0.0008	0.015	<0.001	<0.001	0.40	0.000974	<0.005	0.0045	<0.001	0.067	<0.005	0.0259	2.130	<0.0001	<0.005	0.0113	<0.0008	4.71	<0.0001	4.75	<0.05	<0.05	<0.001	0.0599	<0.001	0.0098
MW92-7	19-Jun-13	17507130619007	<0.01	<0.0005	<0.001	---	---	---	---	0.00077	<0.001	0.00474	0.0021	<0.03	<0.001	---	1.720	<0.00005	0.003	0.0115	<0.002	---	<0.00005	---	<0.0002	---	---	0.0621	---	---
MW92-7	01-Oct-13	17507131001002	<0.01	<0.0005	<0.0005	0.0087	<0.0025	---	0.43	0.00071	<0.005	0.0043	0.0017	0.053	<0.00025	0.022	2.170	<0.0001	<0.005	0.0133	<0.0005	---	<0.0001	---	<0.00025	<0.05	<0.0015	0.0596	<0.001	0.0144
MW92-7	21-May-14	17507140521010	0.016	<0.001	<0.001	0.0083	<0.005	---	0.42	0.00072	<0.001	0.0035	0.0026	<0.03	<0.0005	<0.05	1.690	<0.00005	0.00281	0.0135	<0.001	---	<0.0001	---	<0.0005	<0.001	0.0031	0.0604	<0.001	<0.04
MW92-7	11-Sep-14	17507140911008	<0.01	<0.001	<0.001	0.00932	<0.005	---	0.45	0.00077	<0.001	0.003	0.0023	<0.03	<0.0005	<0.05	1.580	<0.00005	0.00262	0.0119	0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0616	<0.001	<0.04
MW92-7	15-Apr-15	17507150415005	<0.01	0.0018	<0.001	0.0168	<0.001	---	0.44	0.000075	<0.001	0.001	0.0025	<0.3	<0.0005	0.029	0.126	<0.00005	0.00571	<0.005	0.00765	---	<0.0001	---	<0.0001	<0.001	<0.003	0.0582	<0.005	<0.01
MW92-7	03-Jun-15	17507150603004	<0.01	0.0012	<0.001	0.011	<0.001	---	0.42	0.00229	<0.001	0.0026	0.0039	<0.15	<0.0005	0.027	1.280	<0.00005	0.00514	0.01	0.00743	---	<0.0001	5.09	<0.0001	<0.001	<0.003	0.0695	<0.005	0.011

TABLE F3

2008-2018 Groundwater and Leachate Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
MW92-7	02-Sep-15	17507150902006	<0.01	<0.001	<0.001	0.00932	<0.001	---	0.37	0.00118	<0.001	0.0029	0.0035	<0.15	<0.0005	0.011	1.360	<0.000005	0.00304	0.0167	0.00937	---	<0.0001	4.87	<0.0001	<0.001	<0.003	0.0578	<0.005	0.013
MW92-7	05-Nov-15	17507151105009	0.044	<0.001	<0.001	0.00815	<0.001	---	0.41	0.00113	<0.001	0.0021	<0.002	<0.15	<0.0005	0.025	1.410	<0.000005	0.00302	0.0157	0.00983	---	<0.0001	4.92	<0.0001	<0.001	<0.003	0.0595	<0.005	0.011
MW92-7	29-Apr-16	17507160429004	<0.01	<0.001	<0.001	0.00862	<0.001	---	0.44	0.00120	<0.001	0.0021	<0.002	<0.15	<0.0005	0.015	1.120	<0.000005	0.00419	0.0177	0.00577	---	<0.0001	5.41	<0.0001	<0.001	<0.003	0.0614	<0.005	0.014
MW92-7	15-Jun-16	17507160615010	<0.01	<0.001	<0.001	0.00822	<0.001	---	0.44	0.00080	<0.001	0.0011	0.0041	<0.15	<0.0005	0.022	0.609	<0.000005	0.00317	0.0164	0.00622	---	<0.0001	5.18	<0.0001	<0.001	<0.003	0.0577	<0.005	0.014
MW92-7	09-Sep-16	17507160909007	<0.005	<0.0005	<0.0005	0.00797	<0.0005	---	0.46	0.000341	<0.0005	<0.0005	0.0014	<0.15	<0.00025	0.0258	0.112	<0.000005	0.00296	0.0121	0.00663	---	<0.00005	4.90	<0.00005	<0.0005	<0.0015	0.0579	<0.0025	0.008
MW92-7	15-Nov-16	17507161115007	0.142	<0.0010	<0.0010	0.00882	<0.0010	---	0.42	0.000296	<0.0010	<0.0010	0.0021	<0.15	<0.00050	0.020	0.172	<0.0000050	0.00246	0.0101	0.00558	---	<0.00010	4.83	<0.00010	<0.0010	0.0039	0.0532	<0.0050	<0.010
MW92-7	08-May-17	17507170508010	<0.010	<0.0010	<0.0010	0.00800	<0.0010	---	0.42	0.000261	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.024	<0.025	<0.0000050	0.00241	0.0068	0.00575	---	<0.00010	4.91	<0.00010	<0.0010	<0.0030	0.0566	<0.0050	<0.010
MW92-7	06-Jul-17	17507170706012	0.0239	<0.00050	<0.00050	0.00772	<0.00050	---	0.44	0.000578	<0.00050	<0.00050	0.0014	<0.15	<0.00025	0.0258	0.131	<0.0000050	0.00248	0.0085	0.00298	---	<0.000050	4.94	<0.000050	<0.00050	<0.0015	0.0558	<0.0025	0.0069
MW92-7	19-Sep-17	17507170919002	0.0772	<0.00050	<0.00050	0.00893	<0.00050	---	0.40	0.000257	<0.00050	0.00053	0.0022	<0.15	0.00038	0.0224	<0.025	<0.0000050	0.00093	0.0060	0.00394	---	<0.000050	5.41	<0.000050	<0.00050	<0.0015	0.0503	<0.0025	0.0079
MW92-7	15-Nov-17	17507171115010	0.011	<0.0010	<0.0010	0.00819	<0.0010	---	0.45	0.000168	<0.0010	<0.0010	0.0022	<0.15	<0.00050	0.026	<0.025	<0.0000050	0.00219	0.0079	0.00655	---	<0.00010	4.95	<0.00010	<0.0010	<0.0030	0.0587	<0.0050	<0.010
MW92-7	15-May-18	17507180515004	0.049	<0.0010	<0.0010	0.00840	<0.0010	---	0.43	0.000207	<0.0010	<0.0010	0.0022	<0.10	<0.00050	0.022	0.044	<0.0000050	0.00188	0.0077	0.00453	---	<0.00010	5.08	<0.00010	<0.0010	<0.0030	0.0472	<0.0050	<0.010
MW92-7	27-Jul-18	17507180727005	0.006	<0.001	<0.001	<0.05	<0.001	---	0.52	0.00131	<0.001	0.001	0.0024	0.3	<0.0005	0.179	1.150	<0.000025	<0.001	0.0110	<0.0005	---	<0.0001	---	0.0001	---	0.003	0.01	<0.001	0.01
MW92-7	07-Dec-18	17507181207004	0.134	<0.001	<0.001	<0.05	<0.001	---	0.52	0.0002	<0.001	<0.0009	0.0015	0.2	<0.0005	0.027	0.009	<0.000025	0.002	0.0050	0.0124	---	<0.0001	4.8	<0.0001	<0.0005	0.018	0.059	<0.001	0.016
MW92-7A	08-Jun-08	17507080608007	<0.05	<0.002	<0.002	0.02	<0.001	<0.005	0.34	0.0006	<0.005	0.005	0.06	0.87	<0.001	0.14	3.700	<0.0001	<0.01	0.018	<0.002	5.2	<0.0001	3.34	<0.0005	<0.01	0.126	0.008	0.002	0.02
MW92-7A	15-Jun-09	17507090615008	0.03	0.003	<0.001	0.01	<0.0005	<0.002	0.39	0.0013	<0.002	0.0065	0.01	<0.05	<0.0005	0.15	4.300	<0.0001	<0.005	0.014	<0.001	5.38	<0.00005	3.62	0.0003	<0.005	0.0862	0.0073	0.004	0.03
MW92-7A	22-Sep-09	17507090922008	0.402	<0.0008	<0.0008	0.0145	<0.001	<0.001	0.42	0.0023	<0.005	0.0076	0.0045	0.488	<0.005	0.118	4.700	<0.0001	<0.005	0.0303	0.00144	6.12	<0.005	3.53	<0.05	<0.05	0.0097	0.00856	0.0016	0.019
MW92-7A	08-Jun-10	17507100608009	<0.01	<0.0008	<0.0008	0.009	<0.001	<0.001	0.33	0.003	<0.025	0.0035	0.004	0.038	<0.005	0.137	2.470	<0.0001	<0.005	0.0235	<0.004	4.85	<0.005	4.74	<0.05	<0.05	0.0012	0.00933	<0.005	0.0139
MW92-7A	12-Oct-10	17507101012009	<0.01	<0.0008	<0.0008	0.0092	<0.001	<0.001	0.33	0.00308	<0.005	0.005	0.0018	<0.03	<0.005	0.116	3.280	<0.0001	<0.005	0.0158	<0.0008	4.18	<0.0001	3.5	<0.05	<0.05	<0.001	0.00895	<0.001	0.0212
MW92-7A	14-Jun-11	17507110614005	<0.01	<0.0008	<0.0008	0.0079	<0.001	<0.001	0.31	0.00131	<0.005	<0.002	<0.001	<0.03	<0.005	0.111	1.850	<0.0001	<0.005	0.0109	<0.0008	4.82	<0.0001	3.15	<0.05	<0.05	0.0039	0.00988	<0.001	0.0141
MW92-7A	08-Nov-11	17507111108005	<0.01	<0.0008	<0.0008	0.0113	<0.001	<0.001	0.35	0.00119	<0.005	0.0029	<0.001	<0.03	<0.005	0.119	2.280	<0.0001	<0.005	0.014	<0.0008	5.05	<0.0001	3.33	<0.05	<0.05	<0.001	0.00826	<0.001	0.0117
MW92-7A	31-May-12	17507120531008	<0.05	<0.001	<0.001	0.00844	<0.005	<0.005	0.32	0.0009	<0.005	<0.001	0.0042	<0.03	<0.001	0.152	0.407	<0.00005	<0.0005	0.0089	<0.01	4.29	<0.0001	3.06	<0.001	<0.001	0.071	0.0112	<0.01	<0.05
MW92-7A	22-Oct-12	17507121022007	<0.01	<0.0008	<0.0008	0.0118	<0.001	<0.001	0.24	0.00118	<0.005	<0.002	<0.001	<0.03	<0.005	0.135	0.014	<0.0001	<0.005	0.0051	<0.0008	5.21	<0.0001	2.39	<0.05	<0.05	<0.001	0.0118	<0.001	0.0111
MW92-7A	19-Jun-13	17507130619004	<0.01	<0.0005	<0.001	---	---	---	---	0.00056	<0.001	0.00095	<0.001	0.123	<0.001	---	1.120	<0.00005	<0.001	0.0111	<0.002	---	<0.00005	---	<0.0002	---	---	0.0091	---	---
MW92-7A	21-May-14	17507140521009	0.017	<0.001	<0.001	0.00893	<0.005	---	0.29	0.00062	<0.001	<0.001	<0.001	0.262	<0.0005	0.157	0.752	<0.00005	<0.0005	0.0098	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.00915	<0.001	<0.04
MW92-7A	11-Sep-14	17507140911009	0.035	<0.001	<0.001	0.00927	<0.005	---	0.33	0.00156	<0.001	0.0011	<0.001	0.227	<0.0005	0.159	1.450	<0.00005	<0.0005	0.0107	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.00949	<0.001	<0.04
MW92-7A	15-Apr-15	17507150415006	<0.01	<0.001	<0.001	0.00914	<0.001	---	0.31	0.00149	<0.001	<0.002	<0.001	0.31	<0.0005	0.136	1.390	<0.00005	<0.0005	0.0102	<0.0005	---	<0.0001	---	0.00016	<0.001	<0.003	0.00914	<0.005	0.013
MW92-7A	03-Jun-15	17507150603005	<0.01	<0.001	<0.001	0.00983	<0.001	---	0.33	0.000967	<0.001	0.0025	0.0028	0.56	<0.0005	0.149	1.690	<0.00005	<0.0005	0.0109	<0.0005	---	<0.0001	3.33	0.00014	<0.001	<0.003	0.0083	<0.005	0.021
MW92-7A	02-Sep-15	17507150902007	<0.01	<0.001	<0.001	0.00847	<0.001	---	0.26	0.000386	<0.001	<0.001	<0.002	<0.15	<0.0005	0.111	0.122	<0.000005	<0.0005	0.0053	<0.0005	---	<0.0001	2.86	<0.0001	<0.001	<0.003	0.00779	<0.005	<0.01
MW92-7A	05-Nov-15	17507151105008	0.068	<0.001	<0.001	0.00892	<0.001	---	0.32	0.000785	<0.001	0.0013	<0.002	0.21	<0.0005	0.143	1.250	<0.000005	<0.0005	0.0095	<0.0005	---	<0.0001	3.21	0.00015	<0.001	<0.003	0.00837	<0.005	0.012
MW92-7A	29-Apr-16	17507160429003	<0.01	<0.001	<0.001	0.0098	<0.001	---	0.33	0.000727	<0.001	0.0011	<0.002	0.18	<0.0005	0.135	1.000	<0.000005	0.00154	0.0076	0.00072	---	<0.0001	3.26	0.00012	<0.001	<0.003	0.0125	<0.005	<0.01
MW92-7A	15-Jun-16	17507160615009	0.125	<0.001	<0.001	0.0112	<0.001	---	0.30	0.000609	<0.001	0.001	0.0025	0.24	<0.0005	0.144	0.786	<0.000005	0.00057	0.0081	0.00069	---	<0.0001	3.01	<0.0001	<0.001	<0.003	0.0125	<0.005	0.012
MW92-7A	09-Sep-16	17507160909004	0.0055	<0.0005	<0.0005	0.0103	<0.0005	---	0.24	0.000438	<0.0005	<0.0005	0.0016	<0.15	<0.00025	0.151	0.137	<0.000005	0.00172	0.0053	0.00088	---	<0.00005	2.19	0.000078	<0.0005	<0.0015	0.0102	<0.0025	0.0062
MW92-7A	15-Nov-16	17507161115006	0.018	<0.0010	<0.0010	0.00941	<0.0010	---	0.22	0.000505	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.113	0.457	<0.0000050	0.00152	0.0052	0.00052	---	<0.00010	2.08	<0.00010	<0.0010	<0.0030	0.00925	<0.0050	<0.010
MW92-7A	08-May-17	17507170508011	<0.010	<0.0010	<0.0010	0.01020	<0.0010	---	0.24	0.000654	<0.0010	0.0016	<0.0020	0.26	<0.00050	0.111	1.790	<0.0000050	0.00196	0.0100	<0.00050	---	<0.00010	2.36	0.00012	<0.0010	<0.0030	0.00699	<0.0050	<0.010
MW92-7A	06-Jul-17	17507170706013	0.0199	<0.00050	<0.00050	0.00865	<0.00050	---	0.29	0.000198	<0.00050	0.00171	<0.0010	0.33	<0.00025	0.126	1.950	<0.0000050	0.00055	0.0120	<0.00025	---	<0.000050	2.79	0.000113	<0.00050	<0.0015	0.0079	<0.0025	0.0077
MW92-7A	19-Sep-17	17507170919001	0.0268	<0.00050	<0.00050	0.00902	<0.00050	---	0.25	0.000364	<0.00050	0.00068	0.0014	0.3	<0.00025	0.133	0.591	<0.0000050	0.00056	0.0079	0.00043	---	<0.000050	2.66	0.000085	<0.00050	<0.0015	0.00894	<0.0025	0.0068
MW92-7A	15-Nov-17	17507171115011	<0.010	<0.0010	0.0011	0.00828	<0.0010	---	0.34	0.000318	<0.0010	0.0045	<0.0020	3.45	<0.00050	0.148	3.530	<0.0000050	<0.00050	0.0175	<0.00050	---	<0.00010	3.22	0.00019	<0.0010	<0.0030	0.00835	<0.0050	0.014
MW92-7A	15-May-18	17507180515005	0.031	<0.0010	<0.0010	0.00970	<0.0010	---	0.33	0.000748	<0.0010	0.0015	<0.0020	0.63	<0.00050	0.16	1.760	<0.0000050	<0.00050	0.0145	<0.00050	---	<0.00010	3.22	0.00015	<0.0010	<0.0030	0.00786	<0.0050	0.012
MW92-7A	27-Jul-18	17507180727004	---	---	---	---	---	---	---	---	---	---	---	0.2	---	---	0.016	---	---	---	---	---	---	---	---	---	---	---	---	---
MW92-7A	11-Sep-18	17507180911005	0.021	<0.001	0.001	<0.05	<0.001	---	0.40	0.00109	<0.001	0.0031	<0.0008	1	<0.0005	0.156	2.230	<0.000025	<0.001	0.0130	0.0013	---	<0.0001	---	0.0001	---	0.003	0.009	0.002	0.01
MW92-7A	07-Dec-18	17507181207005	0.029	<0.001	<0.001	<0.05	<0.001	---	0.41	0.00045	<0.001	0.0048	<0.0008	2.4	<0.0005	0.148	3.210	<0.000025	<0.001	0.0170	0.0013	---	<0.0001	3.42	0.0001	<0.0005	0.014	0.009	<0.001	0.013
03-3	15-Jun-09	17507090615002	0.04	0.001	0.002	0.02	<0.0005	<0.002	0.37	0.0004	<0.002	0.0072	<0.005	<0.05	<0.0005	0.1	1.600	<0.0001	<0.005	0.016	<0.001	5.35	0.00106	3.15	<0.0002	<0.005	0.0683	0.015	0.003	0.02
03-3	22-Sep-09	17507090922002	<0.01	<0.0008	<0.0008	0.0155	<0.001	<0.001	0.36	0.0014	<0.005	0.0082	0.0023	0.034	<0.005	0.0824	1.340	<0.0001	<0.005	0.04	0.00231	4.1	<0.005	3.03	<0.05	<0.05	0.0014	0.0147	<0.001	0.0194
03-3	08-Jun-10	17507100608003	<0.01	<0.0008	<0.0008	0.0164	<0.001	<0.001	0.33	0.0012	<0.025	<0.002	0.0034	<0.03	<0.005	0.093	0.146	<0.0001	<0.005	0.0207	<0.004	5.17	<0.005	4.43	<0.05	<0.05	0.0013	0.016	<0.005	0.0101
03-3	12-Oct-10	17507101012003	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
03-3	14-Jun-11	17507110614006	<0.01	<0.0008	<0.0008	0.0148	<0.001	<0.001	0.31	0.00153	<0.005	<0.002	0.0064	<0.03	<0.005	0.0701	0.310	<0.0001	<0.005	0.0127	0.00134	4.85	<0.0001	3.03	<0.05	<0.05	<0.001	0.0155	<0.001	0.016
03-3	08-Nov-11	17507111108006	<0.01	<0.0008	<0.0008	0.0241	<0.001	<0.001	0.26	0.000338	<0.005	<0.002	0.002	<0.03	<0.005	0.0918	<0.005	<0.0001	<0.005	0.0131	0.00337	5.53	<0.0001	2.35	<0.05	<0.05	<0.001	0.0214	<0.001	0.0047
03-3	31-May-12	17507120531002	<0.05	<0.001	<0.001	0.0159	<0.005	<0.005	0.30	<0.0005	<0.005	<0.001	0.0053	<0.03	<0.001	0.105	0.008	<0.00005	<0.0005	0.0133	<0.01	4.62	<0.0001	2.70	<0.001	<0.001	0.06	0.0177	<0.01	<0.05
03-3	22-Oct-12	17507121022001	<0.01	<0.0008	<0.0008	0.0365	<0.001	<0.001	0.28	0.000566	<0.005	<0.002	0.0012	<0.03	<0.005	0.0872	0.126	<0.0001	<0.005	0.011	0.00219	5.37	<0.0001	2.79	<0.05	<0.05	<0.001	0.0144	<0.001	0.0088
03-3	19-Jun-13	17507130619008	<0.01	<0.0005	<0.001	---	---	---	---	0.00057	<0.001	0.00068	0.0012	<0.03	<0.001	---	0.386	<0.00005	<0.001	0.0121	<0.002	---	<0.00005	---	<0.0002	---	---	0.0152	---	---
03-3	21-May-14	17507140521003	0.047	<0.001	<0.001	0.016	<0.005	---	0.32	0.00055	<0.001	<0.001	0.0027	0.044	<0.0005	0.091	0.135	<0.00005	<0.0005	0.0166	0.0013	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0152	<0.001	<0.04
03-3	11-Sep-14	17507140911001	<0.01	<0.001	0.0012	0.013	<0.005	---	0.33	0.0008	<0.001	<0.001	0.0015	<0.03	<0.0005	0.084	0.187	<0.00005	<0.0005	0.0075	0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0139	<0.001	<0.04
03-3	15-Apr-15	17507150415010	<0.01	<0.001	<0.001	0.0155	<0.001	---	0.30	0.000611	<0.001	<0.002	0.0011	<0.15	<0.0005	0.074	0.062	<0.00005	<0.0005	0.0069	0.00186	---	<0.0001	---	<0.0001	<0.001	<0.003	0.0155	<0.005	<0.01
03-3	05-Nov-15	17507151105013	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
03-3	29-Apr-16	17507160429008	0.061	<0.001	<0.001	0.0148	<0.001	---	0.35	0.000502	<0.001	<0.001	<0.002	<0.15	<0.0005	0.073	0.069	<0.000005	<0.0005	0.0083	0.00234	---	<0.0001	3.50	<0.0001	<0.001	<0.003	0.0156	<0.005	<0.01
03-3	09-Sep-16	17507160909002	0.126	<0.0005	<0.0005	0.0151	<0.0005	---	0.31	0.000235	<0.0005	0.00054	0.0015	<0.15	0.00029	0.0973	<0.025	<0.000005	<0.00025	0.0069	0.00245	---	<0.00005	2.98	<0.00005	<0.0005	0.0016	0.0153	<0.0025	0.0059
03-3	15-Nov-16	17507161115002	<0.010	<0.0010	<0.0010	0.0133	<0.0010	---	0.34	0.00021	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.093	<0.025	<0.0000050	<0.00050	0.0071	0.00223	---	<0.00010	2.95	<0.00010	<0.0010	<0.0030	0.0154	<0.0050	<0.010
03-3	08-May-17	17507170508015	<0.010	<0.0010	<0.0010	0.0167	<0.0010	---	0.35	0.00026	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.107	0.045	<0.0000050	<0.00050	0.0098	0.00206	---	<0.00010	2.98	<0.00010	<0.0010	<0.0030	0.0138	<0.0050	<0.010
03-3	06-Jul-17	17507170706008	0.0137	<0.00050	<0.00050	0.0128	<0.00050	---	0.33	0.00044	<0.00050	<0.00050	0.0017	<0.15	<0.00025	0.0955	0.138	<0.0000050	<0.00025	0.0068	0.00131	---	<0.000050	3.03	0.000056	<0.00050	<0.0015	0.015	<0.0025	<0.0050
03-3	27-Jul-18	17507180727006	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.53	0.00018	<0.001	<0.0009	0.0011	<0.1	<0.0005	0.108	<0.005	<0.000025	<0.001	0.006	0.0019	---	0.0001	---	<0.0001	---	0.003	0.017	<0.001	<0.005
03-3	11-Sep-18	17507180911007	---	---	---	---	---	---	---	---	---	---	---	<0.1	---	---	<0.005	---	---	---	---	---	---	---	---	---	---	---	---	---
03-3	07-Dec-18	17507181207008	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.38	0.00066	<0.001	<0.0009	0.0024	<0.1	<0.0005	0.113	<0.005	<0.000025	<0.001	0.009	0.0031	---	<0.0001	2.94	<0.0001	<0.0005	0.008	0.017	<0.001	0.01

TABLE F3

2008-2018 Groundwater and Leachate Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
03-5	08-Jun-08	17507080608002	<0.05	<0.002	0.002	0.02	<0.001	<0.005	0.37	0.0006	<0.005	0.009	<0.01	<0.1	<0.001	0.08	2.420	<0.0001	<0.01	0.026	<0.002	4.8	<0.0001	3	<0.0005	<0.01	0.096	0.013	0.001	0.02
03-5	08-Oct-08	17507081008001	<0.05	<0.002	<0.002	0.02	<0.001	<0.005	0.38	0.0006	<0.005	0.009	<0.01	0.39	<0.001	0.08	3.240	<0.0001	<0.01	0.018	<0.002	4.9	<0.0001	3.17	<0.0005	<0.01	0.066	0.011	0.002	0.02
03-5	15-Jun-09	17507090615003	<0.02	0.001	0.001	0.02	<0.0005	<0.002	0.41	0.0014	<0.002	0.011	<0.005	<0.05	<0.0005	0.094	4.230	<0.0001	<0.005	0.017	<0.001	5.34	<0.00005	3.34	<0.0002	<0.005	0.0697	0.012	0.003	0.02
03-5	22-Sep-09	17507090922003	0.037	<0.0008	<0.0008	0.0167	<0.001	<0.001	0.44	<0.001	<0.005	0.0101	0.0022	0.061	<0.005	0.0805	3.980	<0.0001	<0.005	0.0321	0.0016	5.14	<0.005	3.15	<0.05	<0.05	0.0021	0.0118	<0.001	0.0106
03-5	08-Jun-10	17507100608004	<0.01	<0.0008	<0.0008	0.0192	<0.001	<0.001	0.35	0.0011	<0.025	0.003	0.0034	<0.03	<0.005	0.0879	1.010	<0.0001	<0.005	0.0248	<0.004	4.53	<0.005	4.66	<0.05	<0.05	0.001	0.0138	<0.005	0.0131
03-5	12-Oct-10	17507101012004	<0.01	<0.0008	<0.0008	0.0185	<0.001	<0.001	0.32	0.00109	<0.005	0.003	0.0019	<0.03	<0.005	0.0765	1.420	<0.0001	<0.005	0.0148	<0.0008	3.9	<0.0001	3.18	<0.05	<0.05	<0.001	0.0132	<0.001	0.0156
03-5	14-Jun-11	17507110614007	<0.01	<0.0008	<0.0008	0.0144	<0.001	<0.001	0.33	0.00126	<0.005	0.0059	0.0012	<0.03	<0.005	0.0629	3.290	<0.0001	<0.005	0.0274	<0.0008	4.1	<0.0001	3.2	<0.05	<0.05	<0.001	0.013	<0.001	0.011
03-5	08-Nov-11	17507111108007	<0.01	<0.0008	<0.0008	0.0221	<0.001	<0.001	0.30	0.000971	<0.005	<0.002	<0.001	<0.03	<0.005	0.0716	0.159	<0.0001	<0.005	0.0098	<0.0008	4.16	<0.0001	2.91	<0.05	<0.05	<0.001	0.0125	<0.001	0.0066
03-5	31-May-12	17507120531003	<0.05	<0.001	<0.001	0.0162	<0.005	<0.005	0.32	0.00057	<0.005	<0.001	0.0017	<0.03	<0.001	0.083	0.307	<0.00005	<0.0005	0.0129	<0.01	3.57	<0.0001	3.08	<0.001	<0.001	0.061	0.0148	<0.01	<0.05
03-5	22-Oct-12	17507121022002	0.016	<0.0008	<0.0008	0.0284	<0.001	<0.001	0.28	0.000696	<0.005	<0.002	<0.001	0.036	<0.005	0.069	0.987	<0.0001	<0.005	0.013	<0.0008	4.11	<0.0001	3.11	<0.05	<0.05	<0.001	0.0125	<0.001	0.0099
03-5	19-Jun-13	17507130619009	0.03	<0.0005	<0.001	---	---	---	---	0.00064	<0.001	0.00282	0.0011	<0.03	<0.001	---	1.640	<0.00005	<0.001	0.0143	<0.002	---	<0.00005	---	<0.0002	---	---	0.0133	---	---
03-5	21-May-14	17507140521005	0.198	<0.001	<0.001	0.0196	<0.005	---	0.34	0.00071	<0.001	0.0023	0.0021	0.177	<0.0005	0.088	1.010	<0.00005	<0.0005	0.0136	<0.001	---	<0.0001	---	<0.0005	<0.001	0.0068	0.0137	0.0015	<0.04
03-5	11-Sep-14	17507140911002	<0.01	<0.001	<0.001	0.0145	<0.005	---	0.34	0.00079	<0.001	0.0037	0.001	<0.03	<0.0005	0.081	1.930	<0.00005	<0.0005	0.0163	0.0013	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0132	<0.001	<0.04
03-5	15-Apr-15	17507150415007	0.023	<0.001	<0.001	0.0175	<0.001	---	0.32	0.000405	<0.001	<0.002	0.001	<0.15	<0.0005	0.073	0.648	<0.00005	<0.0005	0.0084	0.0011	---	<0.0001	---	<0.0001	<0.001	<0.003	0.0145	<0.005	<0.01
03-5	05-Nov-15	17507151105012	0.043	<0.001	<0.001	0.0161	<0.001	---	0.36	0.000567	<0.001	0.0017	<0.002	<0.15	<0.0005	0.093	1.310	<0.000005	<0.0005	0.0113	0.00088	---	<0.0001	3.35	<0.0001	<0.001	<0.003	0.0136	<0.005	<0.01
03-5	29-Apr-16	17507160429007	<0.01	<0.001	<0.001	0.0176	<0.001	---	0.33	0.000314	<0.001	<0.001	<0.002	<0.15	<0.0005	0.068	0.058	<0.000005	0.00104	0.0062	0.00209	---	<0.0001	3.68	<0.0001	<0.001	<0.003	0.0161	<0.005	<0.01
03-5	15-Jun-16	17507160615002	<0.01	<0.001	<0.001	0.0158	<0.001	---	0.38	0.000669	<0.001	0.0028	<0.002	<0.15	<0.0005	0.082	1.940	<0.000005	<0.0005	0.0132	0.00082	---	<0.0001	3.49	<0.0001	<0.001	<0.003	0.0134	<0.005	0.01
03-5	09-Sep-16	17507160909003	<0.005	<0.0005	<0.0005	0.0170	<0.0005	---	0.36	0.000484	<0.0005	0.00169	0.0014	<0.15	<0.00025	0.0859	1.380	<0.000005	0.00029	0.0113	0.00118	---	<0.00005	3.31	0.000081	<0.0005	<0.0015	0.0134	<0.0025	0.0069
03-5	15-Nov-16	17507161115003	<0.010	<0.0010	<0.0010	0.0158	<0.0010	---	0.29	0.000204	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.078	<0.025	<0.0000050	0.00052	0.0053	0.00421	---	<0.00010	2.83	<0.00010	<0.0010	<0.0030	0.0170	<0.0050	<0.010
03-5	08-May-17	17507170508014	<0.010	<0.0010	<0.0010	0.0170	<0.0010	---	0.30	0.000237	<0.0010	<0.0010	<0.0020	<0.15	<0.00050	0.091	<0.025	<0.0000050	<0.00050	0.0055	0.00347	---	<0.00010	2.96	<0.00010	<0.0010	<0.0030	0.0147	<0.0050	<0.010
03-5	06-Jul-17	17507170706009	<0.0050	<0.00050	<0.00050	0.0161	<0.00050	---	0.33	0.000411	<0.00050	0.0005	<0.0010	<0.15	<0.00025	0.0897	0.434	<0.0000050	0.00028	0.0082	0.00168	---	<0.000050	3.15	0.000079	<0.00050	<0.0015	0.015	<0.0025	<0.0050
03-5	19-Sep-17	17507170919005	<0.0050	<0.00050	<0.00050	0.0140	<0.00050	---	0.32	0.000416	<0.00050	0.00303	<0.0010	<0.15	<0.00025	0.0863	1.620	<0.0000050	0.0003	0.0134	0.00059	---	<0.000050	3.6	0.00009	<0.00050	<0.0015	0.0123	<0.0025	0.0075
03-5	15-Nov-17	17507171115014	0.018	<0.0010	<0.0010	0.0151	<0.0010	---	0.38	0.000768	<0.0010	0.0023	<0.0020	<0.15	<0.00050	0.093	2.070	<0.0000050	<0.00050	0.0163	<0.00050	---	<0.00010	3.34	<0.00010	<0.0010	<0.0030	0.0141	<0.0050	<0.010
03-5	15-May-18	17507180515008	<0.010	<0.0010	<0.0010	0.0162	<0.0010	---	0.36	0.000538	<0.0010	0.0014	<0.0020	<0.10	<0.00050	0.092	1.320	<0.0000050	<0.00050	0.0129	0.00072	---	<0.00010	3.46	<0.00010	<0.0010	<0.0030	0.0116	<0.0050	<0.010
03-5	27-Jul-18	17507180727008	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.59	0.00063	<0.001	0.0016	0.0025	<0.1	<0.0005	0.1	1.310	<0.000025	<0.001	0.012	0.0028	---	<0.0001	---	<0.0001	---	0.003	0.014	<0.001	0.007
BH-104	08-Jun-10	17507100608002	<0.01	<0.0008	<0.0008	0.0181	<0.001	<0.001	0.34	<0.001	<0.025	<0.002	0.0034	<0.03	<0.005	0.0677	<0.005	<0.0001	<0.005	0.0178	0.0112	3.26	<0.005	4.28	<0.05	<0.05	0.0011	0.0146	<0.005	0.0098
BH-104	12-Oct-10	17507101012002	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
BH-104	15-Apr-15	17507150415011	0.018	<0.001	<0.001	0.018	<0.001	---	0.27	0.000616	<0.001	<0.002	0.001	<0.15	<0.0005	0.059	<0.025	<0.00005	<0.0005	0.0055	0.00882	---	<0.0001	---	<0.0001	<0.001	<0.003	0.0133	<0.005	<0.01
BH-104	03-Jun-15	17507150603011	<0.01	<0.001	<0.001	0.0182	<0.001	---	0.33	0.000639	<0.001	<0.001	0.0025	<0.15	<0.0005	0.08	<0.025	<0.00005	<0.0005	0.0055	0.00926	---	<0.0001	3.22	<0.0001	<0.001	0.0047	0.0123	<0.005	<0.01
BH-105(R)	05-Nov-15	17507151105004	0.017	0.0013	<0.001	0.0192	<0.001	---	0.27	0.0018	<0.001	0.0192	<0.002	<0.15	<0.0005	0.049	0.604	<0.000005	0.00657	0.079	0.00341	---	<0.0001	5.07	<0.0001	<0.001	<0.003	0.0564	<0.005	0.025
BH-105(R)	29-Apr-16	17507160429010	<0.01	<0.001	0.0012	0.012	<0.001	---	0.28	0.00103	<0.001	0.0126	<0.002	<0.15	<0.0005	0.037	0.434	<0.000005	0.00322	0.0229	<0.0005	---	<0.0001	5.53	<0.0001	<0.001	<0.003	0.0584	<0.005	0.026
BH-105(R)	15-Jun-16	17507160615013	<0.01	<0.001	<0.001	0.012	<0.001	---	0.28	0.00143	<0.001	0.0126	<0.002	<0.15	<0.0005	0.042	0.405	<0.000005	0.00253	0.0264	<0.0005	---	<0.0001	5.3	<0.0001	<0.001	<0.003	0.0522	<0.005	0.025
BH-105(R)	09-Sep-16	17507160909008	<0.005	<0.0005	0.00075	0.0113	<0.0005	---	0.31	0.000613	<0.0005	0.0107	<0.001	<0.15	<0.00025	0.0463	0.477	<0.000005	0.00201	0.0193	0.00038	---	<0.00005	5.12	0.000072	<0.0005	<0.0015	0.0543	<0.0025	0.0252
BH-105(R)	15-Nov-16	17507161115010	<0.010	<0.0010	<0.0010	0.0102	<0.0010	---	0.27	0.000690	<0.0010	0.0105	<0.0020	0.29	<0.00050	0.04	0.467	<0.0000050	0.00159	0.0153	<0.00050	---	<0.00010	5.02	<0.00010	<0.0010	<0.0030	0.0495	<0.0050	0.024
BH-105(R)	08-May-17	17507170508004	0.154	<0.0010	0.0015	0.0129	<0.0010	---	0.26	0.000257	<0.0010	0.0099	<0.0020	1.66	<0.00050	0.04	0.334	<0.0000050	0.00117	0.0126	<0.00050	---	<0.00010	4.85	<0.00010	<0.0010	<0.0030	0.0421	<0.0050	0.024
BH-105(R)	06-Jul-17	17507170706003	<0.0050	<0.00050	0.00171	0.00958	<0.00050	---	0.27	0.000398	0.00071	0.00865	<0.0010	0.73	<0.00025	0.0502	0.254	<0.0000050	0.00183	0.0122	<0.00025	---	<0.000050	5.04	0.000054	<0.00050	<0.0015	0.0532	<0.0025	0.0282
BH-105(R)	19-Sep-17	17507170919009	<0.0050	<0.00050	0.00162	0.00777	<0.00050	---	0.24	0.000353	<0.00050	0.0071	0.0013	0.53	<0.00025	0.0382	0.193	<0.0000050	0.00173	0.0096	<0.00025	---	<0.000050	5.22	0.000054	<0.00050	<0.0015	0.0503	<0.0025	0.0255
BH-105(R)	15-Nov-17	17507171115005	<0.0050	<0.00050	<0.00050	0.00903	<0.00050	---	0.31	0.000962	<0.00050	0.00903	0.0013	<0.15	<0.00025	0.0521	0.308	<0.0000050	0.00187	0.0199	0.00044	---	<0.000050	5.69	0.000074	<0.00050	<0.0015	0.0594	<0.0025	0.0197
BH-105(R)	15-May-18	17507180515012	<0.0050	<0.00050	0.0008	0.0091	<0.00050	---	0.28	0.000494	<0.00050	0.0123	0.0047	0.424	<0.00025	0.0559	0.280	<0.0000050	0.00136	0.014	0.00025	---	<0.000050	5.46	0.000051	<0.00050	<0.0015	0.0552	<0.0025	0.0251
BH-105(R)	27-Jul-18	17507180727012	0.006	<0.001	<0.001	<0.05	<0.001	---	0.43	0.00053	<0.001	0.0112	0.0013	<0.1	<0.0005	0.059	0.289	<0.000025	0.001	0.015	0.0019	---	<0.0001	---	<0.0001	---	0.003	0.056	<0.001	0.018
BH-105(R)	11-Sep-18	17507180911012	<0.004	<0.001	0.001	<0.05	<0.001	---	0.33	0.00043	<0.001	0.0094	0.0009	<0.1	<0.0005	0.066	0.315	<0.000025	0.001	0.012	0.0008	---	<0.0001	---	<0.0001	---	0.002	0.059	0.002	0.018
BH-105(R)	07-Dec-18	17507181207011	0.02	<0.001	<0.001	<0.05	<0.001	---	0.34	0.00043	<0.001	0.0101	0.001	0.3	<0.0005	0.06	0.325	<0.000025	0.001	0.012	0.001	---	<0.0001	5.13	<0.0001	<0.0005	0.007	0.061	<0.001	0.017
BH-105(R)	07-Dec-18	17507181207012	0.005	<0.001	<0.001	<0.05	<0.001	---	0.33	0.00035	<0.001	0.0101	<0.0008	0.2	<0.0005	0.064	0.330	<0.000025	0.001	0.013	0.0013	---	<0.0001	5.11	<0.0001	<0.0005	0.014	0.059	<0.001	0.019
15-9	29-Apr-16	17507160429011	<0.01	<0.001	<0.001	0.0204	<0.001	---	0.36	0.002	<0.001	0.0063	<0.002	<0.15	<0.0005	0.093	4.090	<0.000005	0.00123	0.0221	0.00746	---	<0.0001	4.80	0.00012	<0.001	0.0035	0.0309	<0.005	0.011
15-9	15-Jun-16	17507160615015	0.015	<0.001	<0.001	0.0185	<0.001	---	0.35	0.00197	<0.001	0.0056	0.0049	<0.15	<0.0005	0.10	4.040	<0.000005	0.00118	0.0237	0.00648	---	<0.0001	4.34	<0.0001	<0.001	<0.003	0.0270	<0.005	0.015
15-9	09-Sep-16	17507160909010	0.057	<0.001	<0.001	0.0148	<0.001	---	0.34	0.00173	<0.001	0.0050	0.0047	<0.15	<0.0005	0.122	3.520	<0.000005	0.00120	0.0220	0.00727	---	<0.0001	4.10	<0.0001	<0.001	<0.003	0.0298	<0.005	0.011
15-9	15-Nov-16	17507161115012	<0.010	<0.0010	<0.0010	0.0133	<0.0010	---	0.34	0.00177	<0.0010	0.0059	0.0020	<0.15	<0.00050	0.149	3.340	<0.0000050	0.00157	0.0247	0.00779	---	<0.00010	4.12	<0.00010	<0.0010	<0.0030	0.0387	<0.0050	<0.010
15-9	08-May-17	17507170508006	<0.010	<0.0010	<0.0010	0.0134	<0.0010	---	0.33	0.00235	<0.0010	0.0089	0.0020	<0.15	<0.00050	0.183	2.990	<0.0000050	0.00150	0.0351	0.00376	---	<0.00010	4.04	<0.00010	<0.0010	<0.0030	0.0418	<0.0050	0.016
15-9	06-Jul-17	17507170706006	0.0119	<0.00050	<0.00050	0.0124	<0.00050	---	0.35	0.00197	<0.00050	0.00674	0.0022	<0.15	<0.00025	0.173	4.280	<0.0000050	0.00113	0.0277	0.00218	---	<0.000050	4.22	0.000092	<0.00050	<0.0015	0.0465	<0.0025	0.0114
15-9	19-Sep-17	17507170919011	<0.010	<0.0010	<0.0010	0.0122	<0.0010	---	0.37	0.00185	<0.0010	0.0035	<0.0020	<0.15	<0.00050	0.157	3.340	<0.0000050	0.00084	0.0214	0.00248	---	<0.00010	4.19	<0.00010	<0.0010	<0.0030	0.039	<0.0050	<0.010
15-9	15-May-18	17507180515013	0.506	<0.0010	<0.0010	0.0211	<0.0010	---	0.35	0.000677	0.0011	<0.0010	0.0040	0.46	0.00084	0.215	0.083	<0.0000050	0.00126	0.0178	0.00361	---	<0.00010	4.31	<0.00010	<0.0010	0.0079	0.0468	<0.0050	0.014
15-9	27-Jul-18	17507180727013	0.005	<0.001	<0.001	<0.05	<0.001	---	0.55	0.00075	<0.001	<0.0009	0.0018	<0.1	<0.0005	0.211	0.036	<0.000025	<0.001	0.018	0.0033	---	<0.0001	---	<0.0001	---	0.004	0.054	<0.001	0.008
15-9	11-Sep-18	17507180911013	0.032	<0.001	0.001	<0.05	<0.001	---	0.42	0.00092	<0.001	<0.0009	0.0017	<0.1	<0.0005	0.216	0.111	<0.000025	<0.001	0.014	0.004	---	<0.0001	---	<0.0001	---	0.004	0.053	0.002	0.008
15-9	07-Dec-18	17507181207013	0.005	<0.001	<0.001	<0.05	<0.001	---	0.42	0.00065	<0.001	<0.0009	0.0017	<0.1	<0.0005	0.184	0.058	<0.000025	<0.001	0.013	0.0035	---	<0.0001	4.18	<0.0001	<0.0005	0.007	0.053	<0.001	0.007
15-10	29-Apr-16	17507160429012	<0.01	<0.001	<0.001	0.0208	<0.001	---	0.45	0.0019	<0.001	0.0269	<0.002	<0.15	<0.0005	0.094	1.940	<0.000005	0.00522	0.0861	0.0210	---	<0.0001	4.97	0.00015	<0.001	<0.003	0.0316	<0.005	0.021
15-10	15-Jun-16	17507160615016	<0.01	<0.001	<0.001	0.0210	<0.001	---	0.45	0.00214	<0.001	0.0246	<0.002	<0.15	<0.0005	0.1	1.810	<0.000005	0.00384	0.0774	0.0132	---	<0.0001	4.68	0.00011	<0.001	<0.003	0.0261	<0.005	0.020
15-10	09-Sep-16	17507160909011	0.019	<0.001	<0.001	0.0161	<0.001	---	0.43	0.00249	<0.001	0.0234	<0.002	<0.15	<0.0005	0.102	2.130	<0.000005	0.00234	0.0719	0.0120	---	<0.0001	4.31	<0.0001	<0.001	<0.003	0.0213	<0.005	0.025
15-10	15-Nov-16	17507161115013	<0.010	<0.0010	<0.0010	0.0148	<0.0010	---	0.42	0.00222	<0.0010	0.0237	<0.0020	<0.15	<0.00050	0.098	2.280	<0.0000050	0.00200	0.0731	0.0107	---	<0.00010	4.29	<0.00010	<0.0010	<0.0030	0.0191	<0.0050	0.029
15-10	08-May-17	17507170508008	<0.010	<0.0010	<0.0010	0.0155	<0.0010	---	0.42	0.00262	<0.0010	0.0197	<0.0020	<0.15	<0.00050	0.124	2.320	<0.0000050	0.00102	0.0738	0.0088	---	<0.00010	4.30	<0.00010	<0.0010	<0.0030	0.0198	<0.0050	0.025
15-10	06-Jul-17	17507170706007	<0.0050	<0.00050	<0.00050	0.0128	<0.00050	---	0.44	0.00231	<0.00050	0.0189	<0.0010	<0.15	<0.00025	0.114	2.170	<0.0000050	0.00109	0.0625	0.00732	---	<0.000050	4.35	0.0001	<0.00050	<0.0015	0.0202	<0.0025	0.0249
15-10	19-Sep-17	17507170919010	0.006	<0.00050	<0.00050	0.012	<0.00050	---	0.39	0.00156	<0.00050	0.0168	<0.0010	<0.15	<0.00025	0.1	1.870	<0.0000050	0.00133	0.0487	0.00567	---	<0.000050	4.81	0.000086	<0.00050	<0.0015	0.0156	<0.0025	0.0232

TABLE F3

2008-2018 Groundwater and Leachate Quality Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	Bi mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Si mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
15-10	15-May-18	17507180515014	<0.010	<0.0010	<0.0010	0.0125	<0.0010	---	0.45	0.000981	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	0.125	0.067	<0.0000050	0.00056	0.0385	0.00871	---	<0.00010	4.63	<0.00010	<0.0010	<0.0030	0.0167	<0.0050	0.02
15-10	27-Jul-18	17507180727014	0.011	<0.001	<0.001	<0.05	<0.001	---	0.66	0.00114	<0.001	<0.0009	0.0017	0.4	<0.0005	0.126	0.139	<0.000025	<0.001	0.039	0.0092	---	<0.0001	---	<0.0001	---	0.003	0.02	<0.001	0.018
15-10	11-Sep-18	17507180911014	0.017	<0.001	0.001	<0.05	<0.001	---	0.52	0.00138	<0.001	<0.0009	0.0039	<0.1	<0.0005	0.13	0.402	<0.000025	<0.001	0.036	0.0061	---	<0.0001	---	<0.0001	---	0.002	0.02	0.002	0.021
15-10	07-Dec-18	17507181207014	0.049	<0.001	<0.001	<0.05	<0.001	---	0.54	0.0009	<0.001	0.001	<0.0008	<0.1	<0.0005	0.117	0.348	<0.000025	<0.001	0.027	0.0075	---	<0.0001	4.51	<0.0001	<0.0005	0.005	0.018	<0.001	0.018
15-11	05-Nov-15	17507151105100	<0.01	0.0013	<0.001	0.0304	<0.001	<0.0005	0.33	0.000679	<0.001	0.0181	<0.002	<0.15	<0.0005	0.112	1.670	<0.000005	0.00897	0.0656	0.0388	4.39	<0.0001	4.77	0.00017	<0.001	<0.003	0.0453	<0.005	0.045
15-11	15-Jun-16	23458160615001	0.016	0.0012	<0.0010	0.0174	<0.0010	---	0.42	0.00236	<0.0010	0.0293	0.0052	<0.15	<0.00050	0.093	3.780	<0.0000050	0.00274	0.0836	0.00529	---	<0.00010	4.21	0.00015	<0.0010	<0.0030	0.0278	<0.0050	0.027
15-11	09-Sep-16	23458160909001	0.0224	0.00055	<0.00050	0.0156	<0.00050	---	0.41	0.00254	<0.00050	0.0256	0.001	<0.15	<0.00025	0.111	3.640	<0.0000050	0.00188	0.0708	0.00595	---	<0.000050	4.3	0.000124	<0.00050	<0.0015	0.0255	<0.0025	0.0255
15-11	15-May-18	17507180515015	<0.010	<0.0010	<0.0010	0.0108	<0.0010	---	0.40	0.00203	<0.0010	<0.0010	<0.0020	<0.10	<0.00050	0.109	0.644	<0.0000050	<0.00050	0.0352	0.00169	---	<0.00010	4.32	<0.00010	<0.0010	<0.0030	0.0215	<0.0050	0.023
15-11	27-Jul-18	17507180727015	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.63	0.00154	<0.001	<0.0009	<0.0008	<0.1	<0.0005	0.118	0.594	<0.000025	<0.001	0.037	0.0034	---	<0.0001	---	<0.0001	---	0.005	0.026	<0.001	0.019
15-11	11-Sep-18	17507180911015	0.007	<0.001	0.001	<0.05	<0.001	---	0.50	0.00167	<0.001	<0.0009	<0.0008	<0.1	<0.0005	0.13	0.957	<0.000025	<0.001	0.035	0.0028	---	<0.0001	---	0.0001	---	0.003	0.027	0.002	0.019
15-11	07-Dec-18	17507181207015	<0.004	<0.001	<0.001	<0.05	<0.001	---	0.50	0.001	<0.001	<0.0009	0.0014	<0.1	<0.0005	0.115	0.312	<0.000025	<0.001	0.023	0.0032	---	<0.0001	4.46	<0.0001	<0.0005	0.004	0.028	<0.001	0.017
Leachate Vault 1	14-Jun-11	17507110614008	<0.2	<0.016	0.027	1.87	<0.02	<0.02	<1	<0.001	<0.1	<0.040	<0.02	1.47	<0.1	0.12	5.950	<0.0001	<0.1	0.048	<0.016	9.51	<0.002	12.9	<1	<1	<0.02	0.0036	0.028	<0.040
Leachate Vault 1	08-Nov-11	17507111108009	0.21	<0.016	0.025	5.56	<0.02	<0.02	1.00	<0.001	<0.1	<0.040	<0.02	2.54	<0.1	0.213	5.630	<0.0001	<0.1	0.074	<0.016	11.3	<0.002	17	<1	<1	<0.02	0.0021	0.031	0.052
Leachate Vault 1	31-May-12	17507120531009	<0.5	<0.01	0.022	3.34	<0.05	<0.05	<1	<0.005	<0.05	<0.01	<0.01	2.06	<0.01	<0.5	3.630	<0.00005	0.0075	0.081	<0.1	10.1	<0.001	17.3	<0.01	<0.01	<0.1	0.0081	<0.1	<0.5
Leachate Vault 1	19-Jun-13	17507130619001	<0.15	<0.005	0.0147	---	---	---	---	<0.0025	<0.025	0.0488	<0.025	4.20	<0.0025	---	5.060	<0.00025	0.233	0.236	<0.05	---	<0.0005	---	<0.005	---	---	0.01	---	---
Leachate Vault 1	01-Oct-13	17507131001010	0.14	<0.01	<0.01	1.2	<0.05	---	<1	<0.001	<0.01	0.055	<0.01	80.4	<0.005	<0.30	5.200	<0.0001	0.0317	0.207	<0.01	---	<0.001	---	<0.005	<0.05	<0.03	0.0014	<0.01	1.24
Leachate Vault 1	21-May-14	17507140521011	0.085	<0.005	0.0132	1.65	<0.025	---	<0.5	<0.0005	0.0053	0.0197	<0.005	18.9	<0.0025	0.25	6.450	<0.00005	0.0141	0.15	<0.005	---	<0.0005	---	<0.0025	<0.005	0.02	0.0399	0.0308	<0.2
Leachate Vault 1	11-Sep-14	17507140911003	0.063	0.001	0.013	3.27	<0.005	---	0.38	<0.0001	0.0042	0.0023	0.0013	148	<0.0005	0.252	10.100	<0.00005	0.0141	0.0923	0.0026	---	<0.0001	---	<0.0005	<0.001	0.0098	0.00051	0.067	<0.04
Leachate Vault 1	03-Jun-15	17507150603013	0.104	0.0017	0.0192	3.66	<0.001	---	0.47	0.000114	0.0063	0.0109	0.0021	1.79	<0.0005	0.255	5.840	<0.0005	0.0036	0.102	0.0107	---	<0.0001	26.9	<0.0001	<0.001	0.0186	0.00771	0.0445	<0.01
Leachate Vault 1	02-Sep-15	17507150902012	0.066	0.0025	0.0075	1.36	<0.002	---	<0.2	0.00024	<0.002	0.0141	0.004	4.22	0.0015	0.089	1.250	<0.000025	0.0777	0.086	0.0021	---	<0.0002	14.2	<0.0002	<0.002	<0.006	0.0187	<0.01	0.116
Leachate Vault 1	29-Apr-16	17507160429013	<0.1	<0.01	0.0140	2.07	<0.01	---	<1.0	<0.0005	<0.01	0.016	<0.020	2.6	<0.005	0.2	6.590	<0.00005	0.006	0.128	<0.005	---	<0.001	24.6	<0.001	<0.01	<0.03	0.0271	<0.050	<0.1
Leachate Vault 1	15-Jun-16	17507160615014	0.045	0.0024	0.0041	0.335	<0.002	---	0.25	0.0003	<0.002	0.013	0.0043	1.99	0.0014	0.084	1.210	<0.000005	0.0391	0.067	0.0019	---	<0.0002	5.03	<0.0002	<0.002	<0.006	0.00962	<0.01	0.045
Leachate Vault 1	09-Sep-16	17507160909009	0.047	<0.002	0.0191	2.51	<0.002	---	0.37	<0.0001	0.0026	0.0045	<0.0040	1.71	<0.001	0.131	2.920	<0.000025	0.0081	0.063	0.0044	---	<0.0002	15.4	<0.0002	<0.002	0.0071	0.00385	0.018	<0.02
Leachate Vault 1	15-Nov-16	17507161115011	0.095	<0.0050	0.0156	3.73	<0.0050	---	<0.50	<0.00025	<0.0050	0.0090	<0.010	4.3	<0.0025	0.175	6.210	<0.000025	0.0044	0.095	0.0295	---	<0.00050	23.1	<0.00050	<0.0050	<0.015	0.00229	0.049	<0.050
Leachate Vault 1	08-May-17	17507170508005	<0.050	<0.0050	0.0121	1.31	<0.0050	---	<0.50	<0.00025	<0.0050	0.0171	<0.010	14.7	<0.0025	0.185	4.970	<0.000050	0.0547	0.137	0.0104	---	<0.00050	18.2	<0.00050	<0.0050	<0.015	0.0127	<0.025	<0.050
Leachate Vault 1	19-Sep-17	17507170919012	0.063	<0.0050	0.0188	2.37	<0.0050	---	<0.50	<0.00025	<0.0050	0.0147	<0.010	16.1	<0.0025	0.156	3.050	<0.0000050	0.0264	0.123	<0.0025	---	<0.00050	22.3	<0.00050	<0.0050	<0.015	0.00729	<0.025	<0.050
Leachate Vault 1	15-Nov-17	17507171115009	<0.10	<0.010	0.018	4.8	<0.010	---	<1.0	<0.00050	<0.010	<0.010	<0.020	5.8	0.01	0.38	4.840	<0.0000050	0.0064	0.092	<0.0050	---	<0.0010	25.5	<0.0010	<0.010	<0.030	0.0013	<0.050	<0.10
Leachate Vault 1	15-May-18	17507180515007	<0.10	<0.010	0.024	2.3	<0.010	---	<1.0	<0.00050	<0.010	0.04	<0.020	5.8	<0.0050	0.64	5.170	<0.000050	0.146	0.234	<0.0050	---	<0.0010	66.4	<0.0010	<0.010	<0.030	0.0177	<0.050	<0.10
Leachate Vault 1	27-Jul-18	17507180727016	0.033	0.005	0.038	3.95	<0.001	---	1.02	0.00039	0.007	0.0344	0.0019	3	<0.0005	0.65	4.850	<0.000025	0.104	0.218	0.124	---	<0.0001	---	<0.0001	---	0.059	0.014	0.036	0.021
Leachate Vault 1	11-Sep-18	17507180911016	0.052	0.003	0.032	3.78	<0.001	---	0.58	0.00039	0.005	0.0224	0.0024	23.9	0.0006	0.471	3.410	<0.000025	0.065	0.139	0.0818	---	0.0001	---	<0.0001	---	0.051	0.01	0.029	0.024
Leachate Vault 1	07-Dec-18	17507181207016	0.041	0.005	0.028	5.95	<0.001	---	0.60	0.00033	0.006	0.0341	0.0012	33.5	<0.0005	0.599	5.350	<0.000025	0.102	0.203	0.771	---	0.0001	82.7	<0.0001	<0.0005	0.098	0.015	0.042	0.058
Leak Detection System	14-Jun-11	17507110614009	<0.01	<0.0008	<0.0008	0.0155	<0.001	<0.001	0.18	0.000061	<0.005	0.0022	<0.001	2.00	<0.005	0.0599	0.784	<0.0001	<0.005	0.0184	<0.0008	4.89	<0.0001	1.73	<0.05	<0.05	<0.001	0.0182	<0.001	0.0171
Leak Detection System	08-Nov-11	17507111108010	<0.01	<0.0008	<0.0008	0.0182	<0.001	<0.001	0.21	0.000453	<0.005	0.0035	<0.001	<0.03	<0.005	0.0751	1.160	<0.0001	<0.005	0.0239	<0.0008	5.72	<0.0001	1.84	<0.05	<0.05	<0.001	0.0224	<0.001	0.0051
Leak Detection System	31-May-12	17507120531010	<0.05	<0.001	<0.001	0.0168	<0.005	<0.005	0.24	0.00087	<0.005	0.0026	0.0048	0.103	<0.001	0.094	0.699	<0.00005	0.00098	0.0244	<0.01	4.82	<0.0001	1.84	<0.001	<0.001	0.048	0.0206	<0.01	<0.05
Leak Detection System	22-Oct-12	17507121022008	<0.01	<0.0008	<0.0008	0.0259	<0.001	<0.001	0.19	0.000464	<0.005	0.0022	0.0012	0.068	<0.005	0.0724	0.763	<0.0001	<0.005	0.0251	<0.0008	5.96	<0.0001	1.88	<0.05	<0.05	<0.001	0.0195	<0.001	0.0119
Leak Detection System	01-Oct-13	17507131001001	0.011	<0.0005	<0.0005	0.0167	<0.0025	---	0.21	0.000310	<0.005	<0.002	0.0025	<0.05	<0.00025	0.092	0.379	<0.0001	<0.005	0.0218	<0.0005	---	<0.0001	---	<0.00025	<0.05	<0.0015	0.0192	<0.001	0.0136
Leak Detection System	19-Jun-13	17507130619010	<0.01	<0.0005	<0.001	---	---	---	---	0.000440	<0.001	0.00134	0.0022	0.142	<0.001	---	0.369	<0.00005	<0.001	0.0193	<0.002	---	<0.00005	---	<0.0002	---	---	0.0215	---	---
Leak Detection System	21-May-14	17507140521001	<0.01	<0.001	<0.001	0.0148	<0.005	---	0.20	0.000460	<0.001	<0.001	0.0025	1.62	<0.0005	0.101	0.193	<0.00005	<0.0005	0.0161	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0223	<0.001	<0.04
Leak Detection System	11-Sep-14	17507140911004	<0.01	<0.001	<0.001	0.0197	<0.005	---	0.20	0.000120	<0.001	0.004	0.0013	1.76	<0.0005	0.095	0.988	<0.00005	0.00054	0.0208	<0.001	---	<0.0001	---	<0.0005	<0.001	<0.003	0.0226	<0.001	<0.04
Leak Detection System	15-Apr-15	17507150415002	0.0202	<0.0005	0.00052	0.0158	<0.0005	---	0.22	0.000448	<0.0005	0.0021	0.00079	0.69	<0.00025	0.0837	0.860	<0.00005	0.00056	0.0211	<0.00025	---	<0.00005	---	<0.00005	<0.0005	<0.0015	0.021	<0.0025	0.0127
Leak Detection System	03-Jun-15	17507150603014	0.118	<0.001	<0.001	0.112	<0.001	---	<0.1	0.000312	<0.001	<0.001	0.0021	0.23	<0.0005	<0.01	0.072	<0.00025	<0.0005	0.0054	<0.0005	---	<0.0001	0.0816	<0.0001	<0.001	<0.003	0.00034	<0.005	<0.01
Leak Detection System	02-Sep-15	17507150902004	0.048	<0.001	<0.001	0.0253	<0.001	---	0.20	0.000157	<0.001	0.0046	<0.002	<0.15	<0.0005	0.063	0.869	<0.000005	0.00053	0.0213	<0.0005	---	<0.0001	1.8	<0.0001	<0.001	<0.003	0.0176	<0.005	0.132
Leak Detection System	05-Nov-15	17507151105005	0.012	<0.001	<0.001	0.0225	<0.001	---	0.21	0.000301	<0.001	0.0018	<0.002	<0.15	<0.0005	0.092	0.729	<0.000005	0.00053	0.0181	<0.0005	---	<0.0001	1.89	<0.0001	<0.001	<0.003	0.0191	<0.005	0.014
Leak Detection System	29-Apr-16	17507160429009	<0.01	<0.001	<0.001	0.0158	<0.001	---	0.23	0.000180	<0.001	0.0013	0.0041	<0.15	<0.0005	0.071	0.413	<0.000005	0.00113	0.0171	<0.0005	---	<0.0001	2.22	<0.0001	<0.001	<0.003	0.0222	<0.005	0.012
Leak Detection System	15-Jun-16	17507160615018	0.017	<0.001	<0.001	0.0332	<0.001	---	0.16	0.000199	<0.001	0.0018	0.0026	0.16	<0.0005	0.05	0.555	<0.000005	0.00059	0.0157	<0.0005	---	<0.0001	1.45	<0.0001	<0.001	<0.003	0.0134	<0.005	0.016
Leak Detection System	09-Sep-16	17507160909013	0.0078	<0.0005	<0.0005	0.0174	<0.0005	---	0.23	0.000447	<0.0005	0.0017	0.0024	<0.15	<0.00025	0.0798	0.603	<0.000005	0.0005	0.02	0.00046	---	<0.00005	1.9	<0.00005	<0.0005	<0.0015	0.0192	<0.0025	0.0314
Leak Detection System	15-Nov-16	17507161115009	<0.010	<0.0010	<0.0010	0.0214	<0.0010	---	0.19	0.001610	<0.0010	0.0073	0.0057	0.36	<0.00050	0.085	1.170	<0.0000050	0.00072	0.0274	0.00259	---	<0.00010	2.29	<0.00010	<0.0010	<0.0030	0.0134	<0.0050	0.016
Leak Detection System	08-May-17	17507170508003	<0.010	<0.0010	<0.0010	0.0160	<0.0010	---	0.22	0.000441	<0.0010	0.0019	<0.0020	<0.15	<0.00050	0.082	0.733	<0.0000050	<0.00050	0.0234	<0.00050	---	<0.00010	1.85	<0.00010	<0.0010	<0.0030	0.0201	<0.0050	<0.010
Leak Detection System	06-Jul-17	17507170706002	0.0086	<0.00050	<0.00050	0.0161	<0.00050	---	0.23	0.000360	<0.00050	0.00204	0.0017	<0.15	<0.00025	0.0818	0.826	<0.0000050	0.00057	0.0236	0.0004	---	<0.000050	1.96	<0.000050	<0.00050	<0.0015	0.0193	<0.0025	0.0055
Leak Detection System	19-Sep-17	17507170919008	0.0069	<0.00050	0.00053	0.0185	<0.00050	---	0.21	0.000112	<0.00050	0.00297	<0.0010	1.6	<0.00025	0.0806	0.950	<0.0000050	0.00048	0.0214	0.00026	---	<0.000050	2.42	<0.000050	<0.00050	<0.0015	0.0164	<0.0025	0.0067
Leak Detection System	15-May-18	17507180515016	<0.0050	<0.00050	<0.00050	0.0186	<0.00050	---	0.22	0.000276	<0.00050	0.00094	0.0023	<0.050	<0.00025	0.121	0.353	<0.0000050	0.00041	0.0125	0.00039	---	<0.000050	2.27	<0.000050	<0.00050	<0.0015	0.0156	<0.0025	0.0061
Leak Detection System	27-Jul-18	17507180727017	0.019	<0.001	0.002	<0.05	<0.001	---	0.38	0.002830	<0.001	0.0067	0.0039	0.9	<0.0005	0.141	1.520	<0.000025	0.001	0.043	0.008	---	<0.0001	---	0.0001	---	0.004	0.024	0.001	0.015
Leak Detection System	11-Sep-18	17507180911017	0.067	<0.001	0.001	<0.05	<0.001	---	0.26	0.001000	<0.001	0.0036	0.0037	0.6	<0.0005	0.11	0.795	<0.000025	<0.001	0.023	<0.0005	---	<0.0001	---	<0.0001	---	0.004	0.019	0.003	0.01
Leak Detection System	07-Dec-18	17507181207017	0.007	<0.001	<0.001	<0.05	<0.001	---	0.28	0.000490	<0.001	0.0017	0.0019	<0.1	<0.0005	0.127	0.544	<0.000025	<0.001	0.019	0.004	---	<0.0001	2.4	<0.0001	<0.0005	0.004	0.021	<0.001	0.009

Notes:

Bold - background well

--- - not analyzed

^ - all data after 2012 are no longer considered to represent background conditions

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
Background														
BH-103	08-Jun-08	17507080608001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
BH-103	14-Oct-08	17507081014001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
BH-103	15-Jun-09	17507090615001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
BH-103	22-Sep-09	17507090922001	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
BH-103	08-Jun-10	17507100608001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	12-Oct-10	17507101012001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	08-Nov-11	17507111108008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	31-May-12	17507120531001	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
BH-103	23-Oct-12	17507121023001	<0.0005	<0.0005	<0.0005	0.00083	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	19-Jun-13	17507130619012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	21-May-14	17507140521006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
BH-103	11-Sep-14	17507140911005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	15-Apr-15	17507150415003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	03-Jun-15	17507150603009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-103	02-Sep-15	17507150902001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	---	---	<0.005
BH-103	05-Nov-15	17507151105001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
BH-103	29-Apr-16	17507160429001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	15-Jun-16	17507160615001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	09-Sep-16	17507160909005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	15-Nov-16	17507161115001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	---
BH-103	08-May-17	17507170508001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	06-Jul-17	17507170706014	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	19-Sep-17	17507170919013	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	15-Nov-17	17507171115002	<0.0005	0.00098	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-103	15-May-18	17507180515009	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
BH-103	27-Jul-18	17507180727009	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-103	11-Sep-18	17507180911009	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1	08-Jun-08	17507080608003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	---	---	---	<0.001
MW92-1	22-Sep-09	17507090922004	---	---	---	---	---	---	---	---	<0.25	0.54	---	---
MW92-1	08-Jun-10	17507100608005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	12-Oct-10	17507101012005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	14-Jun-11	17507110614001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	08-Nov-11	17507111108001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	31-May-12	17507120531004	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
MW92-1	22-Oct-12	17507121022003	<0.0005	0.00064	<0.0005	0.00143	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	19-Jun-13	17507130619003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	01-Oct-13	17507131001006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
MW92-1	21-May-14	17507140521004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	11-Sep-14	17507140911010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	15-Apr-15	17507150415009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	03-Jun-15	17507150603001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	02-Sep-15	17507150902008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1	05-Nov-15	17507151105011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	29-Apr-16	17507160429005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
MW92-1	15-Jun-16	17507160615012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	09-Sep-16	17507160909012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	15-Nov-16	17507161115005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	08-May-17	17507170508012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	06-Jul-17	17507170706011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	19-Sep-17	17507170919003	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	15-Nov-17	17507171115013	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1	15-May-18	17507180515001	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-1	27-Jul-18	17507180727001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.2	0.4	0.2	0.4	<0.001
MW92-1	11-Sep-18	17507180911001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1	07-Dec-18	17507181207001	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1A	08-Jun-08	17507080608004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-1A	08-Oct-08	17507081008002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-1A	15-Jun-09	17507090615005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-1A	22-Sep-09	17507090922005	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
MW92-1A	08-Jun-10	17507100608006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	12-Oct-10	17507101012006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	14-Jun-11	17507110614002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	08-Nov-11	17507111108002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	31-May-12	17507120531005	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
MW92-1A	22-Oct-12	17507121022004	<0.0005	0.00064	<0.0005	0.00164	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	19-Jun-13	17507130619002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	01-Oct-13	17507131001003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	21-May-14	17507140521002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	11-Sep-14	17507140911011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	15-Apr-15	17507150415008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	03-Jun-15	17507150603002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	02-Sep-15	17507150902009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-1A	05-Nov-15	17507151105010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	29-Apr-16	17507160429006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	15-Jun-16	17507160615003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	09-Sep-16	17507160909001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	15-Nov-16	17507161115004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	08-May-17	17507170508013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	06-Jul-17	17507170706010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	19-Sep-17	17507170919004	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	15-Nov-17	17507171115012	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-1A	15-May-18	17507180515002	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-1A	27-Jul-18	17507180727002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.001
MW92-1A	11-Sep-18	17507180911002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-1A	07-Dec-18	17507181207002	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
MW92-6A	08-Jun-08	17507080608005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-6A	14-Oct-08	17507081014002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-6A	15-Jun-09	17507090615006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	0.1	<0.1	---	<0.001
MW92-6A	22-Sep-09	17507090922006	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
MW92-6A	08-Jun-10	17507100608007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	12-Oct-10	17507101012007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	14-Jun-11	17507110614003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	08-Nov-11	17507111108003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	31-May-12	17507120531006	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
MW92-6A	22-Oct-12	17507121022005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	19-Jun-13	17507130619011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	01-Oct-13	17507131001005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	21-May-14	17507140521007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	11-Sep-14	17507140911006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	15-Apr-15	17507150415004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	03-Jun-15	17507150603003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	02-Sep-15	17507150902002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-6A	05-Nov-15	17507151105007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	29-Apr-16	17507160429002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	15-Jun-16	17507160615011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	09-Sep-16	17507160909006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	15-Nov-16	17507161115008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	08-May-17	17507170508002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	06-Jul-17	17507170706001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	19-Sep-17	17507170919006	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	15-Nov-17	17507171115006	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-6A	15-May-18	17507180515003	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-6A	27-Jul-18	17507180727003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.1	0.4	0.1	0.4	<0.001
MW92-6A	11-Sep-18	17507180911003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-6A	07-Dec-18	17507181207003	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7	08-Jun-08	17507080608006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	0.1	---	<0.001
MW92-7	15-Jun-09	17507090615007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-7	22-Sep-09	17507090922007	<0.0005	<0.0005	<0.0005	<0.0005	---	<0.1	<0.1	---	<0.25	<0.25	---	---
MW92-7	08-Jun-10	17507100608008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	12-Oct-10	17507101012008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	14-Jun-11	17507110614004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	08-Nov-11	17507111108004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	1.16	<0.25	<0.25	<0.25	<0.005
MW92-7	31-May-12	17507120531007	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
MW92-7	22-Oct-12	17507121022006	<0.0005	<0.0005	<0.0005	0.00066	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	19-Jun-13	17507130619007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	01-Oct-13	17507131001002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	21-May-14	17507140521010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	11-Sep-14	17507140911008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	15-Apr-15	17507150415005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	---
MW92-7	03-Jun-15	17507150603004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
MW92-7	02-Sep-15	17507150902006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7	05-Nov-15	17507151105009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	29-Apr-16	17507160429004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	15-Jun-16	17507160615010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	09-Sep-16	17507160909007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	15-Nov-16	17507161115007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	08-May-17	17507170508010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	06-Jul-17	17507170706012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	19-Sep-17	17507170919002	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	15-Nov-17	17507171115010	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7	15-May-18	17507180515004	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-7	27-Jul-18	17507180727005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7	11-Sep-18	17507180911004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
MW92-7	07-Dec-18	17507181207004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7A	08-Jun-08	17507080608007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-7A	15-Jun-09	17507090615008	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
MW92-7A	22-Sep-09	17507090922008	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
MW92-7A	08-Jun-10	17507100608009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	12-Oct-10	17507101012009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	14-Jun-11	17507110614005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	08-Nov-11	17507111108005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	31-May-12	17507120531008	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
MW92-7A	22-Oct-12	17507121022007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	19-Jun-13	17507130619004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	21-May-14	17507140521009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	11-Sep-14	17507140911009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	15-Apr-15	17507150415006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	03-Jun-15	17507150603005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	02-Sep-15	17507150902007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
MW92-7A	05-Nov-15	17507151105008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	29-Apr-16	17507160429003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	15-Jun-16	17507160615009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	09-Sep-16	17507160909004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	15-Nov-16	17507161115006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	08-May-17	17507170508011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	06-Jul-17	17507170706013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	19-Sep-17	17507170919001	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	15-Nov-17	17507171115011	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
MW92-7A	15-May-18	17507180515005	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
MW92-7A	27-Jul-18	17507180727004	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	---
MW92-7A	11-Sep-18	17507180911005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
MW92-7A	07-Dec-18	17507181207005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
03-3	15-Jun-09	17507090615002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
03-3	22-Sep-09	17507090922002	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
03-3	12-Oct-10	17507101012003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
03-3	14-Jun-11	17507110614006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-3	08-Nov-11	17507111108006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-3	31-May-12	17507120531002	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
03-3	22-Oct-12	17507121022001	<0.0005	<0.0005	<0.0005	0.0006	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-3	19-Jun-13	17507130619008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-3	01-Oct-13	17507131001007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-3	21-May-14	17507140521003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-3	11-Sep-14	17507140911001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	---
03-3	15-Apr-15	17507150415010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-3	03-Jun-15	17507150603006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	---
03-3	02-Sep-15	17507150902011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-3	05-Nov-15	17507151105013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
03-3	29-Apr-16	17507160429008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	15-Jun-16	17507160615004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
03-3	09-Sep-16	17507160909002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	15-Nov-16	17507161115002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	08-May-17	17507170508015	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	06-Jul-17	17507170706008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	19-Sep-17	17507170919007	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	15-Nov-17	17507171115015	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-3	15-May-18	17507180515006	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
03-3	27-Jul-18	17507180727006	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
03-3	11-Sep-18	17507180911007	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
03-3	07-Dec-18	17507181207008	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
03-5	08-Jun-08	17507080608002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
03-5	08-Oct-08	17507081008001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
03-5	15-Jun-09	17507090615003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	---	<0.1	<0.1	---	<0.001
03-5	22-Sep-09	17507090922003	<0.0005	<0.001	<0.0005	<0.1	<0.0005	<0.1	<0.1	---	<0.25	<0.25	---	<0.001
03-5	08-Jun-10	17507100608004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	12-Oct-10	17507101012004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	14-Jun-11	17507110614007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	08-Nov-11	17507111108007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	31-May-12	17507120531003	<0.0005	<0.0005	<0.0005	<0.0005	<0.001	<0.1	<0.1	<0.05	<0.25	<0.25	<0.05	<0.005
03-5	22-Oct-12	17507121022002	<0.0005	0.00181	0.0007	0.00283	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	19-Jun-13	17507130619009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	01-Oct-13	17507131001004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	21-May-14	17507140521005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-5	11-Sep-14	17507140911002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	15-Apr-15	17507150415007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
03-5	02-Sep-15	17507150902010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.005
03-5	05-Nov-15	17507151105012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	29-Apr-16	17507160429007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
03-5	15-Jun-16	17507160615002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	09-Sep-16	17507160909003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	15-Nov-16	17507161115003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	08-May-17	17507170508014	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	06-Jul-17	17507170706009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	19-Sep-17	17507170919005	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	15-Nov-17	17507171115014	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
03-5	15-May-18	17507180515008	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
03-5	27-Jul-18	17507180727008	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-104	08-Jun-10	17507100608002	<0.0005	<0.0005	<0.0005	0.00066	<0.5	<0.1	---	<0.25	<0.25	<0.25	<0.25	<0.005
BH-104	12-Oct-10	17507101012002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	---	---	---	---	---	---	<0.005
BH-104	15-Apr-15	17507150415011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-104	03-Jun-15	17507150603011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
BH-104	02-Sep-15	17507150902003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	0.32	---	---	<0.005
BH-105(R)	05-Nov-15	17507151105004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	29-Apr-16	17507160429010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	15-Jun-16	17507160615013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	09-Sep-16	17507160909008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	15-Nov-16	17507161115010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	08-May-17	17507170508004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	06-Jul-17	17507170706003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	19-Sep-17	17507170919009	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	15-Nov-17	17507171115005	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
BH-105(R)	15-May-18	17507180515012	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
BH-105(R)	27-Jul-18	17507180727012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	0.1	<0.1	0.1	<0.001
BH-105(R)	11-Sep-18	17507180911012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
BH-105(R)	07-Dec-18	17507181207011	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	---
BH-105(R) dup	07-Dec-18	17507181207012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-9	05-Nov-15	17507151105003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
15-9	29-Apr-16	17507160429011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	15-Jun-16	17507160615015	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	09-Sep-16	17507160909010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	15-Nov-16	17507161115012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	08-May-17	17507170508006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	06-Jul-17	17507170706006	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	19-Sep-17	17507170919011	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	15-Nov-17	17507171115004	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-9	15-May-18	17507180515013	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-9	27-Jul-18	17507180727013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-9	11-Sep-18	17507180911013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-9	07-Dec-18	17507181207013	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
15-10	05-Nov-15	17507151105002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
15-10	29-Apr-16	17507160429012	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	15-Jun-16	17507160615016	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	09-Sep-16	17507160909011	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	15-Nov-16	17507161115013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	08-May-17	17507170508008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	06-Jul-17	17507170706007	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	19-Sep-17	17507170919010	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-10	15-May-18	17507180515014	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-10	27-Jul-18	17507180727014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-10	11-Sep-18	17507180911014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-10	07-Dec-18	17507181207014	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	05-Nov-15	17507151105100	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	---	---	---	---	<0.0005
15-11	15-Jun-16	23458160615001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-11	09-Sep-16	23458160909001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
15-11	15-May-18	17507180515015	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
15-11	27-Jul-18	17507180727015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	11-Sep-18	17507180911015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
15-11	07-Dec-18	17507181207015	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
Leachate Vault 1	14-Jun-11	17507110614008	0.0195	0.0121	0.0121	0.0593	<0.5	0.35	0.45	9.58	9.57	8.65	8.65	<0.005
Leachate Vault 1	08-Nov-11	17507111108009	0.0321	0.201	0.121	1.01	<0.5	45	45	1430	1420	566	566	<0.005
Leachate Vault 1	31-May-12	17507120531009	0.0145	0.0167	0.0068	0.0393	<0.001	0.5	0.6	20.3	20.3	10.6	10.6	<0.005
Leachate Vault 1	19-Jun-13	17507130619001	0.014	0.02	0.007	0.041	<5	1.8	2	92	90.2	40.8	40.8	<0.05
Leachate Vault 1	01-Oct-13	17507131001010	0.00911	0.0185	0.00175	0.0152	<0.5	0.19	0.23	25.5	25.4	8.31	8.31	<0.005
Leachate Vault 1	21-May-14	17507140521011	0.012	0.02	0.0048	0.038	<0.5	0.2	0.3	34.7	34.6	9.59	9.6	<0.005
Leachate Vault 1	11-Sep-14	17507140911003	0.022	0.023	0.0044	0.019	<0.5	<0.1	0.1	149	50.1	149	50.1	<0.005
Leachate Vault 1	03-Jun-15	17507150603013	<0.0005	0.0029	0.0062	0.057	<0.5	1.4	1.3	1600	643	1600	642	<0.005
Leachate Vault 1	02-Sep-15	17507150902012	0.0027	0.0056	0.0044	0.039	<0.5	1.1	1.1	171	70.4	171	70.4	<0.005
Leachate Vault 1	29-Apr-16	17507160429013	0.0140	0.0160	0.0055	0.040	<0.5	0.9	1	3940	879	3930	879	<0.0005
Leachate Vault 1	15-Jun-16	17507160615014	0.0047	0.0170	0.0069	0.048	<3	2.4	2.5	16200	3860	16200	3860	<0.0025
Leachate Vault 1	09-Sep-16	17507160909009	0.0084	0.0086	0.0026	0.017	<0.5	0.2	0.2	24.2	7.93	24.2	7.93	<0.0005
Leachate Vault 1	15-Nov-16	17507161115011	0.0200	0.0180	0.0050	0.027	<0.5	0.1	0.2	161	69.6	161	69.6	<0.0005
Leachate Vault 1	08-May-17	17507170508005	0.0031	0.0090	0.0180	0.110	<0.5	2.7	2.8	13500	4200	13500	4200	<0.0005
Leachate Vault 1	06-Jul-17	17507170706005	0.0093	0.0220	0.0570	0.330	<0.5	4.2	4.6	1770	633	1770	633	0.00101
Leachate Vault 1	19-Sep-17	17507170919012	0.0155	0.0096	0.0049	0.024	<0.0005	1.36	1.41	61.5	22.9	61.4	22.9	<0.0005
Leachate Vault 1	15-Nov-17	17507171115009	0.0104	0.0150	0.0092	0.054	<0.0025	12.6	12.6	---	---	---	---	<0.0025
Leachate Vault 1	15-May-18	17507180515007	0.0218	0.0256	0.0058	0.036	<0.00050	0.32	0.41	126	28.7	125	28.7	<0.0010
Leachate Vault 1	27-Jul-18	17507180727016	0.0336	0.0446	0.0039	0.025	<0.0005	<0.1	0.1	1.5	0.4	1.5	0.4	<0.001
Leachate Vault 1	11-Sep-18	17507180911016	0.0281	0.0482	0.0035	0.025	<0.0005	0.3	0.4	65	11.2	65	11.2	<0.001
Leachate Vault 1	07-Dec-18	17507181207016	0.419	0.2730	0.0080	0.061	<0.0005	0.3	1.1	3.5	3.5	0.7	0.7	<0.001

TABLE F4

2008-2018 Groundwater and Leachate Quality Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Monitoring Well	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19})* mg/L	HEPHw (C_{19}-C_{32})* mg/L	Methyl t-Butyl Ether mg/L
Leak Detection System	14-Jun-11	17507110614009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	08-Nov-11	17507111108010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	6.83	6.83	2.28	2.28	<0.005
Leak Detection System	31-May-12	17507120531010	<0.0005	<0.0005	<0.0005	0.00065	<0.001	<0.1	<0.1	2.05	2.04	1.27	1.27	<0.005
Leak Detection System	22-Oct-12	17507121022008	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	4.78	4.78	1.45	1.45	<0.005
Leak Detection System	19-Jun-13	17507130619010	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	01-Oct-13	17507131001001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	21-May-14	17507140521001	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	11-Sep-14	17507140911004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	15-Apr-15	17507150415002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	03-Jun-15	17507150603014	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	02-Sep-15	17507150902004	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.005
Leak Detection System	05-Nov-15	17507151105005	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	29-Apr-16	17507160429009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	15-Jun-16	17507160615018	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	09-Sep-16	17507160909013	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	0.27	<0.25	0.27	<0.0005
Leak Detection System	15-Nov-16	17507161115009	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	08-May-17	17507170508003	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	06-Jul-17	17507170706002	<0.0005	<0.0005	<0.0005	<0.0005	<0.5	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	19-Sep-17	17507170919008	<0.0005	<0.0005	<0.0005	<0.00071	<0.0005	<0.1	<0.1	<0.25	<0.25	<0.25	<0.25	<0.0005
Leak Detection System	15-May-18	17507180515016	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25	<0.00050
Leak Detection System	27-Jul-18	17507180727017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	0.2	0.3	0.2	0.3	<0.001
Leak Detection System	11-Sep-18	17507180911017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001
Leak Detection System	07-Dec-18	17507181207017	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.001

Notes:

Bold - background well

--- - not analyzed

^ - all data after 2012 are no longer considered to represent background conditions

* - LEPHs and HEPHs do not include CSR-regulated PAHs

VPHw - does not include BTEX

VHw (C_6-C_{10}) - includes BTEX

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
Background														
BH-103	08-Jun-08	17507080608001	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	<3.4
BH-103	14-Oct-08	17507081014001	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
BH-103	15-Jun-09	17507090615001	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
BH-103	22-Sep-09	17507090922001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
BH-103	08-Jun-10	17507100608001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.026	<0.02	0.031	0.053	0.082	<0.01
BH-103	12-Oct-10	17507101012001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.01	<0.01
BH-103	08-Nov-11	17507111108008	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.023	0.022	0.046	0.014	<0.01
BH-103	31-May-12	17507120531001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.014	<0.01	<0.01
BH-103	23-Oct-12	17507121023001	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.049	0.022	<0.01	<0.01
BH-103	19-Jun-13	17507130619012	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	0.052	<0.05	<0.05
BH-103	11-Sep-14	17507140911005	<0.05	<0.05	<0.05	<0.05	0.011	<0.05	<0.05	<0.05	<0.05	0.058	0.058	<0.05
BH-103	15-Apr-15	17507150415003	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.070	0.053	0.053	<0.05
BH-103	03-Jun-15	17507150603009	<0.05	<0.05	<0.05	<0.05	<0.020	<0.05	<0.05	<0.05	<0.05	<0.05	0.05	<0.05
BH-103	05-Nov-15	17507151105001	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH-103	29-Apr-16	17507160429001	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BH-103	15-Jun-16	17507160615001	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BH-103	09-Sep-16	17507160909005	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	0.01	<0.050
BH-103	15-Nov-16	17507161115001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	08-May-17	17507170508001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	06-Jul-17	17507170706014	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	19-Sep-17	17507170919013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	15-Nov-17	17507171115002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	15-May-18	17507180515009	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-103	27-Jul-18	17507180727009	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-103	11-Sep-18	17507180911009	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	0.02	<0.01	<0.01	0.02	0.02	<0.04
MW92-1	22-Sep-09	17507090922004	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.113	0.065	<0.03	<0.03
MW92-1	08-Jun-10	17507100608005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	0.031	0.034	<0.01	<0.01
MW92-1	12-Oct-10	17507101012005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.01	<0.01
MW92-1	14-Jun-11	17507110614001	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.04	<0.08	<0.02	<0.01
MW92-1	08-Nov-11	17507111108001	0.022	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.043	0.012	0.079	0.018	<0.01
MW92-1	31-May-12	17507120531004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.013	<0.01	<0.01
MW92-1	22-Oct-12	17507121022003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.186	<0.02	<0.01	<0.01
MW92-1	19-Jun-13	17507130619003	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
MW92-1	21-May-14	17507140521004	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1	11-Sep-14	17507140911010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1	15-Apr-15	17507150415009	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.16	<0.05	<0.05	<0.05
MW92-1	03-Jun-15	17507150603001	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1	02-Sep-15	17507150902008	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.051	<0.05	<0.05	<0.05
MW92-1	05-Nov-15	17507151105011	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1	29-Apr-16	17507160429005	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-1	15-Jun-16	17507160615012	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-1	09-Sep-16	17507160909012	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
MW92-1	15-Nov-16	17507161115005	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	08-May-17	17507170508012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	06-Jul-17	17507170706011	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	19-Sep-17	17507170919003	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	15-Nov-17	17507171115013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	15-May-18	17507180515001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1	27-Jul-18	17507180727001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1	11-Sep-18	17507180911001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.04
MW92-1	07-Dec-18	17507181207001	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	08-Jun-08	17507080608004	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-1A	08-Oct-08	17507081008002	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-1A	15-Jun-09	17507090615005	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-1A	22-Sep-09	17507090922005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-1A	08-Jun-10	17507100608006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	0.034	0.04	<0.01	<0.01
MW92-1A	12-Oct-10	17507101012006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.01	<0.01
MW92-1A	14-Jun-11	17507110614002	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.04	<0.08	<0.02	<0.01
MW92-1A	08-Nov-11	17507111108002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	0.03	<0.01	<0.01
MW92-1A	31-May-12	17507120531005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
MW92-1A	22-Oct-12	17507121022004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.173	<0.02	<0.01	<0.01
MW92-1A	19-Jun-13	17507130619002	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.386	<0.05	<0.05	<0.05
MW92-1A	01-Oct-13	17507131001003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-1A	21-May-14	17507140521002	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1A	11-Sep-14	17507140911011	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1A	15-Apr-15	17507150415008	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.070	<0.05	<0.05	<0.05
MW92-1A	03-Jun-15	17507150603002	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.063	<0.05	<0.05	<0.05

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
MW92-1A	02-Sep-15	17507150902009	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1A	05-Nov-15	17507151105010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-1A	29-Apr-16	17507160429006	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-1A	15-Jun-16	17507160615003	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-1A	09-Sep-16	17507160909001	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
MW92-1A	15-Nov-16	17507161115004	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	08-May-17	17507170508013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	06-Jul-17	17507170706010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	19-Sep-17	17507170919004	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	15-Nov-17	17507171115012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	15-May-18	17507180515002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-1A	27-Jul-18	17507180727002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	11-Sep-18	17507180911002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-1A	07-Dec-18	17507181207002	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-6A	08-Jun-08	17507080608005	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.03	<3.4
MW92-6A	14-Oct-08	17507081014002	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-6A	15-Jun-09	17507090615006	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-6A	22-Sep-09	17507090922006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-6A	08-Jun-10	17507100608007	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	0.032	0.056	0.08	0.012	<0.01
MW92-6A	12-Oct-10	17507101012007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	0.012	<0.01
MW92-6A	14-Jun-11	17507110614003	<0.02	<0.01	<0.01	0.015	<0.01	0.019	0.023	<0.02	<0.04	<0.08	0.041	<0.01
MW92-6A	08-Nov-11	17507111108003	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.023	0.012	0.044	0.015	<0.01
MW92-6A	31-May-12	17507120531006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.02	<0.02	<0.01
MW92-6A	22-Oct-12	17507121022005	0.012	<0.01	<0.01	<0.01	<0.01	0.012	0.017	0.023	0.155	0.069	0.029	<0.01
MW92-6A	19-Jun-13	17507130619011	<0.05	<0.05	<0.05	<0.05	0.018	<0.05	<0.05	<0.05	<0.05	<0.05	<0.060	<0.05
MW92-6A	01-Oct-13	17507131001005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01
MW92-6A	21-May-14	17507140521007	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-6A	11-Sep-14	17507140911006	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-6A	15-Apr-15	17507150415004	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-6A	03-Jun-15	17507150603003	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-6A	02-Sep-15	17507150902002	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-6A	05-Nov-15	17507151105007	<0.05	<0.05	<0.05	<0.05	0.018	0.056	0.053	<0.05	0.08	0.112	0.094	<0.05
MW92-6A	29-Apr-16	17507160429002	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-6A	15-Jun-16	17507160615011	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
MW92-6A	09-Sep-16	17507160909006	<0.01	<0.01	<0.01	<0.01	<0.005	0.021	0.013	<0.01	<0.050	<0.02	0.025	<0.050
MW92-6A	15-Nov-16	17507161115008	<0.010	<0.010	<0.010	0.013	0.0069	0.04	0.031	<0.010	<0.050	0.039	0.063	<0.050
MW92-6A	08-May-17	17507170508002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	0.022	<0.050
MW92-6A	06-Jul-17	17507170706001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-6A	19-Sep-17	17507170919006	<0.010	<0.010	<0.010	<0.010	<0.0090	0.028	0.018	<0.010	<0.050	0.024	0.038	<0.050
MW92-6A	15-Nov-17	17507171115006	<0.010	<0.010	<0.010	<0.010	<0.0050	0.026	0.016	<0.010	<0.050	0.023	0.033	<0.050
MW92-6A	15-May-18	17507180515003	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-6A	27-Jul-18	17507180727003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	0.32	<0.01	<0.01	0.07	1.11	<0.04
MW92-6A	11-Sep-18	17507180911003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-6A	07-Dec-18	17507181207003	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.02	<0.01	0.02	<0.04
MW92-7	08-Jun-08	17507080608006	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-7	15-Jun-09	17507090615007	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-7	22-Sep-09	17507090922007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-7	08-Jun-10	17507100608008	<0.01	<0.01	<0.01	0.011	<0.01	0.034	0.033	0.029	0.057	0.09	0.045	<0.01
MW92-7	12-Oct-10	17507101012008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	<0.01	<0.01
MW92-7	14-Jun-11	17507110614004	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.02	<0.04	<0.08	<0.02	<0.01
MW92-7	08-Nov-11	17507111108004	0.109	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	0.19	0.023	0.445	0.117	<0.01
MW92-7	31-May-12	17507120531007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
MW92-7	22-Oct-12	17507121022006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.034	<0.02	<0.01	<0.01
MW92-7	19-Jun-13	17507130619007	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7	01-Oct-13	17507131001002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-7	21-May-14	17507140521010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7	11-Sep-14	17507140911008	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7	15-Apr-15	17507150415005	<0.05	<0.05	<0.05	<0.05	0.014	<0.05	<0.05	<0.05	<0.070	0.068	0.08	<0.05
MW92-7	03-Jun-15	17507150603004	<0.05	<0.05	<0.05	0.059	0.068	0.144	0.129	<0.05	0.075	0.185	0.243	<0.05
MW92-7	02-Sep-15	17507150902006	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.071	<0.05	<0.05	<0.05
MW92-7	05-Nov-15	17507151105009	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7	29-Apr-16	17507160429004	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-7	15-Jun-16	17507160615010	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-7	09-Sep-16	17507160909007	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
MW92-7	15-Nov-16	17507161115007	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	0.016	<0.050
MW92-7	08-May-17	17507170508010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7	06-Jul-17	17507170706012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7	19-Sep-17	17507170919002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	0.013	<0.050

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
MW92-7	15-Nov-17	17507171115010	<0.010	<0.070	<0.010	<0.010	<0.0050	<0.020	<0.010	0.019	<0.050	0.081	0.012	0.057
MW92-7	15-May-18	17507180515004	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7	27-Jul-18	17507180727005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-7	11-Sep-18	17507180911004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.04
MW92-7	07-Dec-18	17507181207004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.04
MW92-7A	08-Jun-08	17507080608007	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.05	<3.4
MW92-7A	15-Jun-09	17507090615008	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
MW92-7A	22-Sep-09	17507090922008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
MW92-7A	08-Jun-10	17507100608009	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	0.022	0.025	0.041	0.086	0.03	<0.01
MW92-7A	12-Oct-10	17507101012009	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	0.045	0.041	0.032	<0.01
MW92-7A	14-Jun-11	17507110614005	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	0.032	<0.02	0.042	0.095	0.055	<0.01
MW92-7A	08-Nov-11	17507111108005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	0.018	0.017	0.052	0.02	<0.01
MW92-7A	31-May-12	17507120531008	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.019	<0.01	<0.01
MW92-7A	22-Oct-12	17507121022007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.145	0.023	<0.01	<0.01
MW92-7A	19-Jun-13	17507130619004	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7A	21-May-14	17507140521009	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7A	11-Sep-14	17507140911009	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7A	15-Apr-15	17507150415006	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.080	<0.05	<0.05	<0.05
MW92-7A	03-Jun-15	17507150603005	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.067	<0.05	<0.05	<0.05
MW92-7A	02-Sep-15	17507150902007	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.066	<0.05	<0.05	<0.05
MW92-7A	05-Nov-15	17507151105008	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
MW92-7A	29-Apr-16	17507160429003	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-7A	15-Jun-16	17507160615009	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
MW92-7A	09-Sep-16	17507160909004	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
MW92-7A	15-Nov-16	17507161115006	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	0.013	<0.050
MW92-7A	08-May-17	17507170508011	<0.010	<0.025	<0.010	<0.010	<0.0050	<0.010	<0.010	0.017	<0.050	0.038	<0.010	<0.050
MW92-7A	06-Jul-17	17507170706013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7A	19-Sep-17	17507170919001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7A	15-Nov-17	17507171115011	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7A	15-May-18	17507180515005	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
MW92-7A	27-Jul-18	17507180727004	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	0.02	<0.04
MW92-7A	11-Sep-18	17507180911005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
MW92-7A	07-Dec-18	17507181207005	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
03-3	15-Jun-09	17507090615002	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
03-3	22-Sep-09	17507090922002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
03-3	12-Oct-10	17507101012003	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	0.091	<0.06	0.179	0.196	0.202	<0.06
03-3	08-Nov-11	17507111108006	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	0.027	0.048	0.013	<0.01
03-3	31-May-12	17507120531002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.013	<0.01	<0.01
03-3	22-Oct-12	17507121022001	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	0.236	<0.02	0.034	<0.01
03-3	19-Jun-13	17507130619008	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.058	0.076	<0.05	<0.05
03-3	11-Sep-14	17507140911001	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.074	<0.05	<0.05	<0.05
03-3	15-Apr-15	17507150415010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.060	<0.05	<0.05	<0.05
03-3	03-Jun-15	17507150603006	<0.05	<0.05	<0.05	<0.05	<0.020	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
03-3	29-Apr-16	17507160429008	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
03-3	09-Sep-16	17507160909002	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
03-3	15-Nov-16	17507161115002	<0.030	<0.030	<0.030	<0.030	<0.015	<0.030	<0.030	<0.030	<0.15	<0.060	<0.030	<0.15
03-3	08-May-17	17507170508015	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
03-3	06-Jul-17	17507170706008	<0.010	<0.010	<0.010	<0.010	<0.0050	0.016	0.012	<0.010	<0.050	<0.020	0.027	<0.050
03-3	19-Sep-17	17507170919007	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	0.011	<0.010	<0.050	<0.020	0.027	<0.050
03-3	15-Nov-17	17507171115015	<0.010	<0.010	<0.010	<0.010	<0.0050	0.016	0.013	<0.010	<0.050	<0.020	0.032	<0.050
03-3	15-May-18	17507180515006	<0.010	<0.010	<0.010	<0.010	<0.0050	0.017	0.014	<0.010	<0.050	<0.020	0.035	<0.050
03-3	27-Jul-18	17507180727006	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-3	11-Sep-18	17507180911007	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-3	07-Dec-18	17507181207008	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
03-5	08-Jun-08	17507080608002	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	0.03	<3.4
03-5	08-Oct-08	17507081008001	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
03-5	15-Jun-09	17507090615003	<0.1	<0.05	<0.1	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<3.4
03-5	22-Sep-09	17507090922003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
03-5	08-Jun-10	17507100608004	0.013	<0.01	<0.01	<0.01	<0.01	0.019	0.022	0.03	0.064	0.088	0.027	<0.01
03-5	12-Oct-10	17507101012004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.02	0.01	<0.01
03-5	14-Jun-11	17507110614007	<0.02	<0.01	<0.01	0.024	<0.01	0.041	0.052	<0.02	0.046	0.141	0.103	<0.01
03-5	08-Nov-11	17507111108007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	0.015	0.042	0.014	<0.01
03-5	31-May-12	17507120531003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.014	<0.01	<0.01
03-5	22-Oct-12	17507121022002	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.174	<0.02	<0.01	<0.01
03-5	19-Jun-13	17507130619009	<0.05	<0.05	<0.05	<0.05	0.019	<0.05	0.059	<0.05	<0.05	0.139	0.117	<0.05
03-5	01-Oct-13	17507131001004	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
03-5	11-Sep-14	17507140911002	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
03-5	15-Apr-15	17507150415007	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.063	<0.05	<0.05	<0.05
03-5	02-Sep-15	17507150902010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	0.051	<0.05	<0.05	<0.05
03-5	05-Nov-15	17507151105012	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
03-5	29-Apr-16	17507160429007	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
03-5	15-Jun-16	17507160615002	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
03-5	09-Sep-16	17507160909003	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
03-5	15-Nov-16	17507161115003	<0.030	<0.030	<0.030	<0.030	<0.015	<0.030	<0.030	<0.030	<0.15	<0.060	<0.030	<0.15
03-5	08-May-17	17507170508014	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
03-5	06-Jul-17	17507170706009	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
03-5	19-Sep-17	17507170919005	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	0.011	<0.050
03-5	15-Nov-17	17507171115014	<0.010	<0.010	<0.010	0.013	0.0052	0.053	0.043	<0.010	<0.050	0.044	0.098	<0.050
03-5	15-May-18	17507180515008	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
03-5	27-Jul-18	17507180727008	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-104	08-Jun-10	17507100608002	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	0.024	0.051	0.059	0.013	<0.01
BH-104	15-Apr-15	17507150415011	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.080	0.072	<0.05	<0.05
BH-104	03-Jun-15	17507150603011	<0.070	<0.20	<0.05	<0.05	<0.020	<0.05	<0.05	0.232	0.196	0.464	0.052	<0.05
BH-105(R)	05-Nov-15	17507151105004	<0.05	<0.05	<0.05	<0.05	0.02	<0.05	<0.05	<0.05	0.057	0.061	<0.05	<0.05
BH-105(R)	29-Apr-16	17507160429010	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BH-105(R)	15-Jun-16	17507160615013	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
BH-105(R)	09-Sep-16	17507160909008	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
BH-105(R)	15-Nov-16	17507161115010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	08-May-17	17507170508004	<0.010	<0.010	<0.010	<0.010	<0.0050	0.012	0.01	<0.010	<0.050	<0.020	0.022	<0.050
BH-105(R)	06-Jul-17	17507170706003	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	19-Sep-17	17507170919009	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	15-Nov-17	17507171115005	<0.010	<0.010	<0.010	0.013	0.0112	0.042	0.024	0.016	<0.050	0.03	0.087	<0.050
BH-105(R)	15-May-18	17507180515012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	27-Jul-18	17507180727012	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-105(R)	11-Sep-18	17507180911012	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.04
BH-105(R)	07-Dec-18	17507181207011	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
15-9	29-Apr-16	17507160429011	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
15-9	15-Jun-16	17507160615015	<0.15	<0.15	<0.15	<0.15	<0.030	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15	<0.15
15-9	09-Sep-16	17507160909010	0.011	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	0.028	<0.050	0.063	<0.01	<0.050
15-9	15-Nov-16	17507161115012	<0.020	<0.020	<0.020	<0.020	<0.010	<0.020	<0.020	<0.020	<0.10	<0.040	<0.020	<0.10
15-9	08-May-17	17507170508006	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-9	06-Jul-17	17507170706006	<0.010	<0.040	<0.010	<0.010	<0.0050	0.027	0.018	0.028	<0.050	0.08	0.03	<0.050
15-9	19-Sep-17	17507170919011	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-9	15-Nov-17	17507171115004	<0.010	<0.010	<0.010	<0.010	<0.0050	0.01	0.02	<0.010	<0.050	0.078	0.028	<0.050
15-9	15-May-18	17507180515013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-9	27-Jul-18	17507180727013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-9	11-Sep-18	17507180911013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.04
15-9	07-Dec-18	17507181207013	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	29-Apr-16	17507160429012	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
15-10	15-Jun-16	17507160615016	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
15-10	09-Sep-16	17507160909011	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
15-10	15-Nov-16	17507161115013	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	08-May-17	17507170508008	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	06-Jul-17	17507170706007	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	19-Sep-17	17507170919010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	15-May-18	17507180515014	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-10	27-Jul-18	17507180727014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	11-Sep-18	17507180911014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-10	07-Dec-18	17507181207014	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	05-Nov-15	17507151105100	<0.05	<0.05	<0.05	<0.05	0.024	<0.05	<0.05	0.083	0.281	0.139	<0.060	<0.05
15-11	15-Jun-16	23458160615001	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
15-11	09-Sep-16	23458160909001	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-11	15-May-18	17507180515015	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
15-11	27-Jul-18	17507180727015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	11-Sep-18	17507180911015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
15-11	07-Dec-18	17507181207015	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
Leachate Vault 1	14-Jun-11	17507110614008	1.23	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	1.86	3.09	1.87	<0.02	<0.01
Leachate Vault 1	08-Nov-11	17507111108009	77	<0.08	<0.08	<0.08	<0.08	15.2	<0.08	260	326	522	69	<0.08
Leachate Vault 1	31-May-12	17507120531009	0.74	2.68	<0.60	<0.1	<0.1	<0.30	<0.2	2.71	<2.6	6.24	<0.5	0.5
Leachate Vault 1	19-Jun-13	17507130619001	<60	<250	<600	<10	<3	<10	<20	169	182	<550	<32	<55
Leachate Vault 1	01-Oct-13	17507131001010	0.87	<0.1	<0.1	<0.1	<0.1	0.18	<0.1	2.9	2.75	5.96	<0.1	<0.1
Leachate Vault 1	21-May-14	17507140521011	1.27	3.76	<0.5	<0.5	0.107	<0.5	<0.5	3.48	13.2	8.23	<0.55	<0.8
Leachate Vault 1	11-Sep-14	17507140911003	<5.7	<2.5	<1.8	<0.5	<0.11	<0.5	<0.5	14.2	26.1	31.5	1.83	<2.5
Leachate Vault 1	03-Jun-15	17507150603013	<280	<800	<100	<50	<10	<55	<50	726	1690	1930	<100	<140
Leachate Vault 1	02-Sep-15	17507150902012	<8.1	<24	<5.0	<5.0	<1	<5.0	<5.0	20.3	55.1	43.3	<5.0	<5.0
Leachate Vault 1	29-Apr-16	17507160429013	<51	<5.0	<8.0	13.2	11.4	25.4	37.9	167	299	441	51.9	<5.0
Leachate Vault 1	15-Jun-16	17507160615014	148	73	21	52	44.6	99	146	437	859	1080	196	71
Leachate Vault 1	09-Sep-16	17507160909009	2.15	<0.10	<0.30	<0.10	<0.050	0.25	0.29	5.91	29.1	10	0.47	<0.50
Leachate Vault 1	15-Nov-16	17507161115011	11.4	<1.4	<1.2	<1.2	<0.60	<1.7	2.8	26.9	88.4	55.5	5.8	<6.0
Leachate Vault 1	08-May-17	17507170508005	<850	<2000	<88	25	13.6	100	126	1830	425	3820	286	<50
Leachate Vault 1	06-Jul-17	17507170706005	<53	<350	<42	8.5	5.4	<27	<21	227	337	473	<48	<43
Leachate Vault 1	19-Sep-17	17507170919012	4.26	<0.60	<2.9	<0.30	<0.070	0.66	<1.3	13.5	33.5	22.9	2.15	<2.2
Leachate Vault 1	15-May-18	17507180515007	9.7	<0.30	<1.3	<0.40	<0.24	1.04	1.48	31.7	52.4	53.4	2.93	<0.75
Leachate Vault 1	27-Jul-18	17507180727016	0.53	<0.05	<0.010	<0.01	<0.007	<0.01	0.06	1.15	5.86	1.33	0.07	<0.04
Leachate Vault 1	11-Sep-18	17507180911016	1.95	<0.05	<0.010	0.2	0.11	0.21	0.78	4.43	8.5	8.75	1.1	<0.04
Leachate Vault 1	07-Dec-18	17507181207016	1.36	<0.05	<0.010	0.06	<0.007	0.02	0.26	4.76	9.03	6.21	0.38	<0.04
Leak Detection System	14-Jun-11	17507110614009	0.666	<0.01	2.09	1.02	0.459	1.1	3.34	3.4	1.72	21.1	1.88	<0.01
Leak Detection System	08-Nov-11	17507111108010	0.26	<0.01	<0.01	<0.01	<0.01	0.059	<0.01	1.44	1.55	2.77	0.27	<0.01
Leak Detection System	31-May-12	17507120531010	0.091	0.211	<0.05	<0.01	<0.01	<0.040	<0.03	0.31	<0.21	0.689	<0.05	0.034
Leak Detection System	22-Oct-12	17507121022008	0.139	<0.01	<0.01	<0.01	<0.01	0.033	<0.040	0.438	0.717	1	<0.2	<0.01
Leak Detection System	19-Jun-13	17507130619010	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Leak Detection System	01-Oct-13	17507131001001	0.043	<0.01	0.163	0.043	0.022	0.054	0.211	0.244	0.118	1.51	0.099	<0.01
Leak Detection System	21-May-14	17507140521001	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Leak Detection System	11-Sep-14	17507140911004	<0.05	<0.05	0.078	<0.05	0.018	<0.05	0.127	0.145	0.124	0.914	0.071	<0.05
Leak Detection System	15-Apr-15	17507150415002	0.076	<0.05	0.239	0.093	0.052	0.122	0.415	0.402	0.233	2.91	0.238	<0.05
Leak Detection System	03-Jun-15	17507150603014	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Leak Detection System	02-Sep-15	17507150902004	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.06	<0.05	<0.08	<0.25	<0.06	<0.05
Leak Detection System	05-Nov-15	17507151105005	<0.05	<0.05	<0.05	<0.05	<0.01	<0.05	<0.05	<0.05	<0.05	0.098	<0.05	<0.05
Leak Detection System	29-Apr-16	17507160429009	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Leak Detection System	15-Jun-16	17507160615018	<0.050	<0.050	<0.050	<0.050	<0.010	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050

TABLE F5

2008-2018 Water and Leachate Quality Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation
Block A-18-088-20 W6M

Sample Location	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
Leak Detection System	09-Sep-16	17507160909013	<0.01	<0.01	<0.01	<0.01	<0.005	<0.01	<0.01	<0.01	<0.050	<0.02	<0.01	<0.050
Leak Detection System	15-Nov-16	17507161115009	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
Leak Detection System	08-May-17	17507170508003	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
Leak Detection System	06-Jul-17	17507170706002	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	0.027	<0.010	<0.050
Leak Detection System	19-Sep-17	17507170919008	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
Leak Detection System	15-May-18	17507180515016	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	0.012	0.036	<0.050	0.192	<0.010	<0.050
Leak Detection System	27-Jul-18	17507180727017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	0.01	0.01	0.03	<0.01	<0.04
Leak Detection System	11-Sep-18	17507180911017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	0.01	0.02	<0.01	<0.04
Leak Detection System	07-Dec-18	17507181207017	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04

Notes:

Bold - background well
--- - not analyzed
^ - all data after 2012 are no longer considered to represent background conditions

APPENDIX G
Laboratory Reports

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/Block A-08-088-20W6

AGAT WORK ORDER: 18F368300

WATER ANALYSIS REVIEWED BY: Loan Nguyen, Senior Analyst

DATE REPORTED: Aug 31, 2018

PAGES (INCLUDING COVER): 21

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

2910 12TH STREET NE
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CANADA T2E 7P7
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FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437511 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<0.56		0.56	Aug 24, 2018	LN	
Gross beta	Bq/L	<0.40		0.4	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437511 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	0.08		0.05	Aug 24, 2018	LN	
Radium-226	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.07		0.07	Aug 24, 2018	LN	
Thorium-228	Bq/L	0.03		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.016		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.0008		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.016		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437513 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<1.5		1.5	Aug 24, 2018	LN	
Gross beta	Bq/L	<1.0		1	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437513 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.07		0.07	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.003		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.0002		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.003		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437514 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.8±1.5		1.4	Aug 24, 2018	LN	
Gross beta	Bq/L	1.3±0.3		1	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437514 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	0.2		0.07	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.70		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.035		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.70		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
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Certified By: LN

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437515 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.7±1.7		2	Aug 24, 2018	LN	
Gross beta	Bq/L	<1.4		1.4	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437515 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.71		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.035		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.71		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437516 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<1.5		1.5	Aug 24, 2018	LN	
Gross beta	Bq/L	<1.0		1	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By:

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437516 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	0.07		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Aug 24, 2018	LN	
Thorium-228	Bq/L	0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.25		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.012		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.25		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437517 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	1.8±0.9		1.6	Aug 24, 2018	LN	
Gross beta	Bq/L	<1.0		1	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By:

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437517 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.30		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.015		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.30		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437518 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<1.8		1.8	Aug 24, 2018	LN	
Gross beta	Bq/L	<1.3		1.3	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437518 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Radium-226	Bq/L	0.04		0.02	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Aug 24, 2018	LN	
Uranium-234	Bq/L	0.006		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	0.0003		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	0.006		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437877 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727018 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<0.01		0.01	Aug 24, 2018	LN	
Gross beta	Bq/L	<0.02		0.02	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437877 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 31, 2018

SAMPLE DESCRIPTION: 17507180727018 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	0.1		0.08	Aug 24, 2018	LN	
Radium-226	Bq/L	0.07		0.05	Aug 24, 2018	LN	
Radium-228	Bq/L	<0.2		0.2	Aug 24, 2018	LN	
Thorium-228	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Thorium-230	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Thorium-232	Bq/L	<0.04		0.04	Aug 24, 2018	LN	
Uranium-234	Bq/L	<0.001		0.001	Aug 24, 2018	LN	
Uranium-235	Bq/L	<0.00006		0.00006	Aug 24, 2018	LN	
Uranium-238	Bq/L	<0.001		0.001	Aug 24, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368300

PROJECT: 17507-502/Block A-08-088-20W6

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Gross alpha		subcontracted	
Gross beta		subcontracted	
Lead-210		subcontracted	
Radium-226		subcontracted	
Radium-228		subcontracted	
Thorium-228		subcontracted	
Thorium-230		subcontracted	
Thorium-232		subcontracted	
Uranium-234		subcontracted	
Uranium-235		subcontracted	
Uranium-238		subcontracted	

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1807275417507

Page: 1 of: 1

Lab Submitted To: AGAT Labs

Lab Agreement No.:

Job ID: 18F 28 300

	Invoice to:	Require Report: Y: ☐ N: ☐	Copy of Report to:	
Company Name:	Tervita Corporation		Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe		Suite 600, 214 - 11th Avenue SW	
Address:			Calgary Alberta Canada	
	Canada	PC:	T2R 0K1	
Phone/Fax #:	Ph	Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'Hanley, M. Greenwood

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☐ Add'l Emails: ahum@matrix-solutions.com
- ehenson@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Gross Alpha+Beta	Lead-210	Radium-226	Radium-228	Thorium-228,230,232	Uranium-234,235,238							Lab Sample Number	HOLD
1	17507180727003	MW92-6A		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							9437.11	
2	17507180727009	BH-103		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							13	
3	17507180727012	BH-105(R)		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							14	
4	17507180727013	15-9		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							15	
5	17507180727014	15-10		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							16	
6	17507180727015	15-11		Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							17	
7	17507180727010			Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							18	
8	17507180727016			Water	Jul 27 2018	0	0	BT2	X	X	X	X	X	X							19		X
9																						
10																						
11																						
12																						
13																						
14																						
15																						
	*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'							Preserved/Filtered	/	/	/	/	/	/	/	/	/	/	/	/		

Relinquished by: Miranda O'Hanley Date/Time: Friday, July 27, 2018

Signature:

Received by: Rachel H Date/Time: July 27/18 @ 7:00 PM

Signature:

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

JUL 31 2018 @ 9:42

F 10984

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: PARVITA/ MATRIX

Courier: JAYCO Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 1

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: NA

Hydrocarbons: Earliest Expiry NA

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes No

Coolant Used: (Icepack) Bagged Ice (Free Ice) Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 3 + 2 + 3 = 3 °C	2(Bottle/Jar) 3 + 3 + 3 = 3 °C
3 (Bottle/Jar) 4 + 3 + 3 = 3 °C	4 (Bottle/Jar) 2 + 3 + 3 = 3 °C
5 (Bottle/Jar) ___ + ___ + ___ = ___ °C	6 (Bottle/Jar) ___ + ___ + ___ = ___ °C
7 (Bottle/Jar) ___ + ___ + ___ = ___ °C	8 (Bottle/Jar) ___ + ___ + ___ = ___ °C
9 (Bottle/Jar) ___ + ___ + ___ = ___ °C	10 (Bottle/Jar) ___ + ___ + ___ = ___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18 E368302

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments: Samples are mixed up w/ other samples from other projects

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM @ 7:00PM.

Date: Jul 27 COC: F10984

RECEIVING BASICS - Shipping

Company/Consultant: Matrix / Tervita

Courier: Dropped in Drop Box Prepaid Collect

~~Waybill#~~ Client called to Notify @5:40PM Jul 27

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other_____

Cooler Quantity: 5 LRG

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry:_____

Hydrocarbons: Earliest Expiry _____

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:_____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice) Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 16+14+14=15 °C	2(Bottle/Jar) 19+16+17=16 °C
3 (Bottle/Jar) 19+21+19=20 °C	4 (Bottle/Jar) 14+15+16=15 °C
5 (Bottle/Jar) 16+14+15=15 °C	6 (Bottle/Jar)___+___+___=____ °C
7 (Bottle/Jar)___+___+___=____ °C	8 (Bottle/Jar)___+___+___=____ °C
9 (Bottle/Jar)___+___+___=____ °C	10 (Bottle/Jar)___+___+___=____ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: _____

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other: _____

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date/Time: _____

CPM Initial_____

General Comments: _____

* Subcontracted Analysis (See CPM)

WHERE IS IT SENT:

GP__ Burnaby__ Calgary ✓

Date issued: October 05, 2015

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/Block A-08-088-20W6M

AGAT WORK ORDER: 18F368601

TRACE ORGANICS REVIEWED BY: Elena Gorobets, Report Writer

WATER ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

DATE REPORTED: Aug 07, 2018

PAGES (INCLUDING COVER): 96

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	0.2		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.4		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	0.2		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.4		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	94	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	98	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	78	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	78	50-150	Aug 01, 2018	TD	Aug 01, 2018

Certified By: Elena Gorobets

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	107	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.61		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00115		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	457		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0035		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.034		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	294		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.85		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.023		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	230		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.034		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.014		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2350		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.50	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	873		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	1070		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4080		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	3.4	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	<0.03	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	<2.0	45	2.0	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	<0.02	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	1860	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	457		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	294		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	230	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	7.5		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.85	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	102		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2350		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	3380		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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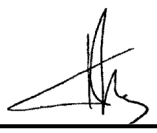

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437552 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

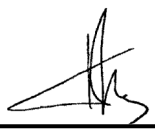
SAMPLE DESCRIPTION: 17507180727001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.004		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	97	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	99	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	110	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.006		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.29		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00034		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	298		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0020		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.125		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	166		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.015		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.004		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0026		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	47.9		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.002		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.007		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	1430		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.50	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	180		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	220		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	2360		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	<0.6	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.28	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	0.27	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	0.06	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	1270	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	298		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	166		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	47.9	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	6.1		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.015	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	102		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	1430		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.06		0.02		SYS	
Calculated TDS	mg/L	1900		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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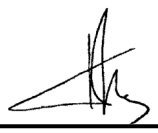

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437575 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

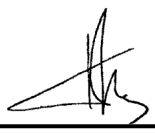
SAMPLE DESCRIPTION: 17507180727002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	7		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.007		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.4		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.4		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	0.00007		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	0.00032		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	0.00111		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	104	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	79	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	105	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.011		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.16		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00051		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	313		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0030		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0022		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.016		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	93.2		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.168		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.012		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0012		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	18.0		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	1170		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.27	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	97		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	118		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	1930		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	10.3	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.24	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	0.39	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	0.09	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	1160	(500)	3.0	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	313		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	93.2		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	18.0	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	3.4		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.168	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	92		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	1170		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.09		0.02		SYS	
Calculated TDS	mg/L	1660		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437576 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

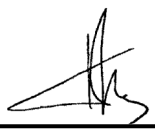
SAMPLE DESCRIPTION: 17507180727003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	15		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.005		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437577 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727004 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	0.00002		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	97	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	82	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437577 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727004 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437577 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727004 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.90	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	757		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	924		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4740		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	7.3	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	1.49	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	9.62	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	2.17	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2390	(500)	1.5	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	351		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	303		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	499	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	10.0		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	0.2	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.016	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	99		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2120		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	2.17		0.02		SYS	
Calculated TDS	mg/L	4020		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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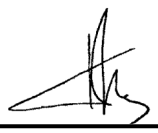

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	97	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	105	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.006		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.52		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00131		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	441		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0010		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0024		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	0.3		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.179		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	464		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.15		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.011		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	225		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.010		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.010		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	3010		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.58	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	5.28		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	644		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	5170		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.9	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.32	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	15.2	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	3.43	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	3110	(500)	1.5	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	441		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	492		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	225	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	12.1		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	0.3	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.15	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	96		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	3130		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	3.43		0.02		SYS	
Calculated TDS	mg/L	4610		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437579 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

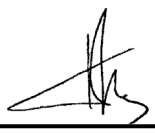
SAMPLE DESCRIPTION: 17507180727005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	7		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.005		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	100	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	99	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	82	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	113	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.53		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00018		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	440		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0011		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.108		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	382		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.006		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0019		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	103		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.017		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.61	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	410		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	500		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4090		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.6	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	<0.03	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	3.01	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	0.68	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2430	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	440		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	382		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	103	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	8.8		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	<0.005	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	99		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.68		0.02		SYS	
Calculated TDS	mg/L	3610		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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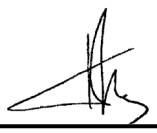

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437580 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

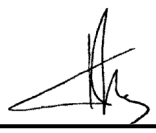
SAMPLE DESCRIPTION: 17507180727006 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	7		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	<0.002		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	89	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	99	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	72	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	101	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.59		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00063		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	461		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0016		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0025		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.100		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	406		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.31		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.012		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0028		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	142		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.014		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.007		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2820		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.49	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	465		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	567		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4310		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	22.5	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.22	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	34.6	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	7.82	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2850	(500)	1.5	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	461		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	406		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	142	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	9.7		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.31	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	90		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2820		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	7.82		0.02		SYS	
Calculated TDS	mg/L	4200		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437581 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

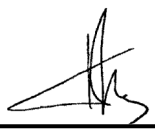
SAMPLE DESCRIPTION: 17507180727008 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	3		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.003		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	89	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	101	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	79	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	78	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	101	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.056		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	1.36		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00236		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	382		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0014		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0049		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.381		0.002	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	355		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.250		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.043		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0042		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	422		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	0.0002		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.002		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.065		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2420		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.96	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	122		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	149		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4840		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.0	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.34	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	2.77	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	0.63	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	3230	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	382		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	355		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	422	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	8.5		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.250	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	96		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2420		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.63		0.02		SYS	
Calculated TDS	mg/L	4470		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.
Note: Results were verified by repeat analysis

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437582 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	6		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.002		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	81	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	98	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	83	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	83	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	92	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.006		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.43		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00053		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	458		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0112		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0013		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.059		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	205		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.289		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.015		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0019		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	355		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.056		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.018		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	1990		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.73	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	711		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	868		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4200		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	14.4	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	1.39	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	<0.20	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	<0.02	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2170	(500)	1.5	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	458		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	205		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	355	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	8.1		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.289	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	93		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	1990		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	3640		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437583 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	0.003		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	91	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	114	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	103	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	102	50-150	Aug 01, 2018	TD	Aug 01, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	103	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.005		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.55		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00075		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	443		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0018		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.211		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	465		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.036		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.018		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0033		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	507		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.004		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.054		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.008		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	3020		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.57	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	627		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	765		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	5740		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.1	(250)	0.6	Jul 31, 2018	AJ	Jul 31, 2018
Fluoride	mg/L	0.03	1.5	0.03	Jul 31, 2018	AJ	Jul 31, 2018
Nitrate	mg/L	9.68	45	0.20	Jul 31, 2018	AJ	Jul 31, 2018
Nitrate-N	mg/L	2.19	10	0.02	Jul 31, 2018	SYS	Jul 31, 2018
Nitrite	mg/L	<0.10	3	0.10	Jul 31, 2018	AJ	Jul 31, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Jul 31, 2018	SYS	Jul 31, 2018
Sulfate	mg/L	3300	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	443		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	465		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	507	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	16.2		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.036	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	102		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	3020		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	2.19		0.02		SYS	
Calculated TDS	mg/L	5120		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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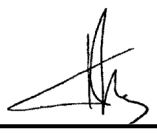

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437584 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	10		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	<0.002		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	94	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	108	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	86	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	86	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	107	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.011		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.66		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00114		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	483		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0017		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	0.4		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.126		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	361		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.139		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.039		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0092		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	254		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.003		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.020		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.018		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.62	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	507		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	619		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4450		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.5	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.10	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	4.83	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	1.09	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2490	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	483		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	361		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	254	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	14.5		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	0.4	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.139	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	105		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.09		0.02		SYS	
Calculated TDS	mg/L	3910		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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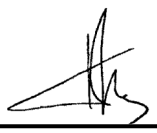

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437585 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	2		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	<0.002		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	91	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	108	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	82	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	82	50-150	Aug 01, 2018	TD	Aug 01, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	103	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.63		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00154		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	486		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.118		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	363		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.594		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.037		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0034		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	262		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.005		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.026		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.019		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2710		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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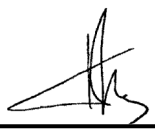

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.52	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	579		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	706		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4550		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.5	(250)	0.6	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.05	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	7.28	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	1.64	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	<0.10	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	2510	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	486		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	363		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	262	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	12.4		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.594	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	103		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2710		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.64		0.02		SYS	
Calculated TDS	mg/L	3990		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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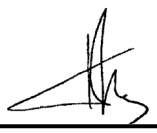

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437586 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

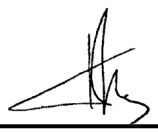
SAMPLE DESCRIPTION: 17507180727015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	3		1	Aug 01, 2018	PS	Aug 01, 2018
Phenols	mg/L	<0.002		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	0.2		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.3		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	0.2		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.3		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	0.00003		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	97	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	109	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	78	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	78	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	110	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.019		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	0.002		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	0.38		0.01	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00283		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	799		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0067		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0039		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	0.9		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.141		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	293		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.52		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.043		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0080		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	201		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.004		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.024		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.015		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	3200		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.30	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	483		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	590		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	5730		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	831	(250)	1.5	Aug 01, 2018	AJ	Aug 01, 2018
Fluoride	mg/L	0.16	1.5	0.03	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate	mg/L	25.5	45	0.20	Aug 01, 2018	AJ	Aug 01, 2018
Nitrate-N	mg/L	5.76	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	20.3	3	0.10	Aug 01, 2018	AJ	Aug 01, 2018
Nitrite-N	mg/L	6.18	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	1970	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	799		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	293		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	201	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	16.2		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	0.9	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	1.52	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	98		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	3200		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	11.9		0.02		SYS	
Calculated TDS	mg/L	4450		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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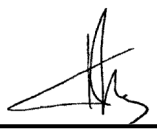

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437587 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	42		1	Aug 01, 2018	PS	Jul 28, 2018
Phenols	mg/L	0.009		0.002	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437589 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	<0.0003		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	79	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	111	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	83	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	81	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437589 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437589 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.053		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	<0.05		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	1.31		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00373		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	379		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0023		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0056		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	<0.1		0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.410		0.002	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	357		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.514		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 01, 2018	PS	Aug 01, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.054		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.0034		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	494		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	0.0002		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.002		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.081		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	2420		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437589 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727010 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.05	7.0-10.5	N/A	Aug 05, 2018	MM	Aug 05, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
T - Alkalinity (as CaCO3)	mg/L	120		5	Aug 05, 2018	MM	Aug 05, 2018
Bicarbonate	mg/L	146		5	Aug 05, 2018	MM	Aug 05, 2018
Carbonate	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Hydroxide	mg/L	<5		5	Aug 05, 2018	MM	Aug 05, 2018
Electrical Conductivity	uS/cm	4950		5	Aug 05, 2018	MM	Aug 05, 2018
Chloride	mg/L	1.3	(250)	0.6	Jul 31, 2018	AJ	Jul 31, 2018
Fluoride	mg/L	0.38	1.5	0.03	Jul 31, 2018	AJ	Jul 31, 2018
Nitrate	mg/L	4.30	45	0.20	Jul 31, 2018	AJ	Jul 31, 2018
Nitrate-N	mg/L	0.97	10	0.02	Jul 31, 2018	SYS	Jul 31, 2018
Nitrite	mg/L	<0.10	3	0.10	Jul 31, 2018	AJ	Jul 31, 2018
Nitrite-N	mg/L	<0.01	1	0.01	Jul 31, 2018	SYS	Jul 31, 2018
Sulfate	mg/L	3500	(500)	15	Aug 01, 2018	AJ	Aug 01, 2018
Dissolved Calcium	mg/L	379		0.3	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	357		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	494	(200)	0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	9.5		0.6	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	<0.1	(0.3)	0.1	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.750	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	93		1	Aug 05, 2018	SYS	Aug 05, 2018
Hardness	mg CaCO3/L	2420		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.97		0.02		SYS	
Calculated TDS	mg/L	4820		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.
Note: Results were verified by repeat analysis

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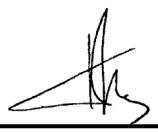

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	0.0336		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Toluene	mg/L	0.0446		0.0003	Aug 01, 2018	EG	Aug 01, 2018
Ethylbenzene	mg/L	0.0039		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Xylenes	mg/L	0.0248		0.0005	Aug 01, 2018	EG	Aug 01, 2018
Styrene	mg/L	<0.0005		0.0005	Aug 01, 2018	EG	Aug 01, 2018
VH W6-10	mg/L	0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
VPH	mg/L	<0.1		0.1	Aug 01, 2018	EG	Aug 01, 2018
EPH (WC10-C19)	mg/L	1.5		0.1	Aug 02, 2018	OP	Aug 01, 2018
EPH (WC19-C32)	mg/L	0.4		0.1	Aug 02, 2018	OP	Aug 01, 2018
LEPH (WC10-C19 - PAH)	mg/L	1.5		0.1	Aug 02, 2018	SYS	Aug 02, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.4		0.1	Aug 02, 2018	SYS	Aug 02, 2018
Acenaphthene	mg/L	0.00053		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Acridine	mg/L	<0.00005		0.00005	Aug 01, 2018	TD	Aug 01, 2018
Anthracene	mg/L	<0.000010		0.000010	Aug 01, 2018	TD	Aug 01, 2018
Chrysene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Fluorene	mg/L	0.00115		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Naphthalene	mg/L	0.00586		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Phenanthrene	mg/L	0.00133		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Aug 01, 2018	TD	Aug 01, 2018
Fluoranthene	mg/L	0.00006		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Pyrene	mg/L	0.00007		0.00001	Aug 01, 2018	TD	Aug 01, 2018
Quinoline	mg/L	<0.00004		0.00004	Aug 01, 2018	TD	Aug 01, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	101	50-150	Aug 01, 2018	EG	Aug 01, 2018
o-Terphenyl (EPH)	%	102	50-150	Aug 02, 2018	OP	Aug 01, 2018
2-Fluorobiphenyl (PAH)	%	102	50-150	Aug 01, 2018	TD	Aug 01, 2018
p-Terphenyl-d14 (PAH)	%	101	50-150	Aug 01, 2018	TD	Aug 01, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Aug 02, 2018	EG	Aug 01, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	114	50-150		Aug 02, 2018	EG	Aug 01, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.033		0.004	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Antimony	mg/L	0.005		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Arsenic	mg/L	0.038		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Barium	mg/L	3.95		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Boron	mg/L	1.02		0.05	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cadmium	mg/L	0.00039		0.00005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Calcium	mg/L	124		1.0	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Chromium	mg/L	0.007		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Cobalt	mg/L	0.0344		0.0009	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Copper	mg/L	0.0019		0.0008	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Iron	mg/L	0.3		0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Lithium	mg/L	0.650		0.002	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Magnesium	mg/L	6		2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	0.073		0.005	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Aug 02, 2018	PS	Aug 02, 2018
Dissolved Molybdenum	mg/L	0.104		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Nickel	mg/L	0.218		0.003	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Selenium	mg/L	0.124		0.0005	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Sodium	mg/L	78.8		2.0	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Titanium	mg/L	0.059		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Uranium	mg/L	0.014		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Vanadium	mg/L	0.036		0.001	Aug 01, 2018	IP	Aug 01, 2018
Dissolved Zinc	mg/L	0.021		0.005	Aug 01, 2018	IP	Aug 01, 2018
Hardness	mg CaCO3/L	334		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.01	7.0-10.5	N/A	Aug 08, 2018	KT	Aug 08, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Aug 08, 2018	KT	Aug 08, 2018
T - Alkalinity (as CaCO3)	mg/L	1250		5	Aug 08, 2018	KT	Aug 08, 2018
Bicarbonate	mg/L	1530		5	Aug 08, 2018	KT	Aug 08, 2018
Carbonate	mg/L	<5		5	Aug 08, 2018	KT	Aug 08, 2018
Hydroxide	mg/L	<5		5	Aug 08, 2018	KT	Aug 08, 2018
Electrical Conductivity	uS/cm	34500		5	Aug 08, 2018	KT	Aug 08, 2018
Chloride	mg/L	13800	(250)	12	Aug 01, 2018	KK	Aug 01, 2018
Fluoride	mg/L	0.61	1.5	0.12	Aug 01, 2018	KK	Aug 01, 2018
Nitrate	mg/L	65.7	45	0.80	Aug 01, 2018	KK	Aug 01, 2018
Nitrate-N	mg/L	14.8	10	0.02	Aug 01, 2018	SYS	Aug 01, 2018
Nitrite	mg/L	75.1	3	0.40	Aug 01, 2018	KK	Aug 01, 2018
Nitrite-N	mg/L	22.9	1	0.01	Aug 01, 2018	SYS	Aug 01, 2018
Sulfate	mg/L	436	(500)	15	Aug 01, 2018	KK	Aug 01, 2018
Dissolved Calcium	mg/L	5080		1.0	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Magnesium	mg/L	255		2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Sodium	mg/L	2230	(200)	2.0	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Potassium	mg/L	612		3.0	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Iron	mg/L	3.0	(0.3)	0.2	Aug 02, 2018	AL	Aug 02, 2018
Dissolved Manganese	mg/L	4.85	0.05	0.005	Aug 02, 2018	AL	Aug 02, 2018
Ion Balance	%	91		1	Aug 08, 2018	SYS	Aug 08, 2018
Hardness	mg CaCO3/L	13700		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	37.7		0.02		SYS	
Calculated TDS	mg/L	23300		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9437712 | DATE RECEIVED: Jul 27, 2018

DATE SAMPLED: Jul 27, 2018 | DATE REPORTED: Aug 07, 2018

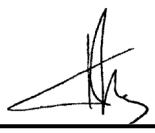
SAMPLE DESCRIPTION: 17507180727016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	790		10	Aug 02, 2018	PS	Aug 02, 2018
Phenols	mg/L	1.29		0.04	Aug 02, 2018	MH	Aug 02, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Aug 07, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
British Columbia CSR - Extended Site Remediation Analysis - Water															
Benzene	3178	9437552	< 0.0005	< 0.0005	NA	< 0.0005	100%	80%	120%	100%	80%	120%	96%	70%	130%
Toluene	3178	9437552	< 0.0003	< 0.0003	NA	< 0.0003	102%	80%	120%	99%	80%	120%	96%	70%	130%
Ethylbenzene	3178	9437552	< 0.0005	< 0.0005	NA	< 0.0005	96%	80%	120%	84%	80%	120%	87%	70%	130%
Xylenes	3178	9437552	< 0.0005	< 0.0005	NA	< 0.0005	103%	80%	120%	96%	80%	120%	93%	70%	130%
Styrene	3178	9437552	< 0.0005	< 0.0005	NA	< 0.0005	107%	80%	120%	99%	80%	120%	102%	70%	130%
VH W6-10	3178	9437552	< 0.1	< 0.1	NA	< 0.1	84%	80%	120%	97%	80%	120%	107%	70%	130%
EPH (WC10-C19)	194	9437575	<0.1	<0.1	NA	< 0.1	111%	80%	120%	95%	80%	120%	98%	70%	130%
EPH (WC19-C32)	194	9437575	0.1	<0.1	NA	< 0.1	111%	80%	120%	102%	80%	120%	90%	70%	130%
Acenaphthene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	98%	70%	130%	94%	70%	130%	89%	70%	130%
Acridine	1718	9437577	<0.00005	<0.00005	NA	< 0.00005	89%	70%	130%	90%	70%	130%	99%	70%	130%
Anthracene	1718	9437577	<0.00001	<0.00001	NA	< 0.000010	84%	70%	130%	85%	70%	130%	81%	70%	130%
Chrysene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	102%	70%	130%	89%	70%	130%	89%	70%	130%
Fluorene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	94%	70%	130%	90%	70%	130%	86%	70%	130%
Naphthalene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	98%	70%	130%	92%	70%	130%	89%	70%	130%
Phenanthrene	1718	9437577	0.00001	0.00001	NA	< 0.00001	95%	70%	130%	92%	70%	130%	87%	70%	130%
Benzo[a]anthracene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	80%	70%	130%	86%	70%	130%	86%	70%	130%
Benzo[a]pyrene	1718	9437577	< 0.000007	< 0.000007	NA	< 0.000007	77%	70%	130%	81%	70%	130%	79%	70%	130%
Fluoranthene	1718	9437577	<0.00001	<0.00001	NA	< 0.00001	83%	70%	130%	90%	70%	130%	89%	70%	130%
Pyrene	1718	9437577	0.00002	0.00002	NA	< 0.00001	93%	70%	130%	92%	70%	130%	82%	70%	130%
Quinoline	1718	9437577	<0.00004	<0.00004	NA	< 0.00004	88%	70%	130%	98%	70%	130%	124%	70%	130%
MTBE in Water															
Methyl tert-butyl ether	3178	9437552	< 0.001	< 0.001	NA	< 0.001	119%	70%	130%	119%	70%	130%	119%	60%	140%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Aug 07, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Matrix Solutions Routine Chemistry Water Analysis															
pH	9446711		7.84	7.81	0.4%	N/A	100%	90%	110%						
T - Alkalinity (as CaCO3)	9446711		807	810	0.4%	< 5	102%	80%	120%						
Electrical Conductivity	9446711		3720	3690	0.6%	< 5	103%	80%	120%						
Chloride	9438940	9437589	71.2	70.7	0.7%	< 0.6	103%	80%	120%	100%	80%	120%	NA	80%	120%
Fluoride	9438940	9437589	0.17	0.17	1.2%	< 0.01	97%	80%	120%	94%	80%	120%	97%	80%	120%
Nitrate	9438940	9437589	101	100	0.6%	< 0.08	96%	80%	120%	96%	80%	120%	NA	80%	120%
Nitrite	9438940	9437589	0.58	0.60	2.4%	< 0.03	91%	80%	120%	89%	80%	120%	99%	80%	120%
Sulfate	9438940	9437589	67	66	NA	< 0.6	95%	80%	120%	95%	80%	120%	NA	80%	120%
Dissolved Calcium	9437552	9437552	457	443	3.0%	< 0.3	100%	80%	120%	102%	80%	120%	NA	80%	120%
Dissolved Magnesium	9437552	9437552	294	291	1.2%	< 0.2	94%	80%	120%	97%	80%	120%	NA	80%	120%
Dissolved Sodium	9437552	9437552	230	221	4.2%	< 0.6	106%	80%	120%	119%	80%	120%	NA	80%	120%
Dissolved Potassium	9437552	9437552	7.5	7.3	2.9%	< 0.6	92%	80%	120%	90%	80%	120%	NA	80%	120%
Dissolved Iron	9437552	9437552	<0.1	<0.1	NA	< 0.1	86%	80%	120%	82%	80%	120%	83%	80%	120%
Dissolved Manganese	9437552	9437552	1.85	1.85	0.0%	< 0.005	90%	80%	120%	84%	80%	120%	NA	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

Water Analysis - DOC, Phenols															
Dissolved Organic Carbon (DOC)	9437576	9437576	15	14	1.5%	< 1	106%	80%	120%	108%	80%	120%	118%	80%	120%
Phenols	9433635		<0.002	<0.002	NA	< 0.002	110%	80%	120%	96%	80%	120%	91%	80%	120%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

British Columbia CSR - Schedule 6 Dissolved Metals															
Dissolved Aluminum	9429612		0.134	0.151	12.0%	< 0.004	100%	80%	120%	107%	80%	120%	114%	80%	120%
Dissolved Antimony	9429612		<0.001	<0.001	NA	< 0.001	107%	80%	120%	105%	80%	120%	99%	80%	120%
Dissolved Arsenic	9429612		0.002	0.001	NA	< 0.001	103%	80%	120%	101%	80%	120%	102%	80%	120%
Dissolved Barium	9429612		0.09	0.10	NA	< 0.05	104%	80%	120%	105%	80%	120%	101%	80%	120%
Dissolved Beryllium	9429612		<0.001	<0.001	NA	< 0.001	106%	80%	120%	105%	80%	120%	118%	80%	120%
Dissolved Boron	9429612		0.05	0.06	13.6%	< 0.01	103%	80%	120%	102%	80%	120%	112%	80%	120%
Dissolved Cadmium	9429612		<0.00005	<0.00005	NA	< 0.00005	105%	80%	120%	104%	80%	120%	102%	80%	120%
Dissolved Calcium	9437552	9437552	457	443	3.0%	< 0.3	100%	80%	120%	102%	80%	120%	NA	80%	120%
Dissolved Chromium	9429612		<0.001	<0.001	NA	< 0.001	100%	80%	120%	107%	80%	120%	101%	80%	120%
Dissolved Cobalt	9429612		<0.0009	<0.0009	NA	< 0.0009	100%	80%	120%	105%	80%	120%	102%	80%	120%
Dissolved Copper	9429612		0.0036	0.0037	NA	< 0.0008	101%	80%	120%	106%	80%	120%	104%	80%	120%
Dissolved Iron	9437552	9437552	<0.1	<0.1	NA	< 0.1	86%	80%	120%	82%	80%	120%	83%	80%	120%
Dissolved Lead	9429612		<0.0005	<0.0005	NA	< 0.0005	103%	80%	120%	102%	80%	120%	97%	80%	120%

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

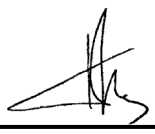
SAMPLED BY:

Water Analysis (Continued)

RPT Date: Aug 07, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Lithium	9429612		0.010	0.011	11.7%	< 0.001	101%	80%	120%	105%	80%	120%	111%	80%	120%
Dissolved Magnesium	9437552	9437552	294	291	1.2%	< 0.2	94%	80%	120%	97%	80%	120%	NA	80%	120%
Dissolved Manganese	9437552	9437552	1.85	1.85	0.0%	< 0.005	90%	80%	120%	84%	80%	120%	NA	80%	120%
Dissolved Mercury	9437585	9437585	<0.	<0.	NA	< 0.000025	105%	90%	110%	93%	90%	110%	98%	80%	120%
Dissolved Molybdenum	9429612		0.005	0.005	7.3%	< 0.001	100%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Nickel	9429612		<0.003	<0.003	NA	< 0.003	99%	80%	120%	105%	80%	120%	104%	80%	120%
Dissolved Selenium	9429612		0.0009	0.0008	NA	< 0.0005	98%	80%	120%	99%	80%	120%	104%	80%	120%
Dissolved Silver	9429612		<0.0001	<0.0001	NA	< 0.0001	90%	80%	120%	89%	80%	120%	94%	80%	120%
Dissolved Sodium	9437552	9437552	230	221	4.2%	< 0.6	106%	80%	120%	119%	80%	120%	NA	80%	120%
Dissolved Thallium	9429612		<0.0001	<0.0001	NA	< 0.0001	100%	80%	120%	100%	80%	120%	98%	80%	120%
Dissolved Titanium	9429612		0.003	0.003	NA	< 0.001	98%	80%	120%	102%	80%	120%	102%	80%	120%
Dissolved Uranium	9429612		<0.001	<0.001	NA	< 0.001	101%	80%	120%	99%	80%	120%	100%	80%	120%
Dissolved Vanadium	9429612		0.004	0.005	NA	< 0.001	101%	80%	120%	106%	80%	120%	106%	80%	120%
Dissolved Zinc	9429612		0.011	0.012	NA	< 0.004	103%	80%	120%	104%	80%	120%	106%	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:



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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	TO-0542	EPA SW-846 8260	GC/MS
Toluene	TO-0542	EPA SW-846 8260	GC/MS
Ethylbenzene	TO-0542	EPA SW-846 8260	GC/MS
Xylenes	TO-0542	EPA SW-846 8260	GC/MS
Styrene	TO-0542	EPA SW-846 8260	GC/MS
VH W6-10	TO-0542	B.C. ENVIRONMENT	GC/FID
VPH	TO-0542	B.C. ENVIRONMENT	GC/MS/FID
EPH (WC10-C19)	TO 0511	B.C. ENVIRONMENT	GC/FID
EPH (WC19-C32)	TO 0511	B.C. ENVIRONMENT	GC/FID
LEPH (WC10-C19 - PAH)	TO 0511	B.C. ENVIRONMENT	GC/FID
HEPH (WC19-C32 - PAH)	TO 0511	B.C. ENVIRONMENT	GC/FID
Acenaphthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Acridine	TO 0200	EPA SW846 3511 & 8270	GC/MS
Anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Chrysene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluorene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Naphthalene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Phenanthrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluoranthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Quinoline	TO 0200	EPA SW846 3511 & 8270	GC/MS
Toluene-d8 (BTEX)	TO-0543	BC Environment	GC/MS
o-Terphenyl (EPH)	TO 0511	B.C. ENVIRONMENT	GC/FID
2-Fluorobiphenyl (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
p-Terphenyl-d14 (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
Methyl tert-butyl ether	TO 0340	EPA SW-846 5035/8260-W	GC/MS
Toluene-d8	TO-0570	EPA SW-846 8260	GC/MS

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Antimony	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Arsenic	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Barium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Beryllium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Boron	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cadmium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Calcium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Chromium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cobalt	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Copper	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Iron	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Lead	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Lithium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Magnesium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Mercury	INST 0160	SM 3112 B DW	CV/AA
Dissolved Molybdenum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Nickel	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Selenium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Silver	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Sodium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Thallium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Titanium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Uranium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Vanadium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Zinc	INST 0141	SM 3125 B-D	ICP-MS
pH	INST 0101	SM 4500 H+	pH METER
p - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
T - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
Bicarbonate	INST 0101	SM 2320 B	PC TITRATE
Carbonate	INST 0101	SM 2320 B	PC TITRATE
Hydroxide	INST 0101	SM 2320 B	TITRATION
Electrical Conductivity	INST 0101	SM 2510 B	CONDUCTIVITY METER
Chloride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate-N	INST 0150	SM 4110 B	CALCULATION
Nitrite	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrite-N	INST 0150	SM 4110 B	CALCULATION
Sulfate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Dissolved Calcium	INST 0140	SM 3120 B	ICP/OES
Dissolved Magnesium	INST 0140	SM 3120 B	ICP/OES
Dissolved Sodium	INST 0140	SM 3120 B	ICP/OES
Dissolved Potassium	INST 0140	SM 3120 B	ICP/OES
Dissolved Iron	INST 0140	SM 3120 B	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B	ICP/OES
Ion Balance		SM 1030E	
Dissolved Organic Carbon (DOC)	INST 0170	SM 5310 B DW	COMBUSTION

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F368601

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Phenols	INST 0300	SM 420.2	CONTINUOUS FLOW ANALYZER

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1807272117507

Page: 1 of: 2

Lab Submitted To: AGAT Labs
Lab Agreement No.:
Job ID: 18F368601

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation		Matrix Solutions - Environmental Data Services (EDS)
Contact Name:	Scott Crowe		Suite 600, 214 - 11th Avenue SW
Address:			Calgary Alberta Canada
	Canada	PC:	T2R 0K1
Phone/Fax #:	Ph	Fax.	Ph: 403-237-0606 Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'hanley, M. Greenwood

AFE #:

REGULATORY REQUIREMENTS: (check):
- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other

SERVICE REQUESTED: (check):
- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com
- ☐ Add'l Emails: ahum@matrix-solutions.com; ehenson@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Analysis Required: 58696	54668	58104	58547	MTBE	58328	Lab Sample Number	HOLD
1	17507180727001	MW92-1		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X	94377	
2	17507180727002	MW92-1A		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		75
3	17507180727003	MW92-6A		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		76
4	17507180727004	MW92-7A		Water	Jul 27 2018	0	0	BT5	X	X						77
5	17507180727005	MW92-7		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		78
6	17507180727006	03-3		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		80
7	17507180727008	03-5		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		81
8	17507180727009	BH-103		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		82
9	17507180727012	BH-105(R)		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		83
10	17507180727013	15-9		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		84
11	17507180727014	15-10		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		85
12	17507180727015	15-11		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		86
13	17507180727017	LDS		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		87
14	17507180727020	Leachate vault 1		Water	Jul 27 2018	0	0	BT11	X	X	X	X	X	X		88
15	17507180727010			Water	Jul 27 2018	0	0	BT7	X	X				X		89
*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'								Preserved/Filtered								

Relinquished by: Miranda O'Hanley **Date/Time:** Friday, July 27, 2018
Signature:
Received by: **Date/Time:**
Signature:

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle preservative. Dissolved metal, dissolved mercury, phenols and DOC have

JUL 31 2018 @ 9:45

C 32442

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1807272117507

Lab Submitted To: AGAT Labs
Lab Agreement No.:
Job ID:

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'hanley, M. Greenwood

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ **RUSH (Please ensure you contact the lab): Due Date:** (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: **Always send to eds@matrix-solutions.com**

- ☐ Add'l Emails: see page 1

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	58696	54668	58104	58547	MTBE	58328							Lab Sample Number	HOLD
1	17507180727018			Water	Jul 27 2018	0	0	BT7	X	X				X								X
2	17507180727019			Water	Jul 27 2018	0	0	BT4		X												X
3																						
4																						
5																						
6																						
7																						
8																						
9																						
10																						
11																						
12																						
13																						
14																						
15																						

Analysis Required

*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'

Preserved/Filtered

Relinquished by: Miranda O'Hanley **Date/Time:** Friday, July 27, 2018
Signature:

Received by: **Date/Time:**
Signature:

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle see page 1

JUL 31 2018

C 32443

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: TERVITA / MATRIX

Courier: JK ZIP Prepaid Collect

Waybill#_____

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:_____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other_____

Cooler Quantity: 5

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? (Yes) No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: JULY 30. 2018

Hydrocarbons: Earliest Expiry AUG. 10. 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:_____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: (Icepack) Bagged Ice (Free Ice) Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 3 + 2 + 3 = 3 °C	2(Bottle/Jar) 3 + 3 + 3 = 3 °C
3 (Bottle/Jar) 4 + 3 + 3 = 3 °C	4 (Bottle/Jar) 2 + 3 + 3 = 2 °C
5 (Bottle/Jar)___+___+___=____ °C	6 (Bottle/Jar)___+___+___=____ °C
7 (Bottle/Jar)___+___+___=____ °C	8 (Bottle/Jar)___+___+___=____ °C
9 (Bottle/Jar)___+___+___=____ °C	10 (Bottle/Jar)___+___+___=____ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18 F36860 1

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:_____

Account Project Manager:_____have they been notified of the above issues: Yes No

Whom spoken to:_____ Date/Time:_____

CPM Initial_____

General Comments: SAMPLES ARE IN WITH WP W/ OTHER SAMPLES FROM OTHER PROJECTS

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Jul 30 18 coc: F10984

RECEIVING BASICS - Shipping

Company/Consultant: Matrix / Tervita

Courier: _____ Prepaid Collect

Waybill# _____

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other: _____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other _____

Cooler Quantity: 5 LRG

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: _____

Hydrocarbons: Earliest Expiry _____

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken: _____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice) Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 7 + 8 + 9 = 8 °C	2 (Bottle/Jar) 3 + 5 + 4 = 4 °C
3 (Bottle/Jar) 3 + 4 + 3 = 3 °C	4 (Bottle/Jar) 6 + 5 + 6 = 6 °C
5 (Bottle/Jar) 5 + 4 + 4 = 4 °C	6 (Bottle/Jar) ___ + ___ + ___ = ___ °C
7 (Bottle/Jar) ___ + ___ + ___ = ___ °C	8 (Bottle/Jar) ___ + ___ + ___ = ___ °C
9 (Bottle/Jar) ___ + ___ + ___ = ___ °C	10 (Bottle/Jar) ___ + ___ + ___ = ___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: _____

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other: _____

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date/Time: _____

CPM Initial _____

General Comments: _____

*Temp check before send out - Left in fridge over weekend *

* Subcontracted Analysis (See CPM)

WHERE IS IT SENT:

GP ___ Burnaby ___ Calgary ✓

Date issued: October 05, 2015

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/BlockA-08-088-20W6M

AGAT WORK ORDER: 18F384826

WATER ANALYSIS REVIEWED BY: Loan Nguyen, Senior Analyst

DATE REPORTED: Oct 10, 2018

PAGES (INCLUDING COVER): 21

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543191 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	2.7±1.1		1.1	Oct 10, 2018	LN	
Gross beta	Bq/L	1.9±0.4		0.79	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

2910 12TH STREET NE
CALGARY, ALBERTA
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FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543191 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	0.1		0.08	Oct 10, 2018	LN	
Radium-226	Bq/L	0.11		0.02	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.1		0.1	Oct 10, 2018	LN	
Thorium-228	Bq/L	0.07		0.04	Oct 10, 2018	LN	
Thorium-230	Bq/L	0.06		0.04	Oct 10, 2018	LN	
Thorium-232	Bq/L	0.08		0.04	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.061		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.0030		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.061		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543195 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911009 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<1.8		1.8	Oct 10, 2018	LN	
Gross beta	Bq/L	<1.3		1.3	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By:

AGAT Laboratories

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CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543195 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911009 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Radium-226	Bq/L	0.02		0.005	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Thorium-228	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-230	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-232	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.007		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.0004		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.007		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543196 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	5.0±1.9		1.4	Oct 10, 2018	LN	
Gross beta	Bq/L	<0.99		0.99	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: 

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water

SAMPLE ID: 9543196

DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018

DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Radium-226	Bq/L	0.01		0.005	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Thorium-228	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-230	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-232	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.67		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.034		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.67		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543197 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	5.3±2.4		2.7	Oct 10, 2018	LN	
Gross beta	Bq/L	2.5±0.6		2	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543197 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.08		0.08	Oct 10, 2018	LN	
Radium-226	Bq/L	0.32		0.02	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.2		0.2	Oct 10, 2018	LN	
Thorium-228	Bq/L	0.09		0.04	Oct 10, 2018	LN	
Thorium-230	Bq/L	0.11		0.04	Oct 10, 2018	LN	
Thorium-232	Bq/L	0.08		0.04	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.68		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.034		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.68		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543198 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.8±1.7		1.8	Oct 10, 2018	LN	
Gross beta	Bq/L	<1.3		1.3	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543198 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Radium-226	Bq/L	0.08		0.01	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Oct 10, 2018	LN	
Thorium-228	Bq/L	0.06		0.02	Oct 10, 2018	LN	
Thorium-230	Bq/L	0.02		0.02	Oct 10, 2018	LN	
Thorium-232	Bq/L	0.05		0.02	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.26		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.013		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.26		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543199 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	6.0±2.3		1.8	Oct 10, 2018	LN	
Gross beta	Bq/L	2.4±0.5		1.3	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543199 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Radium-226	Bq/L	0.03		0.005	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.05		0.05	Oct 10, 2018	LN	
Thorium-228	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-230	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Thorium-232	Bq/L	<0.01		0.01	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.31		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.016		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.31		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543200 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	12±6		7	Oct 10, 2018	LN	
Gross beta	Bq/L	17±3		4.8	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543200 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.08		0.08	Oct 10, 2018	LN	
Radium-226	Bq/L	0.05		0.02	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.2		0.2	Oct 10, 2018	LN	
Thorium-228	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Thorium-230	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Thorium-232	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.12		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.0059		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.12		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9543201 | DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911010 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	5.9±2.3		2	Oct 10, 2018	LN	
Gross beta	Bq/L	2.6±0.5		1.3	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water SAMPLE ID: 9543201 DATE RECEIVED: Sep 12, 2018

DATE SAMPLED: Sep 11, 2018 DATE REPORTED: Oct 10, 2018

SAMPLE DESCRIPTION: 17507180911010 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Oct 10, 2018	LN	
Radium-226	Bq/L	0.03		0.01	Oct 10, 2018	LN	
Radium-228	Bq/L	<0.09		0.09	Oct 10, 2018	LN	
Thorium-228	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Thorium-230	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Thorium-232	Bq/L	<0.02		0.02	Oct 10, 2018	LN	
Uranium-234	Bq/L	0.007		0.001	Oct 10, 2018	LN	
Uranium-235	Bq/L	0.0004		0.00006	Oct 10, 2018	LN	
Uranium-238	Bq/L	0.007		0.001	Oct 10, 2018	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F384826

PROJECT: 17507-502/BlockA-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Gross alpha		subcontracted	
Gross beta		subcontracted	
Lead-210		Subcontracted	
Radium-226		Subcontracted	
Radium-228		Subcontracted	
Thorium-228		Subcontracted	
Thorium-230		Subcontracted	
Thorium-232		Subcontracted	
Uranium-234		Subcontracted	
Uranium-235		Subcontracted	
Uranium-238		Subcontracted	

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1809113217507

3°C

Page: 1 of : 1

Lab Submitted To: AGAT Labs

Lab Agreement No.:

Job ID: N F 3 8 4 8 2 6

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'Hanley, M. Greenwood

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☐ Add'l Emails: ahum@matrix-solutions.com; ehenson@matrix-solutions.com; mrutten@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Gross Alpha+Beta	Lead-210	Radium-226	Radium-228	Thorium-228,230,232	Uranium-234,235,238	Lab Sample Number	HOLD
1	17507180911003	MW92-6A		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
2	17507180911009	BH-103		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
3	17507180911012	BH-105(R)		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
4	17507180911013	15-9		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
5	17507180911014	15-10		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
6	17507180911015	15-11		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
7	17507180911016	Leachate		Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
8	17507180911010			Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		
9	17507180911011			Water	Sep 11 2018	0	0	BT6	X	X	X	X	X	X		X
10																
11																
12																
13																
14																
15																

Preserved/Filtered

195 196 197 198 199 ~~200~~ 201 202

*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'

Relinquished by: Miranda O'Hanley **Date/Time:** Tuesday, September 11, 2018

Signature:

Received by: **Date/Time:** Sept 11 18

Signature:

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

F 11003

SEP 13 2018 @ 10:40

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: TORVITA/ MATRIX

Courier: A700 Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: Yes (No)

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 4

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: NA

Hydrocarbons: Earliest Expiry NA

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: (Icepack) Bagged Ice Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 3+2+3=3 °C	2(Bottle/Jar) 3+3+3=3 °C
3 (Bottle/Jar) 3+2+3=3 °C	4 (Bottle/Jar) 3+2+3=3 °C
5 (Bottle/Jar)___+___+___=___ °C	6 (Bottle/Jar)___+___+___=___ °C
7 (Bottle/Jar)___+___+___=___ °C	8 (Bottle/Jar)___+___+___=___ °C
9 (Bottle/Jar)___+___+___=___ °C	10 (Bottle/Jar)___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18F3X4K7C

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Sept 11 coc: F11003

RECEIVING BASICS - Shipping

Company/Consultant: Matrix/Tervita

Courier: Client dropped off in Prepaid Collect

Waybill# After-Hours Shed

Branch: EDM GP FN FM RD VAN LYD KSJ EST Other:

If multiple sites were submitted at once: Yes No

Custody Seal Intact: Yes No NA

TAT: <24hr 24-48hr 48-72hr Reg Other

Cooler Quantity: 3 LRG

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes NO

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry:

Hydrocarbons: Earliest Expiry

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES NO Precaution Taken:

Legal Samples: Yes NO

International Samples: Yes NO

Tape Sealed: Yes NO

Coolant Used: Icepack Bagged Ice Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 5+5+5=5 °C	2(Bottle/Jar) 5+5+3=4 °C
3 (Bottle/Jar) 5+3+4=4 °C	4 (Bottle/Jar)___+___+___=___ °C
5 (Bottle/Jar)___+___+___=___ °C	6 (Bottle/Jar)___+___+___=___ °C
7 (Bottle/Jar)___+___+___=___ °C	8 (Bottle/Jar)___+___+___=___ °C
9 (Bottle/Jar)___+___+___=___ °C	10 (Bottle/Jar)___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No:

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

Matrix COC#: MD-MO1809112417507

PROJECT #: 17507-502 pt2

* Subcontracted Analysis (See CPM)

WHERE IS IT SENT:

GP Burnaby Calgary ✓

Date issued: October 05, 2015

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502 / Block A-08-088-20W6M

AGAT WORK ORDER: 18F385227

TRACE ORGANICS REVIEWED BY: Elena Gorobets, Report Writer

WATER ANALYSIS REVIEWED BY: Loan Nguyen, Senior Analyst

DATE REPORTED: Sep 18, 2018

PAGES (INCLUDING COVER): 81

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	105	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	98	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	86	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	85	50-150	Sep 16, 2018	TD	Sep 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	105	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.056		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.44		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00123		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	507		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0013		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.035		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	312		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	2.16		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.021		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	230		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.036		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.013		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.04		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	871		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	1060		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	3920		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	2.4		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.03		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	<0.20		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	<0.02		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	1920		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	507		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	312		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	230		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	7.6		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	2.16		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	107		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	3500		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546006 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911001 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	3		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	116	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	99	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	74	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	73	50-150	Sep 16, 2018	TD	Sep 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	116	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.007		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.31		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00081		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	460		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0012		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.201		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	324		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.259		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.007		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0020		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	0.0002		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	98.2		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.014		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.005		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2480		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.14		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	325		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	396		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	3480		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	<0.6		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.10		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	0.73		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	0.16		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2180		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	460		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	324		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	98.2		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	10.2		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.259		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	104		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2480		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.16		0.02		SYS	
Calculated TDS	mg/L	3270		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546015 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911002 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	8		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	109	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	101	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	116	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	109	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.121		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.15		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00045		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	454		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0019		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	0.2		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.041		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	122		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.077		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.006		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0007		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	20.3		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.008		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	1640		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.22		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	156		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	191		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	2290		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	9.6		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.25		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	0.31		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	0.07		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	1360		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	454		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	122		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	20.3		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	3.8		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	0.2		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.077		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	106		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	1640		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.07		0.02		SYS	
Calculated TDS	mg/L	2060		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546016 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911003 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	11		2	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546018 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911004 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	105	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	99	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	83	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	86	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546018 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911004 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	104	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	96	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	113	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	110	50-150	Sep 16, 2018	TD	Sep 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	104	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.021		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.40		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00109		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	468		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	0.0031		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	1.0		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.156		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	518		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	2.23		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.013		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	249		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.009		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.010		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	3300		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.18		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	555		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	677		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	4900		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	2.8		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.09		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	1.93		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	0.44		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	3090		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	468		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	518		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	249		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	13.0		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	1.0		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	2.23		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	102		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	3300		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.44		0.02		SYS	
Calculated TDS	mg/L	4680		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546019 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911005 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	5		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	0.005		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546020 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911007 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	116	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	98	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	79	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	80	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546020 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911007 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546020 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911007 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.34		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	406		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	495		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	3990		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	<0.6		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.07		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	3.24		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	0.73		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2510		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	509		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	414		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	110		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	9.5		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	107		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2980		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.73		0.02		SYS	
Calculated TDS	mg/L	3800		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	0.00002		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	0.00002		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	0.00002		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	108	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	112	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	73	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	75	50-150	Sep 16, 2018	TD	Sep 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	108	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.067		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.88		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00777		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	385		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	0.0104		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0014		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.482		0.002	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	346		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	1.99		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.092		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0015		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	594		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	0.0005		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.169		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2390		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.53		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	87		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	107		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	5070		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	<0.6		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.28		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	8.83		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	1.99		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	3200		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	385		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	346		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	594		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	10.8		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	1.99		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	108		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2390		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.99		0.02		SYS	
Calculated TDS	mg/L	4600		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546021 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911009 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	6		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	0.003		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	104	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	97	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	98	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	93	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	104	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.33		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00043		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	503		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	0.0094		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0009		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.066		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	220		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.315		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.012		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0008		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	362		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.059		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.018		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2160		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.37		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	709		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	865		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	4160		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	1.8		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.07		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	<0.20		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	<0.02		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2050		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	503		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	220		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	362		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	8.3		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.315		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	104		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2160		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	3570		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546022 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911012 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	106	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	96	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	109	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	111	50-150	Sep 16, 2018	TD	Sep 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	106	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.032		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.42		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00092		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	508		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0017		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.216		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	491		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.111		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.014		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0040		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	497		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.004		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.053		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.008		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	3290		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.22		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	622		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	759		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	5560		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	1.2		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.24		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	9.11		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	2.06		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	3350		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	508		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	491		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	497		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	16.2		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.111		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	107		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	3290		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	2.06		0.02		SYS	
Calculated TDS	mg/L	5250		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546023 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911013 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	10		2	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	102	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	96	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	92	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	94	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	102	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.017		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.52		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00138		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	512		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0039		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.130		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	374		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.402		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.036		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0061		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	238		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.020		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.021		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2820		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.26		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	509		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	621		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	4290		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	<0.6		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.16		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	3.62		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	0.82		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2590		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	512		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	374		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	238		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	13.3		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.402		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	104		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2820		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.82		0.02		SYS	
Calculated TDS	mg/L	4040		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546024 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911014 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	112	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	100	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	71	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	71	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	112	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.007		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.50		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00167		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	519		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.130		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	381		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.957		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.035		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0028		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	255		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.027		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.019		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2860		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.15		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	581		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	709		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	4410		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	0.7		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	0.11		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	6.60		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	1.49		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2550		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	519		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	381		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	255		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	12.5		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	<0.1		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.957		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	106		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2860		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.49		0.02		SYS	
Calculated TDS	mg/L	4070		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546031 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911015 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	3		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	<0.002		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	0.0281		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	0.0482		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	0.00352		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	0.0247		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	0.4		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	0.3		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	65.0		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	11.2		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	65.0		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	11.2		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	0.00195		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	0.00021		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	0.00443		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	0.0085		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	0.00875		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	0.0002		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	0.00011		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	0.00078		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	0.0011		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	110	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	115	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	114	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	130	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	110	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.052		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.032		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	3.78		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.58		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00039		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	3420		1.0	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	0.005		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	0.0224		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0024		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	23.9		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	0.0006		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.471		0.002	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	186		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	3.41		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	0.065		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.139		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	0.0818		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	1780		2.0	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.051		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.010		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.029		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.024		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	9310		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.96		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	770		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	939		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	24100		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	8780		12	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	<0.1		0.1	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	240		0.8	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	54.2		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	96.6		0.4	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	29.4		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	335		0.6	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	3420		1.0	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	186		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	1780		2.0	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	577		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	23.9		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	3.41		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	101		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	9310		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	83.6		0.02		SYS	
Calculated TDS	mg/L	15900		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546032 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911016 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	821		10	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	0.79		0.02	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Toluene	mg/L	<0.0003		0.0003	Sep 15, 2018	MB	Sep 14, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Xylenes	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
Styrene	mg/L	<0.0005		0.0005	Sep 15, 2018	MB	Sep 14, 2018
VH W6-10	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
VPH	mg/L	<0.1		0.1	Sep 15, 2018	MB	Sep 14, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Sep 17, 2018	OP	Sep 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Sep 17, 2018	SYS	Sep 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Acridine	mg/L	<0.00005		0.00005	Sep 16, 2018	TD	Sep 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Sep 16, 2018	TD	Sep 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Naphthalene	mg/L	0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Phenanthrene	mg/L	0.00002		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Sep 16, 2018	TD	Sep 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Sep 16, 2018	TD	Sep 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Sep 16, 2018	TD	Sep 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	112	50-150	Sep 15, 2018	MB	Sep 14, 2018
o-Terphenyl (EPH)	%	102	50-150	Sep 17, 2018	OP	Sep 14, 2018
2-Fluorobiphenyl (PAH)	%	96	50-150	Sep 16, 2018	TD	Sep 14, 2018
p-Terphenyl-d14 (PAH)	%	98	50-150	Sep 16, 2018	TD	Sep 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Sep 15, 2018	MB	Sep 14, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	112	50-150		Sep 15, 2018	MB	Sep 14, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.067		0.004	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Arsenic	mg/L	0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Barium	mg/L	<0.05		0.05	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Boron	mg/L	0.26		0.01	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cadmium	mg/L	0.00100		0.00005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Calcium	mg/L	577		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Cobalt	mg/L	0.0036		0.0009	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Copper	mg/L	0.0037		0.0008	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Iron	mg/L	0.6		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Lithium	mg/L	0.110		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Magnesium	mg/L	283		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.795		0.005	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Sep 15, 2018	PS	Sep 15, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Nickel	mg/L	0.023		0.003	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Sodium	mg/L	91.0		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Titanium	mg/L	0.004		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Uranium	mg/L	0.019		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Vanadium	mg/L	0.003		0.001	Sep 18, 2018	EB	Sep 18, 2018
Dissolved Zinc	mg/L	0.010		0.005	Sep 18, 2018	EB	Sep 18, 2018
Hardness	mg CaCO3/L	2610		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.87		N/A	Sep 15, 2018	MM	Sep 15, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
T - Alkalinity (as CaCO3)	mg/L	456		5	Sep 15, 2018	MM	Sep 15, 2018
Bicarbonate	mg/L	556		5	Sep 15, 2018	MM	Sep 15, 2018
Carbonate	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Hydroxide	mg/L	<5		5	Sep 15, 2018	MM	Sep 15, 2018
Electrical Conductivity	uS/cm	3930		5	Sep 15, 2018	MM	Sep 15, 2018
Chloride	mg/L	121		0.6	Sep 15, 2018	CO	Sep 15, 2018
Fluoride	mg/L	<0.03		0.03	Sep 15, 2018	CO	Sep 15, 2018
Nitrate	mg/L	7.92		0.20	Sep 15, 2018	CO	Sep 15, 2018
Nitrate-N	mg/L	1.79		0.02	Sep 15, 2018	SYS	Sep 15, 2018
Nitrite	mg/L	<0.10		0.10	Sep 15, 2018	CO	Sep 15, 2018
Nitrite-N	mg/L	<0.01		0.01	Sep 15, 2018	SYS	Sep 15, 2018
Sulfate	mg/L	2130		1.5	Sep 15, 2018	CO	Sep 15, 2018
Dissolved Calcium	mg/L	577		0.3	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Magnesium	mg/L	283		0.2	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Sodium	mg/L	91.0		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Potassium	mg/L	6.3		0.6	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Iron	mg/L	0.6		0.1	Sep 17, 2018	AS	Sep 17, 2018
Dissolved Manganese	mg/L	0.795		0.005	Sep 17, 2018	AS	Sep 17, 2018
Ion Balance	%	99		1	Sep 17, 2018	SYS	Sep 17, 2018
Hardness	mg CaCO3/L	2610		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.79		0.02		SYS	
Calculated TDS	mg/L	3490		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9546033 | DATE RECEIVED: Sep 11, 2018

DATE SAMPLED: Sep 11, 2018 | DATE REPORTED: Sep 18, 2018

SAMPLE DESCRIPTION: 17507180911017 A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	20		1	Sep 14, 2018	PS	Sep 14, 2018
Phenols	mg/L	0.003		0.002	Sep 16, 2018	JH	Sep 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Trace Organics Analysis

RPT Date: Sep 18, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
British Columbia CSR - Extended Site Remediation Analysis - Water															
Benzene	3209	9546006	< 0.0005	< 0.0005	NA	< 0.0005	92%	80%	120%	88%	80%	120%	95%	70%	130%
Toluene	3209	9546006	< 0.0003	< 0.0003	NA	< 0.0003	93%	80%	120%	88%	80%	120%	90%	70%	130%
Ethylbenzene	3209	9546006	< 0.0005	< 0.0005	NA	< 0.0005	107%	80%	120%	101%	80%	120%	94%	70%	130%
Xylenes	3209	9546006	< 0.0005	< 0.0005	NA	< 0.0005	90%	80%	120%	92%	80%	120%	90%	70%	130%
Styrene	3209	9546006	< 0.0005	< 0.0005	NA	< 0.0005	111%	80%	120%	85%	80%	120%	109%	70%	130%
VH W6-10	3209	9546006	< 0.1	< 0.1	NA	< 0.1	111%	80%	120%	118%	80%	120%	106%	70%	130%
EPH (WC10-C19)	252	9546015	< 0.1	< 0.1	NA	< 0.1	107%	80%	120%	96%	80%	120%	87%	70%	130%
EPH (WC19-C32)	252	9546015	< 0.1	< 0.1	NA	< 0.1	107%	80%	120%	107%	80%	120%	74%	70%	130%
Acenaphthene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	98%	70%	130%	105%	70%	130%	98%	70%	130%
Acridine	1763	9546015	<0.00005	<0.00005	NA	< 0.00005	84%	70%	130%	81%	70%	130%	82%	70%	130%
Anthracene	1763	9546015	<0.00001	<0.00001	NA	< 0.000010	91%	70%	130%	100%	70%	130%	90%	70%	130%
Chrysene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	91%	70%	130%	98%	70%	130%	93%	70%	130%
Fluorene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	97%	70%	130%	105%	70%	130%	96%	70%	130%
Naphthalene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	101%	70%	130%	107%	70%	130%	97%	70%	130%
Phenanthrene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	94%	70%	130%	103%	70%	130%	95%	70%	130%
Benzo[a]anthracene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	91%	70%	130%	100%	70%	130%	92%	70%	130%
Benzo[a]pyrene	1763	9546015	< 0.000007	< 0.000007	NA	< 0.000007	81%	70%	130%	88%	70%	130%	81%	70%	130%
Fluoranthene	1763	9546015	< 0.00001	< 0.00001	NA	< 0.00001	93%	70%	130%	102%	70%	130%	94%	70%	130%
Pyrene	1763	9546015	<0.00001	<0.00001	NA	< 0.00001	95%	70%	130%	102%	70%	130%	92%	70%	130%
Quinoline	1763	9546015	<0.00004	<0.00004	NA	< 0.00004	86%	70%	130%	82%	70%	130%	83%	70%	130%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

MTBE in Water															
Methyl tert-butyl ether	3209	9546006	< 0.001	< 0.001	NA	< 0.001	113%	70%	130%	113%	70%	130%	113%	60%	140%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By: Elena Gorobets

AGAT Laboratories

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis

RPT Date: Sep 18, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Matrix Solutions Routine Chemistry Water Analysis															
pH	9548347		8.12	8.13	0.1%	N/A	100%	90%	110%						
T - Alkalinity (as CaCO3)	9548347		331	331	0.0%	< 5	102%	80%	120%						
Electrical Conductivity	9548347		1510	1450	4.1%	< 5	105%	80%	120%						
Chloride	9546021	9546021	<1.5	<1.5	NA	< 0.6	96%	80%	120%	93%	80%	120%	93%	80%	120%
Fluoride	9546021	9546021	<0.3	<0.3	NA	< 0.01	102%	80%	120%	89%	80%	120%	96%	80%	120%
Nitrate	9546021	9546021	10.1	9.9	2.0%	< 0.08	102%	80%	120%	98%	80%	120%	110%	80%	120%
Nitrite	9546021	9546021	<1.0	<1.0	NA	< 0.03	98%	80%	120%	96%	80%	120%	96%	80%	120%
Sulfate	9546021	9546021	3200	3210	0.3%	< 0.6	95%	80%	120%	93%	80%	120%	NA	80%	120%
Dissolved Calcium	9540547		633	630	0.5%	< 0.3	110%	80%	120%	118%	80%	120%	NA	80%	120%
Dissolved Magnesium	9540547		331	329	0.6%	< 0.2	100%	80%	120%	105%	80%	120%	NA	80%	120%
Dissolved Sodium	9540547		41.9	41.6	0.7%	< 0.6	103%	80%	120%	101%	80%	120%	NA	80%	120%
Dissolved Potassium	9540547		8.9	9.0	1.1%	< 0.6	93%	80%	120%	95%	80%	120%	NA	80%	120%
Dissolved Iron	9540547		<0.1	<0.1	NA	< 0.1	105%	80%	120%	102%	80%	120%	99%	80%	120%
Dissolved Manganese	9540547		0.096	0.097	1.0%	< 0.005	103%	80%	120%	98%	80%	120%	101%	80%	120%
Matrix Solutions Routine Chemistry Water Analysis															
Chloride	9546015	9546015	<1.5	<1.5	NA	< 0.6	96%	80%	120%	93%	80%	120%	93%	80%	120%
Fluoride	9546015	9546015	<0.3	<0.3	NA	< 0.01	110%	80%	120%	113%	80%	120%	104%	80%	120%
Nitrate	9546015	9546015	<2.0	<2.0	NA	< 0.08	98%	80%	120%	97%	80%	120%	99%	80%	120%
Nitrite	9546015	9546015	<1.0	<1.0	NA	< 0.03	97%	80%	120%	97%	80%	120%	96%	80%	120%
Sulfate	9546015	9546015	2180	2180	0%	< 0.6	95%	80%	120%	94%	80%	120%	NA	80%	120%
British Columbia CSR - Schedule 6 Dissolved Metals															
Dissolved Aluminum	9549713		<0.004	<0.004	NA	< 0.004	116%	80%	120%	111%	80%	120%	119%	80%	120%
Dissolved Antimony	9549713		<0.001	<0.001	NA	< 0.001	105%	80%	120%	102%	80%	120%	100%	80%	120%
Dissolved Arsenic	9549713		<0.001	<0.001	NA	< 0.001	101%	80%	120%	103%	80%	120%	105%	80%	120%
Dissolved Barium	9549713		<0.05	<0.05	NA	< 0.05	119%	80%	120%	103%	80%	120%	103%	80%	120%
Dissolved Beryllium	9549713		<0.001	<0.001	NA	< 0.001	97%	80%	120%	103%	80%	120%	114%	80%	120%
Dissolved Boron	9549713		<0.01	<0.01	NA	< 0.01	82%	80%	120%	117%	80%	120%	107%	80%	120%
Dissolved Cadmium	9549713		<0.00005	<0.00005	NA	< 0.00005	103%	80%	120%	99%	80%	120%	104%	80%	120%
Dissolved Calcium	9540547		633	630	0.5%	< 0.3	110%	80%	120%	118%	80%	120%	NA	80%	120%
Dissolved Chromium	9549713		<0.001	<0.001	NA	< 0.001	103%	80%	120%	99%	80%	120%	94%	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

Water Analysis (Continued)

RPT Date: Sep 18, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Cobalt	9549713		<0.0009	<0.0009	NA	< 0.0009	108%	80%	120%	97%	80%	120%	96%	80%	120%
Dissolved Copper	9549713		<0.0008	<0.0008	NA	< 0.0008	103%	80%	120%	100%	80%	120%	95%	80%	120%
Dissolved Iron	9540547		<0.1	<0.1	NA	< 0.1	105%	80%	120%	102%	80%	120%	99%	80%	120%
Dissolved Lead	9549713		<0.0005	<0.0005	NA	< 0.0005	112%	80%	120%	109%	80%	120%	108%	80%	120%
Dissolved Lithium	9549713		<0.001	<0.001	NA	< 0.001	101%	80%	120%	99%	80%	120%	105%	80%	120%
Dissolved Magnesium	9540547		331	329	0.6%	< 0.2	100%	80%	120%	105%	80%	120%	NA	80%	120%
Dissolved Manganese	9540547		0.096	0.097	1.0%	< 0.005	103%	80%	120%	98%	80%	120%	101%	80%	120%
Dissolved Mercury	9546022	9546022	<0.	<0.	NA	< 0.000025	99%	90%	110%	102%	90%	110%	117%	80%	120%
Dissolved Molybdenum	9549713		<0.001	<0.001	NA	< 0.001	103%	80%	120%	98%	80%	120%	91%	80%	120%
Dissolved Nickel	9549713		<0.003	<0.003	NA	< 0.003	105%	80%	120%	97%	80%	120%	93%	80%	120%
Dissolved Selenium	9549713		0.0015	<0.0005	NA	< 0.0005	100%	80%	120%	100%	80%	120%	95%	80%	120%
Dissolved Silver	9549713		0.0002	<0.0001	NA	< 0.0001	92%	80%	120%	88%	80%	120%	81%	80%	120%
Dissolved Sodium	9540547		41.9	41.6	0.7%	< 0.6	103%	80%	120%	101%	80%	120%	NA	80%	120%
Dissolved Thallium	9549713		<0.0001	<0.0001	NA	< 0.0001	98%	80%	120%	99%	80%	120%	98%	80%	120%
Dissolved Titanium	9549713		<0.001	<0.001	NA	< 0.001	95%	80%	120%	104%	80%	120%	96%	80%	120%
Dissolved Uranium	9549713		<0.001	<0.001	NA	< 0.001	106%	80%	120%	100%	80%	120%	100%	80%	120%
Dissolved Vanadium	9549713		0.002	0.002	NA	< 0.001	105%	80%	120%	99%	80%	120%	95%	80%	120%
Dissolved Zinc	9549713		<0.005	<0.005	NA	< 0.004	97%	80%	120%	101%	80%	120%	104%	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Water Analysis - DOC, Phenols															
Dissolved Organic Carbon (DOC)	9546021	9546021	6	6	0.0%	< 1	99%	80%	120%	93%	80%	120%	98%	80%	120%
Phenols	9548432		0.009	0.010	NA	< 0.002	110%	80%	120%	98%	80%	120%	107%	80%	120%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Water Anaysis - DOC, Phenols															
Dissolved Organic Carbon (DOC)	9546021	9546021	6	6	2.5%	< 1	99%	80%	120%	93%	80%	120%	98%	80%	120%
Phenols	9548432	9548432	0.009	0.010	NA	< 0.002	110%	80%	120%	98%	80%	120%	107%	80%	120%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Toluene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Ethylbenzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Xylenes	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Styrene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
VH W6-10	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/FID
VPH	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/MS/FID
EPH (WC10-C19)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
EPH (WC19-C32)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
LEPH (WC10-C19 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
HEPH (WC19-C32 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
Acenaphthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Acridine	TO 0200	EPA SW846 3511 & 8270	GC/MS
Anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Chrysene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluorene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Naphthalene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Phenanthrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluoranthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Quinoline	TO 0200	EPA SW846 3511 & 8270	GC/MS
Toluene-d8 (BTEX)	TO-0543	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
o-Terphenyl (EPH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
2-Fluorobiphenyl (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
p-Terphenyl-d14 (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
Methyl tert-butyl ether	TO 0340	EPA SW-846 5035/8260-W	GC/MS
Toluene-d8	TO-0570	EPA SW-846 8260	GC/MS

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Antimony	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Arsenic	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Barium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Beryllium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Boron	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cadmium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Calcium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Chromium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cobalt	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Copper	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Iron	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Lead	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Lithium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Magnesium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Mercury	INST 0160	SM 3112 B DW	CV/AA
Dissolved Molybdenum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Nickel	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Selenium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Silver	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Sodium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Thallium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Titanium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Uranium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Vanadium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Zinc	INST 0141	SM 3125 B-D	ICP-MS
pH	INST 0101	SM 4500 H+	pH METER
p - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
T - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
Bicarbonate	INST 0101	SM 2320 B	PC TITRATE
Carbonate	INST 0101	SM 2320 B	PC TITRATE
Hydroxide	INST 0101	SM 2320 B	TITRATION
Electrical Conductivity	INST 0101	SM 2510 B	CONDUCTIVITY METER
Chloride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate-N	INST 0150	SM 4110 B	CALCULATION
Nitrite	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrite-N	INST 0150	SM 4110 B	CALCULATION
Sulfate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Dissolved Calcium	INST 0140	SM 3120 B	ICP/OES
Dissolved Magnesium	INST 0140	SM 3120 B	ICP/OES
Dissolved Sodium	INST 0140	SM 3120 B	ICP/OES
Dissolved Potassium	INST 0140	SM 3120 B	ICP/OES
Dissolved Iron	INST 0140	SM 3120 B	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B	ICP/OES
Ion Balance		SM 1030E	
Dissolved Organic Carbon (DOC)	INST 0170	SM 5310 B DW	COMBUSTION

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F385227

PROJECT: 17507-502 / Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:M. O'Hanley, M. Greenwood

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Phenols	INST 0300	SM 420.2	CONTINUOUS FLOW ANALYZER

Matrix Solutions Inc.

ENVIRONMENT & ENGINEERING

COC # MD-MO1809112417507

Page: 1 of: 1

Lab Submitted To: AGAT Labs

Lab Agreement No.:

Job ID: 18F385227

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax:	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'Hanley, M. Greenwood

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☐ Add'l Emails: ahum@matrix-solutions.com; ehenson@matrix-solutions.com; mrutten@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Analysis Required: 58696	54668	58104	58547	MTBE	58328	Lab Sample Number	HOLD
1	17507180911001	MW92-1		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	9546006	
2	17507180911002	MW92-1A		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	6015	
3	17507180911003	MW92-6A		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	016	
4	17507180911004	MW92-7		Water	Sep 11 2018	0	0	BT2		X					018	
5	17507180911005	MW92-7A		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	019	
6	17507180911007	03-3		Water	Sep 11 2018	0	0	BT5	X	X					020	
7	17507180911009	BH-103		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	021	
8	17507180911012	BH-105(R)		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	022	
9	17507180911013	15-9		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	023	
10	17507180911014	15-10		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	024	
11	17507180911015	15-11		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	6031	
12	17507180911016	Leachate vault 1		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	032	
13	17507180911017	LDS		Water	Sep 11 2018	0	0	BT11	X	X	X	X	X	X	033	
14	17507180911018			Water	Sep 11 2018	0	0	BT7	X	X			X		6082	X
15	17507180911019			Water	Sep 11 2018	0	0	BT4		X					6083	X
	*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'							Preserved/Filtered								

Relinquished by: Miranda O'Hanley **Date/Time:** Tuesday, September 11, 2018 **Received by:** **Date/Time:** Sept 11/18

Signature: **Signature:**

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

F 11006

SEP 13 2018

@ 10:59

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Sept 11 COC: F11006

RECEIVING BASICS - Shipping

Company/Consultant: Matrix/Tervita

Courier: Client dropped off in Prepaid Collect

Waybill# After-Hours Shed

Branch: EDM GP FN FM RD VAN LYD KSJ EST Other:

If multiple sites were submitted at once: Yes No

Custody Seal Intact: Yes No NA

TAT: <24hr 24-48hr 48-72hr Reg Other

Cooler Quantity: 3 LRG

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes No

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry:

Hydrocarbons: Earliest Expiry

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES NO Precaution Taken:

Legal Samples: Yes No

International Samples: Yes No

Tape Sealed: Yes No

Coolant Used: Icepack Bagged Ice Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 6+6+7=6 °C	2(Bottle/Jar) 4+4+3=4 °C
3 (Bottle/Jar) 3+3+2=3 °C	4 (Bottle/Jar)___+___+___=___ °C
5 (Bottle/Jar)___+___+___=___ °C	6 (Bottle/Jar)___+___+___=___ °C
7 (Bottle/Jar)___+___+___=___ °C	8 (Bottle/Jar)___+___+___=___ °C
9 (Bottle/Jar)___+___+___=___ °C	10 (Bottle/Jar)___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No:

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

Matrix COC#: MD-MO1809112417507

PROJECT #: 17507-502

* Subcontracted Analysis (See CPM)

WHERE IS IT SENT:

GP Burnaby Calgary ✓

Date issued: October 05, 2015

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: TORVITA / MATRIX

Courier: JP 200 Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: Yes (No)

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 3

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , Nitrate/Nitrite , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: SEP 14 2018

Hydrocarbons: Earliest Expiry SEP 18 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: (Icepack) Bagged Ice Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 3+2+3=3 °C	2(Bottle/Jar) 3+3+2=3 °C
3 (Bottle/Jar) 3+3+4=3 °C	4 (Bottle/Jar)___+___+___=___ °C
5 (Bottle/Jar)___+___+___=___ °C	6 (Bottle/Jar)___+___+___=___ °C
7 (Bottle/Jar)___+___+___=___ °C	8 (Bottle/Jar)___+___+___=___ °C
9 (Bottle/Jar)___+___+___=___ °C	10 (Bottle/Jar)___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18T385227

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments:

* Subcontracted Analysis (See CPM)

AGAT Laboratories

2910 12TH STREET NE
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CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/Block A-08-088-20W6M

AGAT WORK ORDER: 18F419486

WATER ANALYSIS REVIEWED BY: Loan Nguyen, Senior Analyst

DATE REPORTED: Jan 08, 2019

PAGES (INCLUDING COVER): 23

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777089 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207003 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	1.9±0.8		1	Jan 08, 2019	LN	
Gross beta	Bq/L	1.5±0.3		0.56	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777089 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207003 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Radium-226	Bq/L	0.04		0.01	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.08		0.08	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.038		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.0019		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.038		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777201 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207009 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.1±1.4		2.3	Jan 08, 2019	LN	
Gross beta	Bq/L	2.5±0.5		1.3	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777201 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207009 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Radium-226	Bq/L	0.02		0.01	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.08		0.08	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.006		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.0003		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.006		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777202 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207012 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.9±1.5		1.7	Jan 08, 2019	LN	
Gross beta	Bq/L	<0.98		0.98	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777202 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207012 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Radium-226	Bq/L	0.02		0.005	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Thorium-228	Bq/L	0.01		0.01	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.70		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.035		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.70		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777203 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207013 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	5.6±2.2		2.6	Jan 08, 2019	LN	
Gross beta	Bq/L	3.6±0.7		1.3	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777203 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207013 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.08		0.08	Jan 08, 2019	LN	
Radium-226	Bq/L	0.12		0.02	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.2		0.2	Jan 08, 2019	LN	
Thorium-228	Bq/L	0.10		0.04	Jan 08, 2019	LN	
Thorium-230	Bq/L	0.08		0.04	Jan 08, 2019	LN	
Thorium-232	Bq/L	0.08		0.04	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.67		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.033		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.67		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
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Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777204 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207014 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	3.3±1.4		1.9	Jan 08, 2019	LN	
Gross beta	Bq/L	2.6±0.5		1	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777204 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207014 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Radium-226	Bq/L	0.08		0.01	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.09		0.09	Jan 08, 2019	LN	
Thorium-228	Bq/L	0.04		0.02	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.22		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.011		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.22		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777205 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207015 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<1.8		1.8	Jan 08, 2019	LN	
Gross beta	Bq/L	<1		1	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777205 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207015 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Radium-226	Bq/L	0.02		0.005	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.05		0.05	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.32		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.016		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.32		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777206 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207016 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<12		12	Jan 08, 2019	LN	
Gross beta	Bq/L	22±4		7	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777206 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207016 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.08		0.08	Jan 08, 2019	LN	
Radium-226	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Radium-228	Bq/L	0.3		0.2	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.04		0.04	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.17		0.01	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.0085		0.0006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.17		0.01	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777207 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207010 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<2.5		2.5	Jan 08, 2019	LN	
Gross beta	Bq/L	1.7±0.4		1.3	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777207 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207010 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Radium-226	Bq/L	0.02		0.005	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.05		0.05	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Uranium-234	Bq/L	0.004		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	0.0002		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	0.004		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted - Gross alpha and beta Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777208 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207018 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Gross alpha	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Gross beta	Bq/L	<0.02		0.02	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.

Certified By: LN

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Subcontracted- Radio Chemistry Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9777208 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Jan 08, 2019

SAMPLE DESCRIPTION: 17507181207018 BlockA-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Lead-210	Bq/L	<0.02		0.02	Jan 08, 2019	LN	
Radium-226	Bq/L	<0.005		0.005	Jan 08, 2019	LN	
Radium-228	Bq/L	<0.05		0.05	Jan 08, 2019	LN	
Thorium-228	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-230	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Thorium-232	Bq/L	<0.01		0.01	Jan 08, 2019	LN	
Uranium-234	Bq/L	<0.001		0.001	Jan 08, 2019	LN	
Uranium-235	Bq/L	<0.00006		0.00006	Jan 08, 2019	LN	
Uranium-238	Bq/L	<0.001		0.001	Jan 08, 2019	LN	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Note: Performed by subcontracted laboratory.
Symbol of "<" means "less than". This indicates that it was not detected at level stated above.
"Less than" values reported above represent the lowest detection limits achievable for the sample.

Certified By: LN

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419486

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Gross alpha		subcontracted	
Gross beta		subcontracted	
Lead-210		subcontracted	
Radium-226		subcontracted	
Radium-228		subcontracted	
Thorium-228		subcontracted	
Thorium-230		subcontracted	
Thorium-232		subcontracted	
Uranium-234		subcontracted	
Uranium-235		subcontracted	
Uranium-238		subcontracted	

2°C

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1812072917507

Page: 1 of: 1

Lab Submitted To: AGAT Labs
Lab Agreement No.:
Job ID: 18 F419486

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation		Matrix Solutions - Environmental Data Services (EDS)
Contact Name:	Scott Crowe		Suite 600, 214 - 11th Avenue SW
Address:			Calgary Alberta Canada
	Canada	PC:	T2R 0K1
Phone/Fax #:	Ph	Fax.	Ph: 403-237-0606 Fax:403-263-2493

Matrix Project #: 17507 - 502
Matrix Proj. Name: Tervita Corporation
Location: Block A-08-088-20 W6M
Sampler's Name: M. O'Hanley , A. Watson

11 DEC '18 AM 9:30

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☒ Add'l Emails: ahum@matrix-solutions.com
- ehenson@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Gross Alpha+Beta	Lead-210	Radium-226	Radium-228	Thorium-228,230,232	Uranium-234,235,238	Lab Sample Number	HOLD
1	17507181207003	MW92-6A		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	47470859	
2	17507181207009	BH-103		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	201	
3	17507181207012	BH-105(R)		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	02	
4	17507181207013	15-9		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	03	
5	17507181207014	15-10		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	04	
6	17507181207015	15-11		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	05	
7	17507181207016	Leachate		Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	06	
8	17507181207010			Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	07	
9	17507181207018			Water	Dec 07 2018	0	0	BT6	☒	☒	☒	☒	☒	☒	08	
10																
11																
12																
13																
14																
15																

*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required' — Preserved/Filtered

Relinquished by: Miranda O'Hanley **Date/Time:** Friday, December 07, 2018
Signature:

Received by: **Date/Time:**
Signature:

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

C 35091

DEC 11 2018

@ 9:30

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: JENUITA / MATRIX

Courier: SAZOO Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 8

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: DEC - 12, 2018 as per FSJ's SOW.

Hydrocarbons: Earliest Expiry DEC 20, 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice) Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 3 + 2 + 2 = 2 °C	2(Bottle/Jar) 2 + 2 + 2 = 2 °C
3 (Bottle/Jar) 2 + 3 + 2 = 2 °C	4 (Bottle/Jar) 2 + 2 + 2 = 2 °C
5 (Bottle/Jar) 3 + 2 + 2 = 2 °C	6 (Bottle/Jar) 3 + 2 + 2 = 2 °C
7 (Bottle/Jar) 2 + 2 + 2 = 2 °C	8 (Bottle/Jar) 3 + 2 + 2 = 2 °C
9 (Bottle/Jar) ___ + ___ + ___ = ___ °C	10 (Bottle/Jar) ___ + ___ + ___ = ___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18F419486

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments: SAMPLES ARE MIXED UP FROM OTHER SAMPLES IN 8 COOLERS

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Dec 10 18 COC: F 11112

RECEIVING BASICS - Shipping

Company/Consultant: Matrix / Tervita

Courier: Client Drop off Prepaid Collect

Waybill# After hours Shed

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other_____

Cooler Quantity: 6 LRG, 1 MED

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: Wed Dec 12th / 2018

Hydrocarbons: Earliest Expiry Dec 20th 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:_____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice)* Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 2 + 0.3 + 1 = 1 °C	2(Bottle/Jar) 7 + 3 + 5 = 5 °C
3 (Bottle/Jar) 10 + 13 + 8 = 10 °C	4 (Bottle/Jar) 8 + 4 + 4 = 5 °C
5 (Bottle/Jar) 10 + 5 + 7 = 7 °C	6 (Bottle/Jar) 0.3 + 0.2 + 0.1 = 0.4 °C
7 (Bottle/Jar) 3 + 2 + 1 = 2 °C	8 (Bottle/Jar) ___ + ___ + ___ = ___ °C
9 (Bottle/Jar) ___ + ___ + ___ = ___ °C	10 (Bottle/Jar) ___ + ___ + ___ = ___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: _____

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other: _____

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date/Time: _____

CPM Initial_____

General Comments: _____

Matrix project # 17507-502

Matrix COC #'s MD-M0181207291750 7/

MD-M0181207181750 7

Same day sample

WHERE IS IT SENT:

GP ___ Burnaby___ Calgary ✓

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/Block A-08-088-20W6M

AGAT WORK ORDER: 18F419804

TRACE ORGANICS REVIEWED BY: Elena Gorobets, Report Writer

WATER ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

DATE REPORTED: Dec 17, 2018

PAGES (INCLUDING COVER): 92

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	82	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	101	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	82	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

AGAT Laboratories

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.45		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00112		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	478		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0013		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.033		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	294		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	2.20		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.020		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0018		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	209		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	3.34		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.018		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.037		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.013		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2400		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.53		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	896		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	1090		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3930		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.8		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.09		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.34		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.08		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2050		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	478		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	294		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	209		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.1		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	2.20		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2400		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.08		0.02		SYS	
Calculated TDS	mg/L	3580		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	98	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	114	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	93	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.014		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.33		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00058		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	464		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0022		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	0.0008		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.190		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	338		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.786		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.009		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0020		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	103		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	2.57		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.009		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.015		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.017		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.52		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	323		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	394		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3600		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.1		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.16		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.57		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.13		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2390		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	464		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	338		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	103		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	10.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.786		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	99		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.13		0.02		SYS	
Calculated TDS	mg/L	3500		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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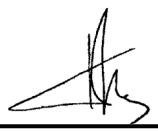

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	7		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	87	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	104	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	109	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	87	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.007		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.10		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00026		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	396		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0016		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.032		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	110		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.007		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.005		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0010		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	17.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	1.01		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.003		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	1440		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.58		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	110		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	134		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	2110		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	13.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.26		0.01	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.30		0.08	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.03		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	1300		0.6	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	396		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	110		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	17.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	3.0		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.007		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	100		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	1440		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.07		0.02		SYS	
Calculated TDS	mg/L	1910		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	113	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	118	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.134		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.52		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00020		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	398		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0015		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.027		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	295		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.009		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.005		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0124		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	388		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	4.80		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.018		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.059		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.016		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2210		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.83		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	783		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	955		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4360		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	8.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	7.76		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.75		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2340		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	398		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	295		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	388		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	9.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.009		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2210		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.75		0.02		SYS	
Calculated TDS	mg/L	3920		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.006		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	88	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	109	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	121	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	88	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.029		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.41		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00045		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	455		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0048		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	2.4		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.148		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	503		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	3.21		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.017		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	237		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	3.42		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.014		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.009		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.013		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	3210		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.55		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	539		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	657		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4850		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.13		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	2.60		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.59		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	3220		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	455		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	503		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	237		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	12.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	2.4		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	3.21		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	96		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	3210		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.59		0.02		SYS	
Calculated TDS	mg/L	4760		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

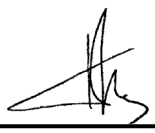
SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	6		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.006		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	88	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	119	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	115	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	88	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.38		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00066		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	496		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0024		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.113		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	340		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.009		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0031		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	92.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	2.94		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.008		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.017		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.010		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2640		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.87		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	378		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	461		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3690		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.1		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.10		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	1.68		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.38		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2380		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	496		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	340		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	92.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	8.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	100		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2640		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.38		0.02		SYS	
Calculated TDS	mg/L	3550		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.004		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	79	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	121	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	129	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	79	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.005		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.33		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00035		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0101		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.064		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	212		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.330		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.013		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	343		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	5.11		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.014		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.059		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.019		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2130		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.72		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	641		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	782		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4070		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.27		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.06		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2190		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	212		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	343		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.330		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	99		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2130		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.06		0.02		SYS	
Calculated TDS	mg/L	3640		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	108	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.011		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	<0.01		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	481		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	480		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.058		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0038		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	470		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	0.382		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.009		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	3180		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.73		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	624		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	761		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	5640		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.21		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	9.17		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	2.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	3540		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	481		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	480		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	470		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	15.4		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.058		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	98		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	3180		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	2.07		0.02		SYS	
Calculated TDS	mg/L	5370		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	124	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	127	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	<0.01		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	350		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.348		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	221		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2700		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.65		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	509		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	621		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4340		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.25		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	5.54		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.25		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2750		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	350		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	221		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	12.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.348		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2700		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.25		0.02		SYS	
Calculated TDS	mg/L	4150		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

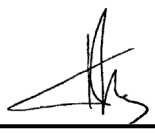
SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	2		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	106	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	123	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	93	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.02		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	479		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	362		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.312		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	230		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.60		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	602		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	735		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4460		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.13		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	7.07		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.60		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2780		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	479		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	362		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	230		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	11.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.312		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	91		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.60		0.02		SYS	
Calculated TDS	mg/L	4230		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	0.419		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	0.273		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	0.00797		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	0.0605		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	1.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	0.3		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	3.5		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	0.7		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	3.5		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.7		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	0.00136		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	0.00476		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00903		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	0.00621		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	0.00006		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	0.00026		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	0.00038		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	102	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.041		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	0.005		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	0.028		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	5.95		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.60		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00033		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	5160		1.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	0.006		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0341		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0012		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	33.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.599		0.002	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	300		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	5.35		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.102		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.203		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.771		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	2690		2.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	82.7		0.2	Dec 16, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.098		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.015		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	0.042		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.058		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	14100		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.93		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	1220		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	1490		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	38100		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	14500		30	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.9		0.6	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	79.5		4.0	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	18.0		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	92.1		2.0	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	28.0		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	303		3.0	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	5160		1.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	300		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	2690		2.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	705		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	33.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	5.35		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	14100		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	46.0		0.02		SYS	
Calculated TDS	mg/L	24600		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

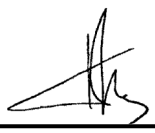
SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1410		100	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.71		0.02	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	83	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	101	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	99	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	98	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	83	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.02		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	547		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	317		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.544		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	93.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.56		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	409		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	499		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3930		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	67.9		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.28		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.65		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.15		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2450		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	547		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	317		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	93.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	5.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.544		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.15		0.02		SYS	
Calculated TDS	mg/L	3730		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	21		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	130	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.01		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	498		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.3		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	211		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.325		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	340		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2110		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.62		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	734		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	896		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4120		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.7		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.29		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2210		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	498		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	211		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	340		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.3		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.325		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2110		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.07		0.02		SYS	
Calculated TDS	mg/L	3710		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	87	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	115	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	116	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	<0.01		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	<0.3		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	<0.2		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	<0.5		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.38		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	<0.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	<0.01		0.01	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	<0.08		0.08	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	<0.02		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.03		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	<0.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	<0.3		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	<0.2		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Hardness	mg CaCO3/L	<0.5		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	<1		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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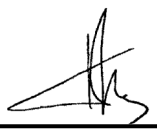

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781369 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207019 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 16, 2018	SYS	Dec 16, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 16, 2018	SYS	Dec 16, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 16, 2018	TD	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 16, 2018	TD	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 16, 2018	TD	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 16, 2018	TD	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	98	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	114	50-150	Dec 16, 2018	TD	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	126	50-150	Dec 16, 2018	TD	Dec 14, 2018

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781369 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 17, 2018

SAMPLE DESCRIPTION: 17507181207019 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Dec 17, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
British Columbia CSR - Extended Site Remediation Analysis - Water															
Benzene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	93%	80%	120%	88%	80%	120%	98%	70%	130%
Toluene	3587	9781330	< 0.0003	< 0.0003	NA	< 0.0003	93%	80%	120%	85%	80%	120%	95%	70%	130%
Ethylbenzene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	101%	80%	120%	90%	80%	120%	105%	70%	130%
Xylenes	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	97%	80%	120%	90%	80%	120%	102%	70%	130%
Styrene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	81%	80%	120%	85%	80%	120%	86%	70%	130%
VH W6-10	3587	9781330	< 0.1	< 0.1	NA	< 0.1	86%	80%	120%	101%	80%	120%	93%	70%	130%
EPH (WC10-C19)	400	9781332	<0.1	<0.1	NA	< 0.1	91%	80%	120%	87%	80%	120%	93%	70%	130%
EPH (WC19-C32)	400	9781332	<0.1	<0.1	NA	< 0.1	91%	80%	120%	87%	80%	120%	89%	70%	130%
Acenaphthene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	124%	70%	130%	111%	70%	130%	103%	70%	130%
Acridine	381	9781332	< 0.00005	< 0.00005	NA	< 0.00005	115%	70%	130%	106%	70%	130%	100%	70%	130%
Anthracene	381	9781332	< 0.000010	< 0.000010	NA	< 0.000010	120%	70%	130%	108%	70%	130%	101%	70%	130%
Chrysene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	107%	70%	130%	101%	70%	130%
Fluorene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	126%	70%	130%	106%	70%	130%	99%	70%	130%
Naphthalene	381	9781332	0.00002	0.00001	NA	< 0.00001	122%	70%	130%	105%	70%	130%	100%	70%	130%
Phenanthrene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	107%	70%	130%	101%	70%	130%
Benzo[a]anthracene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	127%	70%	130%	115%	70%	130%	106%	70%	130%
Benzo[a]pyrene	381	9781332	< 0.000007	< 0.000007	NA	< 0.000007	104%	70%	130%	95%	70%	130%	87%	70%	130%
Fluoranthene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	103%	70%	130%	99%	70%	130%
Pyrene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	122%	70%	130%	108%	70%	130%	103%	70%	130%
Quinoline	381	9781332	< 0.00004	< 0.00004	NA	< 0.00004	118%	70%	130%	98%	70%	130%	101%	70%	130%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

MTBE in Water															
Methyl tert-butyl ether	3587	9781330	< 0.001	< 0.001	NA	< 0.001	118%	70%	130%		70%	130%		60%	140%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By: Elena Gorobets

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Dec 17, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Matrix Solutions Routine Chemistry Water Analysis															
pH	9783994		7.90	7.94	0.5%	N/A	100%	90%	110%						
T - Alkalinity (as CaCO3)	9783994		646	632	2.2%	< 5	103%	80%	120%						
Electrical Conductivity	9783994		1460	1480	1.4%	< 5	101%	80%	120%						
Chloride	9782814		5.2	5.0	3.9%	< 0.6	95%	80%	120%	92%	80%	120%	NA	80%	120%
Fluoride	9782814		0.08	0.08	NA	< 0.01	90%	80%	120%	84%	80%	120%	NA	80%	120%
Nitrate	9782814		1.34	1.35	NA	< 0.08	97%	80%	120%	98%	80%	120%	NA	80%	120%
Nitrite	9782814		<0.20	<0.20	NA	< 0.03	94%	80%	120%	87%	80%	120%	NA	80%	120%
Sulfate	9782814		35.9	36.2	0.8%	< 0.6	95%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Calcium	9781238	9781238	478	481	0.6%	< 0.3	105%	80%	120%	114%	80%	120%	NA	80%	120%
Dissolved Magnesium	9781238	9781238	294	297	1.0%	< 0.2	98%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Sodium	9781238	9781238	209	210	0.5%	< 0.6	98%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Potassium	9781238	9781238	7.1	7.2	1.4%	< 0.6	92%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Iron	9781238	9781238	<0.1	<0.1	NA	< 0.1	109%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Manganese	9781238	9781238	2.20	2.21	0.5%	< 0.005	107%	80%	120%	101%	80%	120%	NA	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

British Columbia CSR - Schedule 6 Dissolved Metals															
Dissolved Aluminum	9782814		<0.004	0.008	NA	< 0.004	108%	80%	120%	106%	80%	120%	106%	80%	120%
Dissolved Antimony	9782814		<0.001	<0.001	NA	< 0.001	117%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Arsenic	9782814		<0.001	<0.001	NA	< 0.001	106%	80%	120%	104%	80%	120%	104%	80%	120%
Dissolved Barium	9782814		0.10	0.10	NA	< 0.05	108%	80%	120%	101%	80%	120%	105%	80%	120%
Dissolved Beryllium	9782814		<0.001	<0.001	NA	< 0.001	104%	80%	120%	106%	80%	120%	94%	80%	120%
Dissolved Boron	9782814		0.08	0.08	0.0%	< 0.01	119%	80%	120%	114%	80%	120%	111%	80%	120%
Dissolved Cadmium	9782814		<0.00005	<0.00005	NA	< 0.00005	112%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Calcium	9781238	9781238	478	481	0.6%	< 0.3	105%	80%	120%	114%	80%	120%	NA	80%	120%
Dissolved Chromium	9782814		<0.001	<0.001	NA	< 0.001	107%	80%	120%	98%	80%	120%	99%	80%	120%
Dissolved Cobalt	9782814		<0.0009	<0.0009	NA	< 0.0009	109%	80%	120%	101%	80%	120%	97%	80%	120%
Dissolved Copper	9782814		0.0020	0.0024	NA	< 0.0008	107%	80%	120%	102%	80%	120%	95%	80%	120%
Dissolved Iron	9781238	9781238	<0.1	<0.1	NA	< 0.1	109%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Lead	9782814		<0.0005	<0.0005	NA	< 0.0005	113%	80%	120%	101%	80%	120%	100%	80%	120%
Dissolved Lithium	9782814		0.029	0.030	3.4%	< 0.001	105%	80%	120%	103%	80%	120%	112%	80%	120%
Dissolved Magnesium	9781238	9781238	294	297	1.0%	< 0.2	98%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Manganese	9781238	9781238	2.20	2.21	0.5%	< 0.005	107%	80%	120%	101%	80%	120%	NA	80%	120%
Dissolved Mercury	9781238	9781238	<0.	<0.	NA	< 0.000025	103%	90%	110%	96%	90%	110%	106%	80%	120%
Dissolved Molybdenum	9782814		0.005	0.005	0.0%	< 0.001	110%	80%	120%	102%	80%	120%	100%	80%	120%
Dissolved Nickel	9782814		<0.003	<0.003	NA	< 0.003	109%	80%	120%	102%	80%	120%	96%	80%	120%

AGAT Laboratories

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

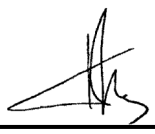
RPT Date: Dec 17, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Selenium	9782814		0.0012	0.0010	NA	< 0.0005	93%	80%	120%	99%	80%	120%	105%	80%	120%
Dissolved Silver	9782814		<0.0001	<0.0001	NA	< 0.0001	98%	80%	120%	93%	80%	120%	87%	80%	120%
Dissolved Sodium	9781238	9781238	209	210	0.5%	< 0.6	98%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Strontium	9782814		0.914	0.936	2.4%	< 0.001	101%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Thallium	9782814		<0.0001	<0.0001	NA	< 0.0001	106%	80%	120%	102%	80%	120%	98%	80%	120%
Dissolved Tin	9782814		<0.0005	<0.0005	NA	< 0.0005	109%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Titanium	9782814		0.007	0.006	15.4%	< 0.001	98%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Uranium	9782814		0.006	0.006	0.0%	< 0.001	113%	80%	120%	98%	80%	120%	105%	80%	120%
Dissolved Vanadium	9782814		<0.001	0.001	NA	< 0.001	109%	80%	120%	99%	80%	120%	99%	80%	120%
Dissolved Zinc	9782814		0.041	0.045	9.3%	< 0.004	105%	80%	120%	100%	80%	120%	99%	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Water Anaysis - DOC, Phenols															
Dissolved Organic Carbon (DOC)	9777139		17	17	0.0%	< 1	99%	80%	120%	116%	80%	120%	NA	80%	120%
Phenols	9784861		0.009	0.011	NA	< 0.002	96%	80%	120%	96%	80%	120%	112%	80%	120%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Certified By:



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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Toluene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Ethylbenzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Xylenes	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Styrene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
VH W6-10	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/FID
VPH	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/MS/FID
EPH (WC10-C19)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
EPH (WC19-C32)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
LEPH (WC10-C19 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
HEPH (WC19-C32 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
Acenaphthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Acridine	TO 0200	EPA SW846 3511 & 8270	GC/MS
Anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Chrysene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluorene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Naphthalene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Phenanthrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluoranthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Quinoline	TO 0200	EPA SW846 3511 & 8270	GC/MS
Toluene-d8 (BTEX)	TO-0543	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
o-Terphenyl (EPH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
2-Fluorobiphenyl (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
p-Terphenyl-d14 (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
Methyl tert-butyl ether	TO-0330	EPA SW-846 5030 & 8260	GC/MS
Toluene-d8	TO-0330	EPA SW-846 5030 & 8260	GC/MS

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Antimony	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Arsenic	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Barium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Beryllium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Boron	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cadmium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Calcium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Chromium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cobalt	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Copper	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Iron	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Lead	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Lithium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Magnesium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Mercury	INST 0160	SM 3112 B DW	CV/AA
Dissolved Molybdenum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Nickel	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Selenium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Silver	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Sodium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Strontium	INST 0141	SM 3125 B	ICP-MS
Dissolved Thallium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Tin	INST 0141	SM 3125 B	ICP-MS
Dissolved Titanium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Uranium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Vanadium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Zinc	INST 0141	SM 3125 B-D	ICP-MS
pH	INST 0101, INST 0104	SM 4500 H+	pH METER
p - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
T - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
Bicarbonate	INST 0101	SM 2320 B	PC TITRATE
Carbonate	INST 0101	SM 2320 B	PC TITRATE
Hydroxide	INST 0101	SM 2320 B	TITRATION
Electrical Conductivity	INST 0101, INST 0120	SM 2510 B	CONDUCTIVITY METER
Chloride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate-N	INST 0150	SM 4110 B	CALCULATION
Nitrite	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrite-N	INST 0150	SM 4110 B	CALCULATION
Sulfate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Dissolved Calcium	INST 0140	SM 3120 B	ICP/OES
Dissolved Magnesium	INST 0140	SM 3120 B	ICP/OES
Dissolved Sodium	INST 0140	SM 3120 B	ICP/OES
Dissolved Potassium	INST 0140	SM 3120 B	ICP/OES
Dissolved Iron	INST 0140	SM 3120 B	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B	ICP/OES

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Ion Balance		SM 1030E	
Dissolved Organic Carbon (DOC)	INST 0170	SM 5310 B DW	COMBUSTION
Phenols	INST 0300	SM 420.2	CONTINUOUS FLOW ANALYZER

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1812071817507

Page: 1 of: 1

Lab Submitted To: AGAT Labs

Lab Agreement No.: 18-T449804

Job ID:

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'Hanley, A. Watson

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☒ Add'l Emails: ahum@matrix-solutions.com
- ehenson@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Analysis Required: 58696	54668	58104	58547	MTBE	58328	Lab Sample Number	HOLD
1	17507181207001	MW92-1		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	978	28
2	17507181207002	MW92-1A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	300	
3	17507181207003	MW92-6A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	31	
4	17507181207004	MW92-7		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	32	
5	17507181207005	MW92-7A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	33	
6	17507181207008	03-3		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	34	
7	17507181207012	BH-105(R)		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	35	
8	17507181207013	15-9		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	36	
9	17507181207014	15-10		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	37	
10	17507181207015	15-11		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	38	
11	17507181207016	Leachate vault 1		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	39	
12	17507181207017	LDS		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	40	
13	17507181207011			Water	Dec 07 2018	0	0	BT8	X	X				X	41	
14	17507181207018			Water	Dec 07 2018	0	0	BT13	X	X				X	42	
15	17507181207019			Water	Dec 07 2018	0	0	BT5		X					69	

*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required' Preserved/Filtered

Relinquished by: Miranda O'Hanley **Date/Time:** Friday, December 07, 2018 **Received by:** **Date/Time:**

Signature: **Signature:**

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

DEC 11 2018

C 35092

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: TERVITA / MATRIX

Courier: ATOO Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 8

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: DEC. 12, 2018 as per FSJ's Sh.

Hydrocarbons: Earliest Expiry DEC 20, 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: (Icepack) (Bagged Ice) Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 2+3+2=2 °C	2(Bottle/Jar) 2+2+2=2 °C
3 (Bottle/Jar) 3+2+2=2 °C	4 (Bottle/Jar) 2+2+2=2 °C
5 (Bottle/Jar) 2+1+2=2 °C	6 (Bottle/Jar) 3+2+2=2 °C
7 (Bottle/Jar) 2+2+2=2 °C	8 (Bottle/Jar) 2+2+2=2 °C
9 (Bottle/Jar) ___+___+___=___ °C	10 (Bottle/Jar) ___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18F419804

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments: SAMPLES ARE MIXED UP W/ OTHER SAMPLES FROM OTHER PROJECTS IN 8 COOLERS

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Dec 10/18 COC: F 11112

RECEIVING BASICS - Shipping

Company/Consultant: Matrix / Tervita

Courier: Client Drop off Prepaid Collect

Waybill# After hours Shed

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other_____

Cooler Quantity: 6 LRG, 1 MED

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: Wed Dec 12th / 2018

Hydrocarbons: Earliest Expiry Dec 20th 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:_____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice)* Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 2+0.3+1 = 1 °C 2(Bottle/Jar) 7+3+5 = 5 °C

3 (Bottle/Jar) 10+13+8 = 10 °C 4 (Bottle/Jar) 8+4+4 = 5 °C

5 (Bottle/Jar) 10+5+7 = 7 °C 6 (Bottle/Jar) 0.3+0.3+0.7 = 0.4 °C

7 (Bottle/Jar) 3+2+1 = 2 °C 8 (Bottle/Jar) ___+___+___=___ °C

9 (Bottle/Jar) ___+___+___=___ °C 10 (Bottle/Jar) ___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: _____

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other: _____

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date/Time: _____

CPM Initial_____

General Comments: _____

Matrix project # 17507-502

Matrix COC #'s MD-MOI81207291750?/

MD-MOI81207181750?

Same day sample

WHERE IS IT SENT:

GP Burnaby Calgary ✓

* Subcontracted Analysis (See CPM)

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

CLIENT NAME: TERVITA (CCS)
500,140 10 AVENUE SE
CALGARY, AB T2G0R1
(855) 234-6421

ATTENTION TO: Scott Crowe

PROJECT: 17507-502/Block A-08-088-20W6M

AGAT WORK ORDER: 18F419804

TRACE ORGANICS REVIEWED BY: Elena Gorobets, Report Writer

WATER ANALYSIS REVIEWED BY: Krystyna Krauze, Senior Analyst

DATE REPORTED: Dec 20, 2018

PAGES (INCLUDING COVER): 92

VERSION*: 2

Should you require any information regarding this analysis please contact your client services representative at (403) 735-2005

*NOTES

VERSION 2:Version 2 replaces Version 1 issued December 20, 2018.
Updated Dissolved BC Metals for samples 9781336, 9781337, 9781338, 9781340 and 9781341. Jan 30/19 CR

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	82	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	101	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	82	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.45		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00112		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	478		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0013		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.033		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	294		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	2.20		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.020		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0018		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	209		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	3.34		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.018		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.037		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.013		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2400		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.53		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	896		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	1090		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3930		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.8		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.09		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.34		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.08		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2050		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	478		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	294		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	209		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.1		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	2.20		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2400		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.08		0.02		SYS	
Calculated TDS	mg/L	3580		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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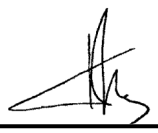

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781238 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207001 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	98	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	114	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	93	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

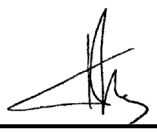
SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.014		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.33		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00058		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	464		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0022		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	0.0008		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.190		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	338		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.786		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.009		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0020		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	103		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	2.57		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.009		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.015		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.017		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:



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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.52		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	323		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	394		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3600		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.1		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.16		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.57		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.13		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2390		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	464		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	338		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	103		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	10.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.786		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	99		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2550		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.13		0.02		SYS	
Calculated TDS	mg/L	3500		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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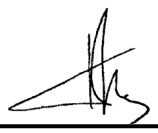

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781330 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207002 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	7		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	87	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	104	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	109	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	87	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.007		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.10		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00026		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	396		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0016		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.032		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	110		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.007		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.005		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0010		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	17.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	1.01		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.003		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	1440		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.58		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	110		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	134		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	2110		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	13.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.26		0.01	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.30		0.08	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.03		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	1300		0.6	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	396		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	110		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	17.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	3.0		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.007		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	100		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	1440		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.07		0.02		SYS	
Calculated TDS	mg/L	1910		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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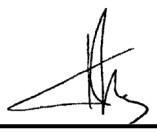

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781331 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207003 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	113	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	118	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.134		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.52		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00020		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	398		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0015		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.027		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	295		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.009		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.002		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.005		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0124		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	388		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	4.80		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.018		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.059		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.016		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2210		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.83		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	783		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	955		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4360		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	8.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	7.76		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.75		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2340		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	398		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	295		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	388		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	9.2		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.009		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2210		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.75		0.02		SYS	
Calculated TDS	mg/L	3920		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781332 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

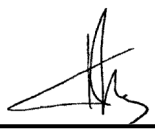
SAMPLE DESCRIPTION: 17507181207004 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.006		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	88	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	109	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	121	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	88	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.029		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.41		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00045		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	455		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0048		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	2.4		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.148		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	503		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	3.21		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.017		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	237		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	3.42		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.014		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.009		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.013		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	3210		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.55		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	539		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	657		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4850		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.13		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	2.60		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.59		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	3220		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	455		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	503		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	237		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	12.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	2.4		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	3.21		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	96		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	3210		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.59		0.02		SYS	
Calculated TDS	mg/L	4760		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781333 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207005 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	6		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.006		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	88	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	119	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	115	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	88	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.38		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00066		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	496		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0024		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.113		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	340		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.009		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0031		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	92.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	2.94		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.008		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.017		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.010		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2640		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.87		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	378		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	461		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3690		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.1		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.10		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	1.68		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.38		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2380		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	496		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	340		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	92.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	8.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	100		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2640		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.38		0.02		SYS	
Calculated TDS	mg/L	3550		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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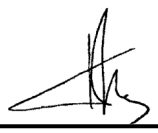

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781334 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207008 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.004		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	79	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	121	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	129	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	79	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.005		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.33		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00035		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0101		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.064		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	212		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.330		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.013		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.0013		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	343		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	5.11		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.014		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.059		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.019		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	2130		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.72		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	641		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	782		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4070		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.27		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.06		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2190		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	212		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	343		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.8		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.2		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.330		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	99		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2130		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.06		0.02		SYS	
Calculated TDS	mg/L	3640		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781335 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

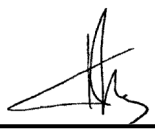
SAMPLE DESCRIPTION: 17507181207012 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	108	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.005		0.004	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Boron	mg/L	0.42		0.01	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00065		0.00005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Calcium	mg/L	481		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Copper	mg/L	0.0017		0.0008	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Lithium	mg/L	0.184		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Magnesium	mg/L	480		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.058		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Nickel	mg/L	0.013		0.003	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Selenium	mg/L	0.0035		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Sodium	mg/L	470		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	4.18		0.005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Titanium	mg/L	0.007		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Uranium	mg/L	0.053		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Zinc	mg/L	0.007		0.005	Dec 14, 2018	EB	Dec 14, 2018
Hardness	mg CaCO3/L	3180		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.73		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	624		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	761		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	5640		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	3.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.21		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	9.17		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	2.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	3540		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	481		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	480		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	470		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	15.4		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.058		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	98		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	3180		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	2.07		0.02		SYS	
Calculated TDS	mg/L	5370		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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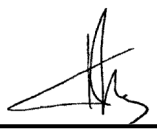

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781336 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207013 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	12		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	124	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	127	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.049		0.004	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Boron	mg/L	0.54		0.01	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00090		0.00005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0010		0.0009	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Lithium	mg/L	0.117		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Magnesium	mg/L	350		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.348		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Nickel	mg/L	0.027		0.003	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Selenium	mg/L	0.0075		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Sodium	mg/L	221		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	4.51		0.005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Titanium	mg/L	0.005		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Uranium	mg/L	0.018		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Zinc	mg/L	0.018		0.005	Dec 14, 2018	EB	Dec 14, 2018
Hardness	mg CaCO3/L	2700		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.65		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	509		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	621		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4340		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	1.4		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.25		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	5.54		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.25		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2750		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	503		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	350		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	221		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	12.3		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.348		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	95		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2700		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.25		0.02		SYS	
Calculated TDS	mg/L	4150		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781337 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207014 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	2		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	93	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	106	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	123	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	93	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Boron	mg/L	0.50		0.01	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00100		0.00005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Calcium	mg/L	479		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Copper	mg/L	0.0014		0.0008	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Lithium	mg/L	0.115		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Magnesium	mg/L	362		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.312		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Nickel	mg/L	0.023		0.003	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Selenium	mg/L	0.0032		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Sodium	mg/L	230		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	4.46		0.005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Titanium	mg/L	0.004		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Uranium	mg/L	0.028		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Zinc	mg/L	0.017		0.005	Dec 14, 2018	EB	Dec 14, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

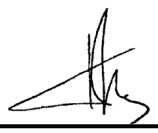
SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.60		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	602		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	735		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4460		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.0		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.13		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	7.07		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	1.60		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2780		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	479		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	362		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	230		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	11.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.312		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	91		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2690		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	1.60		0.02		SYS	
Calculated TDS	mg/L	4230		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

Certified By:



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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781338 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207015 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	4		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	<0.002		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	0.419		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	0.273		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	0.00797		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	0.0605		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	1.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	0.3		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	3.5		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	0.7		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	3.5		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	0.7		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	0.00136		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	0.00002		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	0.00476		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	0.00903		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	0.00621		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	0.00006		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	0.00026		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	0.00038		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	102	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	112	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	90	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.041		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	0.005		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	0.028		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	5.95		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	0.60		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00033		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	5160		1.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	0.006		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0341		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	0.0012		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	33.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	0.599		0.002	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	300		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	5.35		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.102		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	0.203		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	0.771		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	2690		2.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	82.7		0.2	Dec 16, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	0.098		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	0.015		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	0.042		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	0.058		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	14100		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.93		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	1220		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	1490		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	38100		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	14500		30	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.9		0.6	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	79.5		4.0	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	18.0		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	92.1		2.0	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	28.0		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	303		3.0	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	5160		1.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	300		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	2690		2.0	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	705		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	33.5		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	5.35		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	14100		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	46.0		0.02		SYS	
Calculated TDS	mg/L	24600		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781339 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

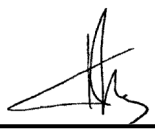
SAMPLE DESCRIPTION: 17507181207016 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	1410		100	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.71		0.02	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By:



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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	83	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	101	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	99	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	98	50-150	Dec 17, 2018	TN	Dec 14, 2018

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

MTBE in Water

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Methyl tert-butyl ether	mg/L	<0.001		0.001	Dec 14, 2018	OM	Dec 13, 2018
SURROGATE	**UNIT**	**RESULT**	**ACCEPTABLE LIMITS**		**DATE ANALYZED**	**INITIAL**	**DATE PREPARED**
Toluene-d8	%	83	50-150		Dec 14, 2018	OM	Dec 13, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

Certified By: Elena Gorobets

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.007		0.004	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Boron	mg/L	0.28		0.01	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00049		0.00005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Calcium	mg/L	547		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0017		0.0009	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Copper	mg/L	0.0019		0.0008	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Lithium	mg/L	0.127		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Magnesium	mg/L	317		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.544		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Nickel	mg/L	0.019		0.003	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Selenium	mg/L	0.0040		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Sodium	mg/L	93.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	2.40		0.005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Titanium	mg/L	0.004		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Uranium	mg/L	0.021		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Zinc	mg/L	0.009		0.005	Dec 14, 2018	EB	Dec 14, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.56		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	409		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	499		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	3930		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	67.9		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.28		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.65		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.15		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2450		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	547		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	317		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	93.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	5.7		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.544		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2670		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.15		0.02		SYS	
Calculated TDS	mg/L	3730		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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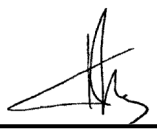

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Anaysis - DOC, Phenols

SAMPLE TYPE: Water | SAMPLE ID: 9781340 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207017 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Organic Carbon (DOC)	mg/L	21		1	Dec 13, 2018	RT	Dec 13, 2018
Phenols	mg/L	0.003		0.002	Dec 16, 2018	JH	Dec 16, 2018

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	90	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	117	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	130	50-150	Dec 17, 2018	TN	Dec 14, 2018

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	0.020		0.004	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Boron	mg/L	0.34		0.01	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cadmium	mg/L	0.00043		0.00005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Calcium	mg/L	498		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Cobalt	mg/L	0.0101		0.0009	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Copper	mg/L	0.0010		0.0008	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Iron	mg/L	0.3		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Lithium	mg/L	0.060		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Magnesium	mg/L	211		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.325		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Nickel	mg/L	0.012		0.003	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Selenium	mg/L	0.0010		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Sodium	mg/L	340		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	5.13		0.005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Titanium	mg/L	0.007		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Uranium	mg/L	0.061		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	EB	Dec 14, 2018
Dissolved Zinc	mg/L	0.017		0.005	Dec 14, 2018	EB	Dec 14, 2018
Hardness	mg CaCO3/L	2110		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781341 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207011 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	7.62		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	734		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	896		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	4120		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	2.7		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	0.08		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	0.29		0.20	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	0.07		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.10		0.10	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	2210		1.5	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	498		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	211		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	340		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	7.9		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	0.3		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	0.325		0.005	Dec 16, 2018	AS	Dec 16, 2018
Ion Balance	%	94		1	Dec 18, 2018	SYS	Dec 18, 2018
Hardness	mg CaCO3/L	2110		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	0.07		0.02		SYS	
Calculated TDS	mg/L	3710		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 17, 2018	SYS	Dec 17, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 17, 2018	TN	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 17, 2018	TN	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 17, 2018	TN	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 17, 2018	TN	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 17, 2018	TN	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	87	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	100	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	115	50-150	Dec 17, 2018	TN	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	116	50-150	Dec 17, 2018	TN	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

Certified By: Elena Gorobets

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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Schedule 6 Dissolved Metals

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Dissolved Aluminum	mg/L	<0.004		0.004	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Antimony	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Arsenic	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Barium	mg/L	<0.05		0.05	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Beryllium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Boron	mg/L	<0.01		0.01	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cadmium	mg/L	<0.00005		0.00005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Calcium	mg/L	<0.3		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Chromium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Cobalt	mg/L	<0.0009		0.0009	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Copper	mg/L	<0.0008		0.0008	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Lead	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Lithium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Magnesium	mg/L	<0.2		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Mercury	mg/L	<0.000025		0.000025	Dec 13, 2018	PS	Dec 13, 2018
Dissolved Molybdenum	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Nickel	mg/L	<0.003		0.003	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Selenium	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Silver	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Sodium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Strontium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Thallium	mg/L	<0.0001		0.0001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Tin	mg/L	<0.0005		0.0005	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Titanium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Uranium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Vanadium	mg/L	<0.001		0.001	Dec 14, 2018	AJ	Dec 14, 2018
Dissolved Zinc	mg/L	<0.005		0.005	Dec 14, 2018	AJ	Dec 14, 2018
Hardness	mg CaCO3/L	<0.5		0.5		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Method Detection Limit.

Certified By:

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
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Certificate of Analysis

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Matrix Solutions Routine Chemistry Water Analysis

SAMPLE TYPE: Water | SAMPLE ID: 9781367 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207018 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
pH	pH Units	6.38		N/A	Dec 18, 2018	KT	Dec 18, 2018
p - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
T - Alkalinity (as CaCO3)	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Bicarbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Carbonate	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Hydroxide	mg/L	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Electrical Conductivity	uS/cm	<5		5	Dec 18, 2018	KT	Dec 18, 2018
Chloride	mg/L	<0.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Fluoride	mg/L	<0.01		0.01	Dec 13, 2018	JM	Dec 13, 2018
Nitrate	mg/L	<0.08		0.08	Dec 13, 2018	JM	Dec 13, 2018
Nitrate-N	mg/L	<0.02		0.02	Dec 13, 2018	SYS	Dec 13, 2018
Nitrite	mg/L	<0.03		0.03	Dec 13, 2018	JM	Dec 13, 2018
Nitrite-N	mg/L	<0.01		0.01	Dec 13, 2018	SYS	Dec 13, 2018
Sulfate	mg/L	<0.6		0.6	Dec 13, 2018	JM	Dec 13, 2018
Dissolved Calcium	mg/L	<0.3		0.3	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Magnesium	mg/L	<0.2		0.2	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Sodium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Potassium	mg/L	<0.6		0.6	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Iron	mg/L	<0.1		0.1	Dec 16, 2018	AS	Dec 16, 2018
Dissolved Manganese	mg/L	<0.005		0.005	Dec 16, 2018	AS	Dec 16, 2018
Hardness	mg CaCO3/L	<0.5		0.5		SYS	
Nitrate + Nitrite - Nitrogen	mg/L	<0.02		0.02		SYS	
Calculated TDS	mg/L	<1		1		SYS	

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
< - Values refer to Report Detection Limits.

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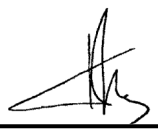

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781369 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207019 Block A-08-088-20W6M

PARAMETER	UNIT	RESULT	G / S	RDL	DATE ANALYZED	INITIAL	DATE PREPARED
Benzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Toluene	mg/L	<0.0003		0.0003	Dec 14, 2018	OM	Dec 13, 2018
Ethylbenzene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Xylenes	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
Styrene	mg/L	<0.0005		0.0005	Dec 14, 2018	OM	Dec 13, 2018
VH W6-10	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
VPH	mg/L	<0.1		0.1	Dec 14, 2018	OM	Dec 13, 2018
EPH (WC10-C19)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
EPH (WC19-C32)	mg/L	<0.1		0.1	Dec 14, 2018	LL	Dec 14, 2018
LEPH (WC10-C19 - PAH)	mg/L	<0.1		0.1	Dec 16, 2018	SYS	Dec 16, 2018
HEPH (WC19-C32 - PAH)	mg/L	<0.1		0.1	Dec 16, 2018	SYS	Dec 16, 2018
Acenaphthene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Acridine	mg/L	<0.00005		0.00005	Dec 16, 2018	TD	Dec 14, 2018
Anthracene	mg/L	<0.000010		0.000010	Dec 16, 2018	TD	Dec 14, 2018
Chrysene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Fluorene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Naphthalene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Phenanthrene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Benzo[a]anthracene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Benzo[a]pyrene	mg/L	<0.000007		0.000007	Dec 16, 2018	TD	Dec 14, 2018
Fluoranthene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Pyrene	mg/L	<0.00001		0.00001	Dec 16, 2018	TD	Dec 14, 2018
Quinoline	mg/L	<0.00004		0.00004	Dec 16, 2018	TD	Dec 14, 2018

SURROGATE	UNIT	RESULT	ACCEPTABLE LIMITS	DATE ANALYZED	INITIAL	DATE PREPARED
Toluene-d8 (BTEX)	%	98	50-150	Dec 14, 2018	OM	Dec 13, 2018
o-Terphenyl (EPH)	%	99	50-150	Dec 14, 2018	LL	Dec 14, 2018
2-Fluorobiphenyl (PAH)	%	114	50-150	Dec 16, 2018	TD	Dec 14, 2018
p-Terphenyl-d14 (PAH)	%	126	50-150	Dec 16, 2018	TD	Dec 14, 2018

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

British Columbia CSR - Extended Site Remediation Analysis - Water

SAMPLE TYPE: Water | SAMPLE ID: 9781369 | DATE RECEIVED: Dec 10, 2018

DATE SAMPLED: Dec 07, 2018 | DATE REPORTED: Dec 20, 2018

SAMPLE DESCRIPTION: 17507181207019 Block A-08-088-20W6M

COMMENTS:

RDL - Reported Detection Limit; G / S - Guideline / Standard
Xylenes is a calculated parameter. The calculated value is the sum of m&p-Xylenes + o-Xylene.
VPH results have been corrected for BTEX contributions.
LEPH & HEPH results have been corrected for PAH contributions.
VPH: Volatile Petroleum Hydrocarbons (n-C6 - n-C10); all volatile compounds in the n-C6 to n-C10 range quantified based on toluene response.
LEPH: Light Extractable Petroleum Hydrocarbons (n-C10 - n-C19); all extractable compounds in the n-C10 to n-C19 range quantified based on n-eicosane response.
HEPH: Heavy Extractable Petroleum Hydrocarbons (n-C19 - n-C32); all extractable compounds in the n-C19 to n-C32 range quantified based on n-eicosane response.

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CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Dec 20, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
British Columbia CSR - Extended Site Remediation Analysis - Water															
Benzene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	93%	80%	120%	88%	80%	120%	98%	70%	130%
Toluene	3587	9781330	< 0.0003	< 0.0003	NA	< 0.0003	93%	80%	120%	85%	80%	120%	95%	70%	130%
Ethylbenzene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	101%	80%	120%	90%	80%	120%	105%	70%	130%
Xylenes	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	97%	80%	120%	90%	80%	120%	102%	70%	130%
Styrene	3587	9781330	< 0.0005	< 0.0005	NA	< 0.0005	81%	80%	120%	85%	80%	120%	86%	70%	130%
VH W6-10	3587	9781330	< 0.1	< 0.1	NA	< 0.1	86%	80%	120%	101%	80%	120%	93%	70%	130%
EPH (WC10-C19)	400	9781332	<0.1	<0.1	NA	< 0.1	91%	80%	120%	87%	80%	120%	93%	70%	130%
EPH (WC19-C32)	400	9781332	<0.1	<0.1	NA	< 0.1	91%	80%	120%	87%	80%	120%	89%	70%	130%
Acenaphthene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	124%	70%	130%	111%	70%	130%	103%	70%	130%
Acridine	381	9781332	< 0.00005	< 0.00005	NA	< 0.00005	115%	70%	130%	106%	70%	130%	100%	70%	130%
Anthracene	381	9781332	< 0.000010	< 0.000010	NA	< 0.000010	120%	70%	130%	108%	70%	130%	101%	70%	130%
Chrysene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	107%	70%	130%	101%	70%	130%
Fluorene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	126%	70%	130%	106%	70%	130%	99%	70%	130%
Naphthalene	381	9781332	0.00002	0.00001	NA	< 0.00001	122%	70%	130%	105%	70%	130%	100%	70%	130%
Phenanthrene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	107%	70%	130%	101%	70%	130%
Benzo[a]anthracene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	127%	70%	130%	115%	70%	130%	106%	70%	130%
Benzo[a]pyrene	381	9781332	< 0.000007	< 0.000007	NA	< 0.000007	104%	70%	130%	95%	70%	130%	87%	70%	130%
Fluoranthene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	121%	70%	130%	103%	70%	130%	99%	70%	130%
Pyrene	381	9781332	< 0.00001	< 0.00001	NA	< 0.00001	122%	70%	130%	108%	70%	130%	103%	70%	130%
Quinoline	381	9781332	< 0.00004	< 0.00004	NA	< 0.00004	118%	70%	130%	98%	70%	130%	101%	70%	130%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

MTBE in Water															
Methyl tert-butyl ether	3587	9781330	< 0.001	< 0.001	NA	< 0.001	118%	70%	130%		70%	130%		60%	140%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis

RPT Date: Dec 20, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Matrix Solutions Routine Chemistry Water Analysis															
pH	9783994		7.90	7.94	0.5%	N/A	100%	90%	110%						
T - Alkalinity (as CaCO3)	9783994		646	632	2.2%	< 5	103%	80%	120%						
Electrical Conductivity	9783994		1460	1480	1.4%	< 5	101%	80%	120%						
Chloride	9782814		5.2	5.0	3.9%	< 0.6	95%	80%	120%	92%	80%	120%	NA	80%	120%
Fluoride	9782814		0.08	0.08	NA	< 0.01	90%	80%	120%	84%	80%	120%	NA	80%	120%
Nitrate	9782814		1.34	1.35	NA	< 0.08	97%	80%	120%	98%	80%	120%	NA	80%	120%
Nitrite	9782814		<0.20	<0.20	NA	< 0.03	94%	80%	120%	87%	80%	120%	NA	80%	120%
Sulfate	9782814		35.9	36.2	0.8%	< 0.6	95%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Calcium	9781238	9781238	478	481	0.6%	< 0.3	105%	80%	120%	114%	80%	120%	NA	80%	120%
Dissolved Magnesium	9781238	9781238	294	297	1.0%	< 0.2	98%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Sodium	9781238	9781238	209	210	0.5%	< 0.6	98%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Potassium	9781238	9781238	7.1	7.2	1.4%	< 0.6	92%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Iron	9781238	9781238	<0.1	<0.1	NA	< 0.1	109%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Manganese	9781238	9781238	2.20	2.21	0.5%	< 0.005	107%	80%	120%	101%	80%	120%	NA	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

pH has been analyzed past the recommended holding time of 15 minutes from sampling (field measurement ideal if more accurate data required)

Nitrate and Nitrite: The regulatory hold time for the analysis of nitrate and/or nitrite in water is 72 hours.

British Columbia CSR - Schedule 6 Dissolved Metals															
Dissolved Aluminum	9782814		<0.004	0.008	NA	< 0.004	108%	80%	120%	106%	80%	120%	106%	80%	120%
Dissolved Antimony	9782814		<0.001	<0.001	NA	< 0.001	117%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Arsenic	9782814		<0.001	<0.001	NA	< 0.001	106%	80%	120%	104%	80%	120%	104%	80%	120%
Dissolved Barium	9782814		0.10	0.10	NA	< 0.05	108%	80%	120%	101%	80%	120%	105%	80%	120%
Dissolved Beryllium	9782814		<0.001	<0.001	NA	< 0.001	104%	80%	120%	106%	80%	120%	94%	80%	120%
Dissolved Boron	9782814		0.08	0.08	NA	< 0.01	119%	80%	120%	114%	80%	120%	111%	80%	120%
Dissolved Cadmium	9782814		<0.00005	<0.00005	NA	< 0.00005	112%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Calcium	9781238	9781238	478	481	0.6%	< 0.3	105%	80%	120%	114%	80%	120%	NA	80%	120%
Dissolved Chromium	9782814		<0.001	<0.001	NA	< 0.001	107%	80%	120%	98%	80%	120%	99%	80%	120%
Dissolved Cobalt	9782814		<0.0009	<0.0009	NA	< 0.0009	109%	80%	120%	101%	80%	120%	97%	80%	120%
Dissolved Copper	9782814		0.0020	0.0024	NA	< 0.0008	107%	80%	120%	102%	80%	120%	95%	80%	120%
Dissolved Iron	9781238	9781238	<0.1	<0.1	NA	< 0.1	109%	80%	120%	103%	80%	120%	100%	80%	120%
Dissolved Lead	9782814		<0.0005	<0.0005	NA	< 0.0005	113%	80%	120%	101%	80%	120%	100%	80%	120%
Dissolved Lithium	9782814		0.029	0.030	3.4%	< 0.001	105%	80%	120%	103%	80%	120%	112%	80%	120%
Dissolved Magnesium	9781238	9781238	294	297	1.0%	< 0.2	98%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Manganese	9781238	9781238	2.20	2.21	0.5%	< 0.005	107%	80%	120%	101%	80%	120%	NA	80%	120%
Dissolved Mercury	9781238	9781238	<0.	<0.	NA	< 0.000025	103%	90%	110%	96%	90%	110%	106%	80%	120%
Dissolved Molybdenum	9782814		0.005	0.005	NA	< 0.001	110%	80%	120%	102%	80%	120%	100%	80%	120%
Dissolved Nickel	9782814		<0.003	<0.003	NA	< 0.003	109%	80%	120%	102%	80%	120%	96%	80%	120%

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Quality Assurance

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

Water Analysis (Continued)

RPT Date: Dec 20, 2018			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Dissolved Selenium	9782814		0.0012	0.0010	NA	< 0.0005	93%	80%	120%	99%	80%	120%	105%	80%	120%
Dissolved Silver	9782814		<0.0001	<0.0001	NA	< 0.0001	98%	80%	120%	93%	80%	120%	87%	80%	120%
Dissolved Sodium	9781238	9781238	209	210	0.5%	< 0.6	98%	80%	120%	96%	80%	120%	NA	80%	120%
Dissolved Strontium	9782814		0.914	0.936	2.4%	< 0.001	101%	80%	120%	100%	80%	120%	NA	80%	120%
Dissolved Thallium	9782814		<0.0001	<0.0001	NA	< 0.0001	106%	80%	120%	102%	80%	120%	98%	80%	120%
Dissolved Tin	9782814		<0.0005	<0.0005	NA	< 0.0005	109%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Titanium	9782814		0.007	0.006	15.4%	< 0.001	98%	80%	120%	104%	80%	120%	103%	80%	120%
Dissolved Uranium	9782814		0.006	0.006	NA	< 0.001	113%	80%	120%	98%	80%	120%	105%	80%	120%
Dissolved Vanadium	9782814		<0.001	0.001	NA	< 0.001	109%	80%	120%	99%	80%	120%	99%	80%	120%
Dissolved Zinc	9782814		0.041	0.045	9.3%	< 0.004	105%	80%	120%	100%	80%	120%	99%	80%	120%

Comments: If Matrix spike value is NA, the spiked analyte concentration was lower than that of the matrix contribution.
If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

Water Anaysis - DOC, Phenols															
Dissolved Organic Carbon (DOC)	9777139		17	17	0.0%	< 1	99%	80%	120%	116%	80%	120%	NA	80%	120%
Phenols	9784861		0.009	0.011	NA	< 0.002	96%	80%	120%	96%	80%	120%	112%	80%	120%

Comments: If the RPD value is NA, the results of the duplicates are under 5X the RDL and will not be calculated.

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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Toluene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Ethylbenzene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Xylenes	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
Styrene	TO-0542	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
VH W6-10	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/FID
VPH	TO-0542	EPA SW-846 5021, B.C. ENVIRONMENT	GC/MS/FID
EPH (WC10-C19)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
EPH (WC19-C32)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
LEPH (WC10-C19 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
HEPH (WC19-C32 - PAH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
Acenaphthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Acridine	TO 0200	EPA SW846 3511 & 8270	GC/MS
Anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Chrysene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluorene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Naphthalene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Phenanthrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]anthracene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Benzo[a]pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Fluoranthene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Pyrene	TO 0200	EPA SW846 3511 & 8270	GC/MS
Quinoline	TO 0200	EPA SW846 3511 & 8270	GC/MS
Toluene-d8 (BTEX)	TO-0543	EPA SW-846 5021/8260, B.C. ENVIRONMENT	GC/MS
o-Terphenyl (EPH)	TO 0511	EPA SW-846 3511, B.C. ENVIRONMENT	GC/FID
2-Fluorobiphenyl (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
p-Terphenyl-d14 (PAH)	TO 0200	EPA SW846 3510C & 8270	GC/MS
Methyl tert-butyl ether	TO-0330	EPA SW-846 5030 & 8260	GC/MS
Toluene-d8	TO-0330	EPA SW-846 5030 & 8260	GC/MS

AGAT Laboratories

2910 12TH STREET NE
CALGARY, ALBERTA
CANADA T2E 7P7
TEL (403)735-2005
FAX (403)735-2771
http://www.agatlabs.com

Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Dissolved Aluminum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Antimony	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Arsenic	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Barium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Beryllium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Boron	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cadmium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Calcium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Chromium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Cobalt	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Copper	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Iron	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Lead	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Lithium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Magnesium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Mercury	INST 0160	SM 3112 B DW	CV/AA
Dissolved Molybdenum	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Nickel	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Selenium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Silver	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Sodium	INST 0140	SM 3120 B- D	ICP/OES
Dissolved Strontium	INST 0141	SM 3125 B	ICP-MS
Dissolved Thallium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Tin	INST 0141	SM 3125 B	ICP-MS
Dissolved Titanium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Uranium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Vanadium	INST 0141	SM 3125 B-D	ICP-MS
Dissolved Zinc	INST 0141	SM 3125 B-D	ICP-MS
pH	INST 0101, INST 0104	SM 4500 H+	pH METER
p - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
T - Alkalinity (as CaCO3)	INST 0101	SM 2320 B	TITRATION
Bicarbonate	INST 0101	SM 2320 B	PC TITRATE
Carbonate	INST 0101	SM 2320 B	PC TITRATE
Hydroxide	INST 0101	SM 2320 B	TITRATION
Electrical Conductivity	INST 0101, INST 0120	SM 2510 B	CONDUCTIVITY METER
Chloride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Fluoride	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrate-N	INST 0150	SM 4110 B	CALCULATION
Nitrite	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Nitrite-N	INST 0150	SM 4110 B	CALCULATION
Sulfate	INST 0150	SM 4110 B	ION CHROMATOGRAPH
Dissolved Calcium	INST 0140	SM 3120 B	ICP/OES
Dissolved Magnesium	INST 0140	SM 3120 B	ICP/OES
Dissolved Sodium	INST 0140	SM 3120 B	ICP/OES
Dissolved Potassium	INST 0140	SM 3120 B	ICP/OES
Dissolved Iron	INST 0140	SM 3120 B	ICP/OES
Dissolved Manganese	INST 0140	SM 3120 B	ICP/OES

2910 12TH STREET NE
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Method Summary

CLIENT NAME: TERVITA (CCS)

AGAT WORK ORDER: 18F419804

PROJECT: 17507-502/Block A-08-088-20W6M

ATTENTION TO: Scott Crowe

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Ion Balance		SM 1030E	
Dissolved Organic Carbon (DOC)	INST 0170	SM 5310 B DW	COMBUSTION
Phenols	INST 0300	SM 420.2	CONTINUOUS FLOW ANALYZER

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

COC # MD-MO1812071817507

Page: 1 of: 1

Lab Submitted To: AGAT Labs

Lab Agreement No.: 18-T449804

Job ID:

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	M. O'Hanley, A. Watson

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ RUSH (Please ensure you contact the lab): Due Date: (mmm dd yyyy)
- ☒ REGULAR Turnaround

REPORT DISTRIBUTION: Always send to eds@matrix-solutions.com

- ☒ Add'l Emails: ahum@matrix-solutions.com
- ehenson@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	Analysis Required: 58696	54668	58104	58547	MTBE	58328	Lab Sample Number	HOLD
1	17507181207001	MW92-1		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	978	28
2	17507181207002	MW92-1A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	300	
3	17507181207003	MW92-6A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	31	
4	17507181207004	MW92-7		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	32	
5	17507181207005	MW92-7A		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	33	
6	17507181207008	03-3		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	34	
7	17507181207012	BH-105(R)		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	35	
8	17507181207013	15-9		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	36	
9	17507181207014	15-10		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	37	
10	17507181207015	15-11		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	38	
11	17507181207016	Leachate vault 1		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	39	
12	17507181207017	LDS		Water	Dec 07 2018	0	0	BT13	X	X	X	X	X	X	40	
13	17507181207011			Water	Dec 07 2018	0	0	BT8	X	X				X	41	
14	17507181207018			Water	Dec 07 2018	0	0	BT13	X	X				X	42	
15	17507181207019			Water	Dec 07 2018	0	0	BT5		X					69	

*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required' Preserved/Filtered

Relinquished by: Miranda O'Hanley **Date/Time:** Friday, December 07, 2018 **Received by:** **Date/Time:**

Signature: **Signature:**

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle

DEC 11 2018

C 35092

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

RECEIVING BASICS - Shipping

Company/Consultant: TERVITA / MATRIX

Courier: ATOO Prepaid Collect

Waybill#

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other

Cooler Quantity: 8

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: DEC. 12, 2018 as per FSJ's Sh.

Hydrocarbons: Earliest Expiry DEC 20, 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: (Icepack) (Bagged Ice) Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 2+3+2=2 °C	2(Bottle/Jar) 2+2+2=2 °C
3 (Bottle/Jar) 3+2+2=2 °C	4 (Bottle/Jar) 2+2+2=2 °C
5 (Bottle/Jar) 2+1+2=2 °C	6 (Bottle/Jar) 3+2+2=2 °C
7 (Bottle/Jar) 2+2+2=2 °C	8 (Bottle/Jar) 2+2+2=2 °C
9 (Bottle/Jar) ___+___+___=___ °C	10 (Bottle/Jar) ___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: 18F419804

Samples Damaged: Yes (No) If YES why?

No Bubble Wrap Frozen Courier

Other:

Account Project Manager: have they been notified of the above issues: Yes No

Whom spoken to: Date/Time:

CPM Initial

General Comments: SAMPLES ARE MIXED UP W/ OTHER SAMPLES FROM OTHER PROJECTS IN 8 COOLERS

* Subcontracted Analysis (See CPM)

Date issued: October 05, 2015
Document ID: SR-9505.003

AGAT Laboratories

SAMPLE INTEGRITY RECEIPT FORM

Date: Dec 10/18 COC: F 11112

RECEIVING BASICS - Shipping

Company/Consultant: Matrix / Tervita

Courier: Client Drop off Prepaid Collect

Waybill# After hours Shed

Branch: EDM GP FN FM RD VAN LYD (FSJ) EST Other:____

If multiple sites were submitted at once: (Yes) No

Custody Seal Intact: Yes No (NA)

TAT: <24hr 24-48hr 48-72hr (Reg) Other_____

Cooler Quantity: 6 LRG, 1 MED

TIME SENSITIVE ISSUES - Shipping

ALREADY EXCEEDED HOLD TIME? Yes (No)

Inorganic Tests (Please Circle): Mibi , BOD , (Nitrate/Nitrite) , Turbidity , Microtox , Ortho PO4 , Tedlar Bag , Residual Chlorine , Chlorophyll* , Chloroamines*

Earliest Expiry: Wed Dec 12th / 2018

Hydrocarbons: Earliest Expiry Dec 20th 2018

SAMPLE INTEGRITY - Shipping

Hazardous Samples: YES (NO) Precaution Taken:_____

Legal Samples: Yes (No)

International Samples: Yes (No)

Tape Sealed: Yes (No)

Coolant Used: Icepack (Bagged Ice)* Free Ice Free Water None

Temperature (Bottles/Jars only) N/A if only Soil Bags Received

FROZEN (Please Circle if samples received Frozen)

1 (Bottle/Jar) 2+0.3+1 = 1 °C 2(Bottle/Jar) 7+3+5 = 5 °C

3 (Bottle/Jar) 10+13+8 = 10 °C 4 (Bottle/Jar) 8+4+4 = 5 °C

5 (Bottle/Jar) 10+5+7 = 7 °C 6 (Bottle/Jar) 0.3+0.3+0.7 = 0.4 °C

7 (Bottle/Jar) 3+2+1 = 2 °C 8 (Bottle/Jar) ___+___+___=___ °C

9 (Bottle/Jar) ___+___+___=___ °C 10 (Bottle/Jar) ___+___+___=___ °C

(If more than 10 coolers are received use another sheet of paper and attach)

LOGISTICS USE ONLY

Workorder No: _____

Samples Damaged: Yes No If YES why?

No Bubble Wrap Frozen Courier

Other: _____

Account Project Manager: _____ have they been notified of the above issues: Yes No

Whom spoken to: _____ Date/Time: _____

CPM Initial_____

General Comments: _____

Matrix project # 17507-502

Matrix COC #'s MD-MOI81207291750?/

MD-MOI81207181750?

Same day sample

WHERE IS IT SENT:

GP Burnaby Calgary ✓

* Subcontracted Analysis (See CPM)

Matrix Solutions Inc.
ATTN: SUE RAYNARD
200 - 150 13 Ave SW
Calgary AB T2R 0V2

Date Received: 16-MAY-18
Report Date: 31-MAY-18 18:15 (MT)
Version: FINAL REV. 2

Client Phone: 403-237-0606

Certificate of Analysis

Lab Work Order #: L2095619

Project P.O. #:	305-43087-24009
Job Reference:	17507-502 SILVERBERRY LF
C of C Numbers:	MD-CB1805152217507
Legal Site Desc:	Block A-08-088-20 W6M

Comments: 31-May-2018 Addition of missing chromatogram for sample L2095619-7.

23-MAY-2018 Dissolved metals bottles for all samples contain solids. Filtration location changed from FIELD to LAB for all samples.

Ryan Smyth, B.A.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-1 17507180515001									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	0.0000089	+/-0.0000051	RRV	0.0000050	mg/L	0		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	0.00056	+/-0.00008	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.00706	+/-0.00073	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.381	+/-0.048	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.00117	+/-0.00021	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	486	+/-43	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.050	-	DLDS	0.050	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.0323	+/-0.0040	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	298	+/-34	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	1.96	+/-0.18	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00054	+/-0.00005	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0190	+/-0.0017	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	7.62	+/-0.73	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00047	+/-0.00005	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	217	+/-23	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	3.33	+/-0.32	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0291	+/-0.0035	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.0114	+/-0.0014	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	104.8	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	102.8	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-1 17507180515001									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
LEPHs and HEPHs									
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	81.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	95.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	90.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	93.2	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	80.7	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	3.7	+/-0.7		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	3.1	+/-0.2	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	104	-			%	-		24-MAY-18	
TDS (Calculated)	3400	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2440	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.12	+/-0.01	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.12	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-1 17507180515001									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	1890	+/-96	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	7.72	+/-0.08		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	3900	+/-320		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	1010	+/-86		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	830	+/-69		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-2 17507180515002									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.00454	+/-0.00047	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.118	+/-0.015	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000302	+/-0.000054	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	301	+/-26	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0015	+/-0.0002	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.050	-	DLDS	0.050	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.0925	+/-0.011	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	141	+/-16	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0219	+/-0.0020	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00026	+/-0.00003	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0031	+/-0.0003	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	4.64	+/-0.45	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00291	+/-0.00031	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	32.7	+/-3.5	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	1.22	+/-0.12	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.00495	+/-0.00059	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-2 17507180515002									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	111.2	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	99.1	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	103.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	113.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	99.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	107.3	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	95.3	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	7.0	+/-1.2		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-2 17507180515002									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.20	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	102	-			%	-		24-MAY-18	
TDS (Calculated)	1760	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	1330	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.11	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	1200	+/-61	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.21	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	2120	+/-170		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	163	+/-15		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	133	+/-12		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-3 17507180515003									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0133	+/-0.0014	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.066	+/-0.008	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000239	+/-0.000043	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	360	+/-32	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0012	+/-0.0001	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.050	-	DLDS	0.050	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.0232	+/-0.0029	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	107	+/-12	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.00372	+/-0.00034	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0040	+/-0.0004	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	2.29	+/-0.22	DLDS	0.25	mg/L	0		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-3 17507180515003									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Selenium (Se)-Dissolved	0.00058	+/-0.00006	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	15.8	+/-1.7	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	0.935	+/-0.091	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.00172	+/-0.00020	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	107.0	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	96.0	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	107.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-3 17507180515003									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Surr: Acenaphthene d10	111.2	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	101.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	106.6	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	90.3	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	10.6	+/-1.7		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	11.8	+/-0.7	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.30	+/-0.04	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	95.6	-			%	-		24-MAY-18	
TDS (Calculated)	1820	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	1340	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.27	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.27	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	1260	+/-64	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.18	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	2110	+/-170		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	133	+/-12		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	109	+/-9.6		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-4 17507180515004									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	0.049	+/-0.006	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0084	+/-0.0009	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-4 17507180515004									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Boron (B)-Dissolved	0.43	+/-0.05	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000207	+/-0.000037	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	389	+/-34	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0022	+/-0.0002	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.022	+/-0.003	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	293	+/-33	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0440	+/-0.0041	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00188	+/-0.00019	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0077	+/-0.0007	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	9.74	+/-0.94	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00453	+/-0.00049	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	396	+/-42	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	5.08	+/-0.49	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0472	+/-0.0056	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	101.7	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	101.5	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	82.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-4 17507180515004									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	106.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	95.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	101.4	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	82.1	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	3.3	+/-0.6		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	8.7	+/-0.5	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.10	+/-0.01	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	108	-			%	-		24-MAY-18	
TDS (Calculated)	3580	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2180	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	1.66	+/-0.11	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	1.66	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2130	+/-110	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	7.83	+/-0.08		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4240	+/-350		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	705	+/-60		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	578	+/-48		5.0	mg/L	0		21-MAY-18	R4049897

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-5 17507180515005									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	0.031	+/-0.004	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0097	+/-0.0010	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.33	+/-0.04	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000748	+/-0.00013	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	461	+/-40	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.0015	+/-0.0002	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0020	-	DLDS	0.0020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	0.63	+/-0.08	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.160	+/-0.020	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	450	+/-51	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	1.76	+/-0.16	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0145	+/-0.0013	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	12.1	+/-1.2	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	203	+/-22	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	3.22	+/-0.31	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	0.00015	+/-0.00002	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.00786	+/-0.00093	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.012	+/-0.001	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	101.3	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	96.2	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-5 17507180515005									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
LEPHs and HEPHs									
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	85.6	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	106.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	91.6	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	98.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	83.8	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	6.1	+/-1.0		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.13	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	111	-			%	-		24-MAY-18	
TDS (Calculated)	3970	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	3000	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.30	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.30	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-5 17507180515005									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2580	+/-130	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.14	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4300	+/-350		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	527	+/-45		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	432	+/-36		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-6 17507180515006									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	102.8	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	104.9	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	115.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	0.017	+/-0.012		0.010	ug/L	0	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	0.014	+/-0.017		0.010	ug/L	0	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-6 17507180515006									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Pyrene	0.035	+/-0.014		0.010	ug/L	-7.5%	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	124.6	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	109.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	124.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	88.7	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Calcium (Ca)-Dissolved	499	+/-44	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	410	+/-46	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0159	+/-0.0015	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	9.64	+/-0.93	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Sodium (Na)-Dissolved	105	+/-11	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	102	-			%	-		24-MAY-18	
TDS (Calculated)	3860	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2930	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.87	+/-0.06	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.87	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2600	+/-130	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.16	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4060	+/-330		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	476	+/-41		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	390	+/-33		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-7 17507180515007									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-7 17507180515007									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.000050	-	DLM	0.000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	0.024	+/-0.003	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Barium (Ba)-Dissolved	2.30	+/-0.24	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	<1.0	-	DLDS	1.0	mg/L	-		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	4770	+/-420	DLDS	5.0	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.040	+/-0.004	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.020	-	DLDS	0.020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	5.8	+/-0.8	DLDS	1.0	mg/L	0		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.64	+/-0.08	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	318	+/-36	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	5.17	+/-0.48	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.146	+/-0.014	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.234	+/-0.021	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	625	+/-60	DLDS	5.0	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	2440	+/-260	DLDS	5.0	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	66.4	+/-6.4	DLDS	0.020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.030	-	DLDS	0.030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0177	+/-0.0021	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.050	-	DLDS	0.050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	0.0218	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	0.00583	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.0010	-	DLQ	0.0010	mg/L	-		23-MAY-18	R4052709
o-Xylene	0.0106	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	0.0257	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	0.0256	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	110.9	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	100.5	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	126000	+/-60000		250	ug/L	0	22-MAY-18	22-MAY-18	R4055366
EPH19-32	28700	+/-14000		250	ug/L	0	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	125000	-		250	ug/L	-		24-MAY-18	
HEPH	28700	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-7 17507180515007									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	111.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	9.70	+/-2.2	DLI	0.10	ug/L	-13.3%	22-MAY-18	23-MAY-18	R4050911
Acenaphthylene	<7.4	-	DLCI	7.4	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Acridine	<0.30	-	DLCI	0.30	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Anthracene	<1.3	-	DLCI	1.3	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Benz(a)anthracene	<0.40	-	DLCI	0.40	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Benzo(a)pyrene	<0.24	-	DLCI	0.24	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.30	-	DLCI	0.30	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.20	-	DLCI	0.20	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Benzo(k)fluoranthene	<0.20	-	DLCI	0.20	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Chrysene	1.04	+/-0.25	DLI	0.10	ug/L	0	22-MAY-18	23-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.050	-	DLI	0.050	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Fluoranthene	1.48	+/-0.26	DLI	0.10	ug/L	0	22-MAY-18	23-MAY-18	R4050911
Fluorene	31.7	+/-6.4	DLI	0.10	ug/L	-9.2%	22-MAY-18	23-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.20	-	DLCI	0.20	ug/L	-	22-MAY-18	23-MAY-18	R4050911
2-Methylnaphthalene	188	+/-53	DLHC	2.0	ug/L	-17.9%	22-MAY-18	23-MAY-18	R4050911
Naphthalene	52.4	+/-17	DLI	0.50	ug/L	-12%	22-MAY-18	23-MAY-18	R4050911
Phenanthrene	53.4	+/-12	DLI	0.20	ug/L	0	22-MAY-18	23-MAY-18	R4050911
Pyrene	2.93	+/-0.53	DLI	0.10	ug/L	-7.5%	22-MAY-18	23-MAY-18	R4050911
Quinoline	<0.75	-	DLCI	0.75	ug/L	-	22-MAY-18	23-MAY-18	R4050911
1-Methylnaphthalene	188	-	DLHC	2.0	ug/L	-	22-MAY-18	23-MAY-18	R4050911
Surr: Acenaphthene d10	N/A	-	SDO:RNA	N/A	%	-	22-MAY-18	23-MAY-18	R4050911
Surr: Chrysene d12	N/A	-	SDO:RNA	N/A	%	-	22-MAY-18	23-MAY-18	R4050911
Surr: Phenanthrene d10	N/A	-	SDO:RNA	N/A	%	-	22-MAY-18	23-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	0.0363	-		0.00071	mg/L	-		24-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	0.41	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	98.3	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	0.32	-		0.10	mg/L	-		24-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	1010	+/-150	DLM	20	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	1.09	+/-0.13	DLHC	0.10	mg/L	0		23-MAY-18	R4054934
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	14300	+/-810	DLHC	10	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	3.72	+/-0.44	DLHC	0.40	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	86.6	-			%	-		24-MAY-18	
TDS (Calculated)	24100	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	13200	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	60.8	+/-4.1	DLHC	0.40	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	67.2	-		0.45	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	6.47	+/-0.56	DLHC	0.20	mg/L	0		18-MAY-18	R4053131
Sulfate in Water by IC									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-7 17507180515007									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Sulfate in Water by IC									
Sulfate (SO4)	666	+/-34	DLHC	6.0	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	6.88	+/-0.07		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	34400	+/-2800		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	1460	+/-120		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	1200	+/-99		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-8 17507180515008									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0162	+/-0.0017	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.36	+/-0.04	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000538	+/-0.000096	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	483	+/-42	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.0014	+/-0.0002	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0020	-	DLDS	0.0020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.092	+/-0.011	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	404	+/-46	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	1.32	+/-0.12	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0129	+/-0.0012	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	10.1	+/-0.97	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00072	+/-0.00008	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	123	+/-13	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	3.46	+/-0.34	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0116	+/-0.0014	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-8 17507180515008									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
BTEX, Styrene and MTBE									
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	103.1	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	98.0	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	23-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	23-MAY-18	R4055366
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	87.1	-		N/A	%	-	22-MAY-18	23-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	23-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	119.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	113.4	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	127.2	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	87.1	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	3.2	+/-0.6		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-8 17507180515008									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.12	+/-0.01	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	101	-			%	-		24-MAY-18	
TDS (Calculated)	3870	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2870	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	1.02	+/-0.07	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	1.02	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2610	+/-130	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.09	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4120	+/-340		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	473	+/-41		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	387	+/-32		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-9 17507180515009									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	0.062	+/-0.007	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0094	+/-0.0010	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.76	+/-0.09	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.00196	+/-0.00035	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	428	+/-37	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0020	-	DLDS	0.0020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.405	+/-0.050	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	363	+/-41	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0535	+/-0.0049	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0310	+/-0.0028	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	8.20	+/-0.79	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00089	+/-0.00010	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-9 17507180515009									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	378	+/-40	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	1.73	+/-0.17	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	0.00012	+/-0.00002	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.075	+/-0.009	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	93.0	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	95.3	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	89.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	98.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-9 17507180515009									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Surr: Chrysene d12	91.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	104.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	92.0	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	6.4	+/-1.1		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.36	+/-0.04	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	102	-			%	-		24-MAY-18	
TDS (Calculated)	4340	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2560	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.48	+/-0.03	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.48	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	3120	+/-160	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	7.91	+/-0.08		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4730	+/-390		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	90.3	+/-8.6		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	74.0	+/-6.8		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-10 17507180515012									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	0.00080	+/-0.00011	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.00910	+/-0.00094	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.283	+/-0.035	DLDS	0.050	mg/L	0		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-10 17507180515012									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Cadmium (Cd)-Dissolved	0.000494	+/-0.000088	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	510	+/-45	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.0123	+/-0.0014	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0047	+/-0.0005	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	0.424	+/-0.056	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.0559	+/-0.0069	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	211	+/-24	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.280	+/-0.026	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00136	+/-0.00014	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0140	+/-0.0012	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	8.39	+/-0.81	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00025	+/-0.00003	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	327	+/-35	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	5.46	+/-0.53	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	0.000051	+/-0.000007	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0552	+/-0.0065	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.0251	+/-0.0029	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	119.4	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	101.2	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	86.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-10 17507180515012									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	96.1	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	93.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	101.1	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	78.7	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	<1.0	-		1.0	mg/L	-		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	2.5	+/-0.2	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.11	+/-0.01	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	107	-			%	-		24-MAY-18	
TDS (Calculated)	3420	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2140	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.11	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2040	+/-100	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	7.83	+/-0.08		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	3900	+/-320		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	661	+/-56		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	542	+/-45		5.0	mg/L	0		21-MAY-18	R4049897

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-11 17507180515013									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	0.506	+/-0.058	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0211	+/-0.0022	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.35	+/-0.04	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000677	+/-0.00012	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	468	+/-41	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	0.0011	+/-0.0002	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0040	+/-0.0004	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	0.46	+/-0.06	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Lead (Pb)-Dissolved	0.00084	+/-0.00009	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.215	+/-0.027	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	446	+/-50	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0830	+/-0.0077	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00126	+/-0.00013	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0178	+/-0.0016	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	16.5	+/-1.6	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00361	+/-0.00039	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	475	+/-51	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	4.31	+/-0.42	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	0.0079	+/-0.0025	DLDS	0.0030	mg/L	0		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0468	+/-0.0056	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.014	+/-0.002	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	107.3	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	97.4	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-11 17507180515013									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
LEPHs and HEPHs									
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	113.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	0.024	+/-0.048		0.020	ug/L	-17.9%	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	101.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	100.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	107.1	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	95.0	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	12.9	+/-2.0		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.13	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	98.1	-			%	-		24-MAY-18	
TDS (Calculated)	5190	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	3010	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	2.55	+/-0.17	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	2.55	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-11 17507180515013									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	3460	+/-180	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.11	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	5570	+/-460		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	641	+/-55		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	525	+/-44		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-12 17507180515014									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0125	+/-0.0013	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.45	+/-0.06	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000981	+/-0.00017	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	499	+/-44	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0020	-	DLDS	0.0020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.125	+/-0.015	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	365	+/-41	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.0666	+/-0.0062	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00056	+/-0.00006	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0385	+/-0.0034	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	13.9	+/-1.3	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00871	+/-0.00094	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	227	+/-24	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	4.63	+/-0.45	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0167	+/-0.0020	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.020	+/-0.002	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-12 17507180515014									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	104.4	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	102.5	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	98.2	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	95.8	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	88.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	101.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	89.5	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	8.8	+/-1.4		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-12 17507180515014									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.19	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	104	-			%	-		24-MAY-18	
TDS (Calculated)	3970	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2750	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	1.65	+/-0.11	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	1.65	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2610	+/-130	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.07	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4280	+/-350		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	505	+/-43		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	414	+/-35		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-13 17507180515015									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.010	-	DLDS	0.010	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0108	+/-0.0011	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.40	+/-0.05	DLDS	0.10	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.00203	+/-0.00036	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	497	+/-44	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Copper (Cu)-Dissolved	<0.0020	-	DLDS	0.0020	mg/L	-		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.10	-	DLDS	0.10	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.109	+/-0.014	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	354	+/-40	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.644	+/-0.060	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0352	+/-0.0031	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	12.8	+/-1.2	DLDS	0.50	mg/L	0		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-13 17507180515015									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Selenium (Se)-Dissolved	0.00169	+/-0.00018	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	234	+/-25	DLDS	0.50	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	4.32	+/-0.42	DLDS	0.0020	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.00010	-	DLDS	0.00010	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0030	-	DLDS	0.0030	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.0010	-	DLDS	0.0010	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0215	+/-0.0026	DLDS	0.00010	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.023	+/-0.003	DLDS	0.010	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	107.6	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	102.6	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	85.5	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-13 17507180515015									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Surr: Acenaphthene d10	97.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	94.4	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	101.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	85.7	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	10.1	+/-1.6		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	42.6	+/-2.4	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.18	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	98.8	-			%	-		24-MAY-18	
TDS (Calculated)	4050	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2700	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	2.39	+/-0.16	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	2.39	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2620	+/-130	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.00	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	4380	+/-360		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	566	+/-48		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	464	+/-39		5.0	mg/L	0		21-MAY-18	R4049897
L2095619-14 17507180515016									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	<0.0000050	-		0.0000050	mg/L	-		20-MAY-18	R4049747
Dissolved Mercury Filtration Location	FIELD	-				-		20-MAY-18	R4050088
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	<0.0050	-	DLDS	0.0050	mg/L	-		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.0186	+/-0.0019	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-14 17507180515016									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals in Water by CRC ICPMS									
Boron (B)-Dissolved	0.223	+/-0.028	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000276	+/-0.000049	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	539	+/-47	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.00094	+/-0.00010	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0023	+/-0.0002	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	<0.050	-	DLDS	0.050	mg/L	-		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.121	+/-0.015	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	311	+/-35	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.353	+/-0.033	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00041	+/-0.00004	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0125	+/-0.0011	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	5.17	+/-0.50	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	0.00039	+/-0.00004	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	91.8	+/-9.8	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Strontium (Sr)-Dissolved	2.27	+/-0.22	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0156	+/-0.0019	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.0061	+/-0.0008	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	105.6	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	95.0	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	91.0	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-14 17507180515016									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
PAHs - BC CSR Regs									
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	0.012	+/-0.017		0.010	ug/L	0	22-MAY-18	22-MAY-18	R4050911
Fluorene	0.036	+/-0.011		0.010	ug/L	-9.2%	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	0.192	+/-0.053		0.020	ug/L	0	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	101.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	92.4	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	103.4	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767
Surr: 3,4-Dichlorotoluene	103.8	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Miscellaneous Parameters									
Dissolved Organic Carbon	17.7	+/-2.7		1.0	mg/L	0		21-MAY-18	R4052187
Phenols (4AAP)	<0.0010	-		0.0010	mg/L	-		22-MAY-18	R4052668
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	36.2	+/-2.1	DLHC	2.5	mg/L	0		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	0.26	+/-0.03	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	102	-			%	-		24-MAY-18	
TDS (Calculated)	3490	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2630	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	0.25	+/-0.02	DLHC	0.10	mg/L	0		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	0.25	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2320	+/-120	DLHC	1.5	mg/L	0		18-MAY-18	R4053131
pH, Conductivity and Total Alkalinity									
pH	8.06	+/-0.09		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	3760	+/-310		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	372	+/-32		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	305	+/-26		5.0	mg/L	0		21-MAY-18	R4049897

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-15 17507180515010									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Dissolved Metals (BC CSR)									
Dissolved Mercury in Water by CVAAS									
Mercury (Hg)-Dissolved	0.0000220	+/-0.0000058		0.0000050	mg/L	0		26-MAY-18	R4056870
Dissolved Mercury Filtration Location	FIELD	-				-		26-MAY-18	R4056827
BTEX,VPH,LEPH & HEPH; PAH Corrected									
BTEX, Styrene and MTBE									
Benzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Ethylbenzene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Methyl-tert-Butyl Ether	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
o-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
m+p-Xylene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Styrene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Toluene	<0.00050	-		0.00050	mg/L	-		23-MAY-18	R4052709
Surr: 4-Bromofluorobenzene	115.2	-		N/A	%	-		23-MAY-18	R4052709
Surr: 1,4-Difluorobenzene	102.5	-		N/A	%	-		23-MAY-18	R4052709
EPH (C10-C19) & EPH (C19-C32)									
EPH10-19	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
EPH19-32	<250	-		250	ug/L	-	22-MAY-18	22-MAY-18	R4055366
LEPHs and HEPHs									
LEPH	<250	-		250	ug/L	-		24-MAY-18	
HEPH	<250	-		250	ug/L	-		24-MAY-18	
LEPHs and HEPHs									
Surr: 2-Bromobenzotrifluoride	81.7	-		N/A	%	-	22-MAY-18	22-MAY-18	R4055366
Prep/Analysis Dates		-				-	22-MAY-18	22-MAY-18	R4055366
PAHs - BC CSR Regs									
Acenaphthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acenaphthylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Acridine	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benz(a)anthracene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(a)pyrene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(b&j)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(g,h,i)perylene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Benzo(k)fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Chrysene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Dibenz(a,h)anthracene	<0.0050	-		0.0050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluoranthene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Fluorene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Indeno(1,2,3-c,d)pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
2-Methylnaphthalene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Naphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Phenanthrene	<0.020	-		0.020	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Pyrene	<0.010	-		0.010	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Quinoline	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
1-Methylnaphthalene	<0.050	-		0.050	ug/L	-	22-MAY-18	22-MAY-18	R4050911
Surr: Acenaphthene d10	97.9	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Chrysene d12	89.2	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Surr: Phenanthrene d10	102.1	-		N/A	%	-	22-MAY-18	22-MAY-18	R4050911
Sum of Xylene Isomer Concentrations									
Xylenes	<0.00071	-		0.00071	mg/L	-		23-MAY-18	
VHs									
Volatile Hydrocarbons (VH6-10)	<0.10	-		0.10	mg/L	-		23-MAY-18	R4052767

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-15 17507180515010									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
VHs									
Surr: 3,4-Dichlorotoluene	80.4	-		N/A	%	-		23-MAY-18	R4052767
VPH Calculation									
VPH (C6-C10)	<0.10	-		0.10	mg/L	-		23-MAY-18	
Dissolved Metals in Water by CRC ICPMS									
Dissolved Metals Filtration Location	LAB	-				-		23-MAY-18	R4053268
Aluminum (Al)-Dissolved	0.0058	+/-0.0010	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Antimony (Sb)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Arsenic (As)-Dissolved	0.00071	+/-0.00010	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Barium (Ba)-Dissolved	0.00857	+/-0.00088	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Beryllium (Be)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Boron (B)-Dissolved	0.281	+/-0.035	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Cadmium (Cd)-Dissolved	0.000239	+/-0.000043	DLDS	0.000025	mg/L	0		23-MAY-18	R4053375
Calcium (Ca)-Dissolved	518	+/-45	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Chromium (Cr)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Cobalt (Co)-Dissolved	0.0124	+/-0.0014	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Copper (Cu)-Dissolved	0.0010	+/-0.0001	DLDS	0.0010	mg/L	0		23-MAY-18	R4053375
Iron (Fe)-Dissolved	0.424	+/-0.056	DLDS	0.050	mg/L	0		23-MAY-18	R4053375
Lead (Pb)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Lithium (Li)-Dissolved	0.0544	+/-0.0067	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Magnesium (Mg)-Dissolved	215	+/-24	DLDS	0.025	mg/L	0		23-MAY-18	R4053375
Manganese (Mn)-Dissolved	0.282	+/-0.026	DLDS	0.00050	mg/L	0		23-MAY-18	R4053375
Molybdenum (Mo)-Dissolved	0.00126	+/-0.00013	DLDS	0.00025	mg/L	0		23-MAY-18	R4053375
Nickel (Ni)-Dissolved	0.0127	+/-0.0011	DLDS	0.0025	mg/L	0		23-MAY-18	R4053375
Potassium (K)-Dissolved	8.44	+/-0.81	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Selenium (Se)-Dissolved	<0.00025	-	DLDS	0.00025	mg/L	-		23-MAY-18	R4053375
Silver (Ag)-Dissolved	<0.000050	-	DLDS	0.000050	mg/L	-		23-MAY-18	R4053375
Sodium (Na)-Dissolved	334	+/-36	DLDS	0.25	mg/L	0		23-MAY-18	R4053375
Thallium (Tl)-Dissolved	0.000050	+/-0.000007	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Tin (Sn)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Titanium (Ti)-Dissolved	<0.0015	-	DLDS	0.0015	mg/L	-		23-MAY-18	R4053375
Tungsten (W)-Dissolved	<0.00050	-	DLDS	0.00050	mg/L	-		23-MAY-18	R4053375
Uranium (U)-Dissolved	0.0534	+/-0.0063	DLDS	0.000050	mg/L	0		23-MAY-18	R4053375
Vanadium (V)-Dissolved	<0.0025	-	DLDS	0.0025	mg/L	-		23-MAY-18	R4053375
Zinc (Zn)-Dissolved	0.0235	+/-0.0028	DLDS	0.0050	mg/L	0		23-MAY-18	R4053375
Routine Water Analysis									
Chloride in Water by IC									
Chloride (Cl)	<2.5	-	DLHC	2.5	mg/L	-		18-MAY-18	R4053131
Fluoride in Water by IC									
Fluoride (F)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Ion Balance Calculation									
Ion Balance	107	-			%	-		24-MAY-18	
TDS (Calculated)	3500	-			mg/L	-		24-MAY-18	
Hardness (as CaCO3)	2180	-			mg/L	-		24-MAY-18	
Nitrate in Water by IC									
Nitrate (as N)	<0.10	-	DLHC	0.10	mg/L	-		18-MAY-18	R4053131
Nitrate+Nitrite									
Nitrate and Nitrite (as N)	<0.11	-		0.11	mg/L	-		23-MAY-18	
Nitrite in Water by IC									
Nitrite (as N)	<0.050	-	DLHC	0.050	mg/L	-		18-MAY-18	R4053131
Sulfate in Water by IC									
Sulfate (SO4)	2110	+/-110	DLHC	1.5	mg/L	0		18-MAY-18	R4053131

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095619-15 17507180515010									
Sampled By: CB,MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
pH, Conductivity and Total Alkalinity									
pH	7.72	+/-0.08		0.10	pH	0		21-MAY-18	R4049897
Conductivity (EC)	3960	+/-320		2.0	uS/cm	0		21-MAY-18	R4049897
Bicarbonate (HCO3)	649	+/-55		5.0	mg/L	0		21-MAY-18	R4049897
Carbonate (CO3)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Hydroxide (OH)	<5.0	-		5.0	mg/L	-		21-MAY-18	R4049897
Alkalinity, Total (as CaCO3)	532	+/-44		5.0	mg/L	0		21-MAY-18	R4049897

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Report Comments: 31-May-2018 Addition of missing chromatogram for sample L2095619-7.

23-MAY-2018 Dissolved metals bottles for all samples contain solids. Filtration location changed from FIELD to LAB for all samples.

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Nitrate (as N)	MS-B	L2095619-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2095619-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2095619-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2095619-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2095619-1, -10, -11, -12, -13, -14, -15, -2, -3, -4, -5, -6, -7, -8, -9

Qualifiers for Sample Submission Listed:

Qualifier	Description
SFPL	DOC LAB FILTER/PRESERVE - Sample was Filtered and Preserved at the laboratory

Sample Parameter Qualifier Key:

Qualifier	Description
DLCI	Detection Limit Raised: Chromatographic Interference due to co-elution.
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
DLI	Detection Limit Raised: Dilution required to address Internal Standard response problems caused by matrix interference.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DLQ	Detection Limit raised due to co-eluting interference. GCMS qualifier ion ratio did not meet acceptance criteria.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis
SDO:RNA	Surrogate diluted out:% recovery not available

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
BTXSM-HS-MS-CL	Water	BTEX, Styrene and MTBE		EPA 8260C/5021A
The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph. BTEX Target compound concentrations are measured using mass spectrometry detection.				
C-DIS-ORG-CL	Water	Dissolved Organic Carbon		APHA 5310 B-Instrumental
This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide. The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC. TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.				
CL-IC-N-CL	Water	Chloride in Water by IC		EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.				
F-IC-N-CL	Water	Fluoride in Water by IC		EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.				
HG-D-CVAA-CL	Water	Dissolved Mercury in Water by CVAAS		APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.				
IONBALANCE-CL	Water	Ion Balance Calculation		APHA 1030E
LEPH/HEPH-CALC-CL	Water	LEPHs and HEPHs		BC MELP; CSR-Analytical Method 3
LEPH/HEPH-CL	Water	LEPHs and HEPHs		BC MELP; CSR-Analytical Method 3

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
MET-D-CCMS-CL	Water	Dissolved Metals in Water by CRC ICPMS		APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

N2N3-CALC-CL	Water	Nitrate+Nitrite		CALCULATION
NO2-IC-N-CL	Water	Nitrite in Water by IC		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

NO3-IC-N-CL	Water	Nitrate in Water by IC		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

PAH-BCCSR-CL	Water	PAHs - BC CSR Regs		EPA 3511/8270D

PAHs are extracted from water using a hexane micro-extraction technique, with analysis by GC/MS.
Container: 250 ML AMBER-EPH/PAH

PH/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity		APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.
Alkalinity measurement is based on the sample's capacity to neutralize acid
Conductivity measurement is based on the sample's capacity to convey an electric current

PHENOLS-4AAP-WT	Water	Phenol (4AAP)		EPA 9066

An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.

SO4-IC-N-CL	Water	Sulfate in Water by IC		EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

TEH-BC-CL	Water	EPH (C10-C19) & EPH (C19-C32)		BC Lab manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include PAHs and are therefore not equivalent to LEPH or HEPH.
Container: 250 ML AMBER-EPH/PAH

VH-HS-FID-CL	Water	VHs		BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

VPH-CALC-CL	Water	VPH Calculation		BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

XYLENES-CALC-CL	Water	Sum of Xylene Isomer Concentrations		CALCULATION

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

Chain of Custody Numbers:

MD-CB1805152217507

Reference Information

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.
MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.
Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2095619 Report Date: 31-MAY-18

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXSM-HS-MS-CL	**Water**							
Batch R4052709								
WG2778315-7 DUP		**L2095783-29**						
Benzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
Ethylbenzene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
Methyl-tert-Butyl Ether		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
o-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
m+p-Xylene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
Styrene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
Toluene		<0.00050	<0.00050	RPD-NA	mg/L	N/A	30	23-MAY-18
WG2778315-2 LCS								
Benzene			82.4		%		70-130	23-MAY-18
Ethylbenzene			78.5		%		70-130	23-MAY-18
Methyl-tert-Butyl Ether			105.2		%		70-130	23-MAY-18
o-Xylene			81.5		%		70-130	23-MAY-18
m+p-Xylene			84.4		%		70-130	23-MAY-18
Styrene			82.7		%		70-130	23-MAY-18
Toluene			77.2		%		70-130	23-MAY-18
WG2778315-6 LCS								
Benzene			91.2		%		70-130	23-MAY-18
Ethylbenzene			83.6		%		70-130	23-MAY-18
Methyl-tert-Butyl Ether			109.6		%		70-130	23-MAY-18
o-Xylene			88.2		%		70-130	23-MAY-18
m+p-Xylene			88.8		%		70-130	23-MAY-18
Styrene			87.5		%		70-130	23-MAY-18
Toluene			83.4		%		70-130	23-MAY-18
WG2778315-1 MB								
Benzene			<0.00050		mg/L		0.0005	23-MAY-18
Ethylbenzene			<0.00050		mg/L		0.0005	23-MAY-18
Methyl-tert-Butyl Ether			<0.00050		mg/L		0.0005	23-MAY-18
o-Xylene			<0.00050		mg/L		0.0005	23-MAY-18
m+p-Xylene			<0.00050		mg/L		0.0005	23-MAY-18
Styrene			<0.00050		mg/L		0.0005	23-MAY-18
Toluene			<0.00050		mg/L		0.0005	23-MAY-18
Surrogate: 4-Bromofluorobenzene			109.4		%		70-130	23-MAY-18
Surrogate: 1,4-Difluorobenzene			95.7		%		70-130	23-MAY-18
WG2778315-5 MB								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BTXSM-HS-MS-CL	**Water**							
Batch R4052709								
WG2778315-5 MB								
Benzene			<0.00050		mg/L		0.0005	23-MAY-18
Ethylbenzene			<0.00050		mg/L		0.0005	23-MAY-18
Methyl-tert-Butyl Ether			<0.00050		mg/L		0.0005	23-MAY-18
o-Xylene			<0.00050		mg/L		0.0005	23-MAY-18
m+p-Xylene			<0.00050		mg/L		0.0005	23-MAY-18
Styrene			<0.00050		mg/L		0.0005	23-MAY-18
Toluene			<0.00050		mg/L		0.0005	23-MAY-18
Surrogate: 4-Bromofluorobenzene			102.8		%		70-130	23-MAY-18
Surrogate: 1,4-Difluorobenzene			101.3		%		70-130	23-MAY-18
WG2778315-8 MS		**L2095783-30**						
Benzene			89.5		%		50-140	23-MAY-18
Ethylbenzene			84.6		%		50-140	23-MAY-18
Methyl-tert-Butyl Ether			110.4		%		50-140	23-MAY-18
o-Xylene			87.0		%		50-140	23-MAY-18
m+p-Xylene			90.0		%		50-140	23-MAY-18
Styrene			84.3		%		50-140	23-MAY-18
Toluene			81.4		%		50-140	23-MAY-18
C-DIS-ORG-CL	**Water**							
Batch R4052187								
WG2778288-1 MB								
Dissolved Organic Carbon			<1.0		mg/L		1	21-MAY-18
CL-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-3 DUP		**L2094929-11**						
Chloride (Cl)		32.9	33.6		mg/L	2.1	20	18-MAY-18
WG2778590-7 DUP		**L2095679-14**						
Chloride (Cl)		10.6	10.5		mg/L	0.7	20	18-MAY-18
WG2778590-2 LCS								
Chloride (Cl)			100.6		%		90-110	18-MAY-18
WG2778590-6 LCS								
Chloride (Cl)			101.5		%		90-110	18-MAY-18
WG2778590-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	18-MAY-18
WG2778590-5 MB								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
CL-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-5 MB								
Chloride (Cl)			<0.50		mg/L		0.5	18-MAY-18
WG2778590-4 MS		**L2094929-11**						
Chloride (Cl)			99.4		%		75-125	18-MAY-18
WG2778590-8 MS		**L2095679-14**						
Chloride (Cl)			109.0		%		75-125	18-MAY-18
F-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-3 DUP		**L2094929-11**						
Fluoride (F)		0.164	0.157		mg/L	4.6	20	18-MAY-18
WG2778590-2 LCS								
Fluoride (F)			105.3		%		90-110	18-MAY-18
WG2778590-6 LCS								
Fluoride (F)			108.9		%		90-110	18-MAY-18
WG2778590-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	18-MAY-18
WG2778590-5 MB								
Fluoride (F)			<0.020		mg/L		0.02	18-MAY-18
WG2778590-4 MS		**L2094929-11**						
Fluoride (F)			103.3		%		75-125	18-MAY-18
HG-D-CVAA-CL	**Water**							
Batch R4049747								
WG2777345-11 DUP		**L2096385-1**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2777345-15 DUP		**L2096724-1**						
Mercury (Hg)-Dissolved		<0.0000050	0.0000065	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2777345-3 DUP		**L2094641-1**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2777345-7 DUP		**L2095619-14**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2777345-10 LCS								
Mercury (Hg)-Dissolved			105.0		%		80-120	20-MAY-18
WG2777345-14 LCS								
Mercury (Hg)-Dissolved			100.0		%		80-120	20-MAY-18
WG2777345-2 LCS								
Mercury (Hg)-Dissolved			102.0		%		80-120	20-MAY-18
WG2777345-6 LCS								
Mercury (Hg)-Dissolved			103.0		%		80-120	20-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-CL	**Water**							
Batch R4049747								
WG2777345-1 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	20-MAY-18
WG2777345-13 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	20-MAY-18
WG2777345-5 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	20-MAY-18
WG2777345-9 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	20-MAY-18
WG2777345-12 MS		**L2096672-9**						
Mercury (Hg)-Dissolved			101.0		%		70-130	20-MAY-18
WG2777345-16 MS		**L2096724-1**						
Mercury (Hg)-Dissolved			100.0		%		70-130	20-MAY-18
WG2777345-4 MS		**L2095619-5**						
Mercury (Hg)-Dissolved			92.4		%		70-130	20-MAY-18
WG2777345-8 MS		**L2095619-14**						
Mercury (Hg)-Dissolved			94.3		%		70-130	20-MAY-18
Batch R4056870								
WG2781458-3 DUP		**L2095619-15**						
Mercury (Hg)-Dissolved		0.0000220	0.0000230		mg/L	4.4	20	26-MAY-18
WG2781458-2 LCS								
Mercury (Hg)-Dissolved			92.7		%		80-120	26-MAY-18
WG2781458-1 MB								
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	26-MAY-18
WG2781458-4 MS		**L2095619-15**						
Mercury (Hg)-Dissolved			103.0		%		70-130	26-MAY-18
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-10 DUP		**L2095619-15**						
Aluminum (Al)-Dissolved		0.0058	0.0053		mg/L	8.4	20	23-MAY-18
Antimony (Sb)-Dissolved		<0.00050	0.00014		mg/L	11	20	23-MAY-18
Arsenic (As)-Dissolved		0.00071	0.00068		mg/L	4.4	20	23-MAY-18
Barium (Ba)-Dissolved		0.00857	0.00769		mg/L	11	20	23-MAY-18
Beryllium (Be)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-18
Boron (B)-Dissolved		0.281	0.270		mg/L	4.0	20	23-MAY-18
Cadmium (Cd)-Dissolved		0.000239	0.000248		mg/L	3.9	20	23-MAY-18
Calcium (Ca)-Dissolved		518	499		mg/L	3.7	20	23-MAY-18
Chromium (Cr)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-10 DUP		**L2095619-15**						
Cobalt (Co)-Dissolved		0.0124	0.0107		mg/L	15	20	23-MAY-18
Copper (Cu)-Dissolved		0.0010	0.00075	J	mg/L	0.00026	0.002	23-MAY-18
Iron (Fe)-Dissolved		0.424	0.353		mg/L	18	20	23-MAY-18
Lead (Pb)-Dissolved		<0.00025	<0.000050	RPD-NA	mg/L	N/A	20	23-MAY-18
Lithium (Li)-Dissolved		0.0544	0.0528		mg/L	3.0	20	23-MAY-18
Magnesium (Mg)-Dissolved		215	182		mg/L	16	20	23-MAY-18
Manganese (Mn)-Dissolved		0.282	0.242		mg/L	15	20	23-MAY-18
Molybdenum (Mo)-Dissolved		0.00126	0.00122		mg/L	2.6	20	23-MAY-18
Nickel (Ni)-Dissolved		0.0127	0.0106		mg/L	18	20	23-MAY-18
Potassium (K)-Dissolved		8.44	7.61		mg/L	10	20	23-MAY-18
Selenium (Se)-Dissolved		<0.00025	0.000191		mg/L	11	20	23-MAY-18
Silver (Ag)-Dissolved		<0.000050	<0.000010	RPD-NA	mg/L	N/A	20	23-MAY-18
Sodium (Na)-Dissolved		334	296		mg/L	12	20	23-MAY-18
Strontium (Sr)-Dissolved		5.41	5.29		mg/L	2.2	20	23-MAY-18
Thallium (Tl)-Dissolved		0.000050	0.000047		mg/L	7.3	20	23-MAY-18
Tin (Sn)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-18
Titanium (Ti)-Dissolved		<0.0015	<0.00030	RPD-NA	mg/L	N/A	20	23-MAY-18
Tungsten (W)-Dissolved		<0.00050	<0.00010	RPD-NA	mg/L	N/A	20	23-MAY-18
Uranium (U)-Dissolved		0.0534	0.0547		mg/L	2.4	20	23-MAY-18
Vanadium (V)-Dissolved		<0.0025	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Zinc (Zn)-Dissolved		0.0235	0.0212		mg/L	10	20	23-MAY-18
WG2778669-11 DUP		**L2095627-6**						
Aluminum (Al)-Dissolved		0.0239	0.0248		mg/L	3.8	20	23-MAY-18
Antimony (Sb)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Arsenic (As)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Barium (Ba)-Dissolved		0.0155	0.0155		mg/L	0.0	20	23-MAY-18
Beryllium (Be)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Boron (B)-Dissolved		0.406	0.399		mg/L	1.7	20	23-MAY-18
Cadmium (Cd)-Dissolved		0.000387	0.000386		mg/L	0.2	20	23-MAY-18
Calcium (Ca)-Dissolved		539	518		mg/L	4.1	20	23-MAY-18
Chromium (Cr)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Cobalt (Co)-Dissolved		0.00372	0.00373		mg/L	0.3	20	23-MAY-18
Copper (Cu)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-11 DUP		**L2095627-6**						
Iron (Fe)-Dissolved		0.078	0.074		mg/L	4.8	20	23-MAY-18
Lead (Pb)-Dissolved		<0.00025	<0.00025	RPD-NA	mg/L	N/A	20	23-MAY-18
Lithium (Li)-Dissolved		0.0535	0.0522		mg/L	2.4	20	23-MAY-18
Magnesium (Mg)-Dissolved		311	301		mg/L	3.1	20	23-MAY-18
Manganese (Mn)-Dissolved		0.743	0.734		mg/L	1.2	20	23-MAY-18
Molybdenum (Mo)-Dissolved		0.00033	0.00030		mg/L	8.4	20	23-MAY-18
Nickel (Ni)-Dissolved		0.0196	0.0186		mg/L	4.9	20	23-MAY-18
Potassium (K)-Dissolved		10.2	10.1		mg/L	1.1	20	23-MAY-18
Selenium (Se)-Dissolved		0.00055	0.00057		mg/L	2.8	20	23-MAY-18
Silver (Ag)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	23-MAY-18
Sodium (Na)-Dissolved		236	232		mg/L	1.8	20	23-MAY-18
Strontium (Sr)-Dissolved		5.40	5.35		mg/L	0.9	20	23-MAY-18
Thallium (Tl)-Dissolved		0.000054	0.000056		mg/L	2.7	20	23-MAY-18
Tin (Sn)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Titanium (Ti)-Dissolved		<0.0015	<0.0015	RPD-NA	mg/L	N/A	20	23-MAY-18
Tungsten (W)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	23-MAY-18
Uranium (U)-Dissolved		0.0168	0.0166		mg/L	1.3	20	23-MAY-18
Vanadium (V)-Dissolved		<0.0025	<0.0025	RPD-NA	mg/L	N/A	20	23-MAY-18
Zinc (Zn)-Dissolved		0.0110	0.0114		mg/L	3.8	20	23-MAY-18
WG2778669-2 LCS								
Aluminum (Al)-Dissolved			97.6		%		80-120	23-MAY-18
Antimony (Sb)-Dissolved			95.3		%		80-120	23-MAY-18
Arsenic (As)-Dissolved			92.3		%		80-120	23-MAY-18
Barium (Ba)-Dissolved			99.0		%		80-120	23-MAY-18
Beryllium (Be)-Dissolved			99.4		%		80-120	23-MAY-18
Boron (B)-Dissolved			86.7		%		80-120	23-MAY-18
Cadmium (Cd)-Dissolved			96.9		%		80-120	23-MAY-18
Calcium (Ca)-Dissolved			97.0		%		80-120	23-MAY-18
Chromium (Cr)-Dissolved			95.6		%		80-120	23-MAY-18
Cobalt (Co)-Dissolved			95.0		%		80-120	23-MAY-18
Copper (Cu)-Dissolved			93.6		%		80-120	23-MAY-18
Iron (Fe)-Dissolved			92.5		%		80-120	23-MAY-18
Lead (Pb)-Dissolved			98.3		%		80-120	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-2 LCS								
Lithium (Li)-Dissolved			98.3		%		80-120	23-MAY-18
Magnesium (Mg)-Dissolved			102.1		%		80-120	23-MAY-18
Manganese (Mn)-Dissolved			91.4		%		80-120	23-MAY-18
Molybdenum (Mo)-Dissolved			97.9		%		80-120	23-MAY-18
Nickel (Ni)-Dissolved			93.3		%		80-120	23-MAY-18
Potassium (K)-Dissolved			99.0		%		80-120	23-MAY-18
Selenium (Se)-Dissolved			94.8		%		80-120	23-MAY-18
Silver (Ag)-Dissolved			91.0		%		80-120	23-MAY-18
Sodium (Na)-Dissolved			95.0		%		80-120	23-MAY-18
Strontium (Sr)-Dissolved			102.9		%		80-120	23-MAY-18
Thallium (Tl)-Dissolved			99.3		%		80-120	23-MAY-18
Tin (Sn)-Dissolved			96.2		%		80-120	23-MAY-18
Titanium (Ti)-Dissolved			96.5		%		80-120	23-MAY-18
Tungsten (W)-Dissolved			87.7		%		80-120	23-MAY-18
Uranium (U)-Dissolved			85.3		%		80-120	23-MAY-18
Vanadium (V)-Dissolved			96.7		%		80-120	23-MAY-18
Zinc (Zn)-Dissolved			89.5		%		80-120	23-MAY-18
WG2778669-4 LCS								
Aluminum (Al)-Dissolved			98.9		%		80-120	23-MAY-18
Antimony (Sb)-Dissolved			94.6		%		80-120	23-MAY-18
Arsenic (As)-Dissolved			94.9		%		80-120	23-MAY-18
Barium (Ba)-Dissolved			97.1		%		80-120	23-MAY-18
Beryllium (Be)-Dissolved			103.5		%		80-120	23-MAY-18
Boron (B)-Dissolved			94.2		%		80-120	23-MAY-18
Cadmium (Cd)-Dissolved			97.5		%		80-120	23-MAY-18
Calcium (Ca)-Dissolved			101.3		%		80-120	23-MAY-18
Chromium (Cr)-Dissolved			96.1		%		80-120	23-MAY-18
Cobalt (Co)-Dissolved			96.4		%		80-120	23-MAY-18
Copper (Cu)-Dissolved			96.6		%		80-120	23-MAY-18
Iron (Fe)-Dissolved			92.3		%		80-120	23-MAY-18
Lead (Pb)-Dissolved			99.1		%		80-120	23-MAY-18
Lithium (Li)-Dissolved			109.1		%		80-120	23-MAY-18
Magnesium (Mg)-Dissolved			97.2		%		80-120	23-MAY-18
Manganese (Mn)-Dissolved			94.1		%		80-120	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-4 LCS								
Molybdenum (Mo)-Dissolved			99.9		%		80-120	23-MAY-18
Nickel (Ni)-Dissolved			96.0		%		80-120	23-MAY-18
Potassium (K)-Dissolved			103.3		%		80-120	23-MAY-18
Selenium (Se)-Dissolved			93.9		%		80-120	23-MAY-18
Silver (Ag)-Dissolved			94.8		%		80-120	23-MAY-18
Sodium (Na)-Dissolved			92.6		%		80-120	23-MAY-18
Strontium (Sr)-Dissolved			104.1		%		80-120	23-MAY-18
Thallium (Tl)-Dissolved			99.7		%		80-120	23-MAY-18
Tin (Sn)-Dissolved			96.2		%		80-120	23-MAY-18
Titanium (Ti)-Dissolved			99.6		%		80-120	23-MAY-18
Tungsten (W)-Dissolved			92.9		%		80-120	23-MAY-18
Uranium (U)-Dissolved			87.3		%		80-120	23-MAY-18
Vanadium (V)-Dissolved			99.0		%		80-120	23-MAY-18
Zinc (Zn)-Dissolved			90.8		%		80-120	23-MAY-18
WG2778669-6 LCS								
Aluminum (Al)-Dissolved			100.1		%		80-120	23-MAY-18
Antimony (Sb)-Dissolved			94.7		%		80-120	23-MAY-18
Arsenic (As)-Dissolved			96.3		%		80-120	23-MAY-18
Barium (Ba)-Dissolved			97.2		%		80-120	23-MAY-18
Beryllium (Be)-Dissolved			97.3		%		80-120	23-MAY-18
Boron (B)-Dissolved			89.8		%		80-120	23-MAY-18
Cadmium (Cd)-Dissolved			99.6		%		80-120	23-MAY-18
Calcium (Ca)-Dissolved			98.8		%		80-120	23-MAY-18
Chromium (Cr)-Dissolved			94.9		%		80-120	23-MAY-18
Cobalt (Co)-Dissolved			97.2		%		80-120	23-MAY-18
Copper (Cu)-Dissolved			96.9		%		80-120	23-MAY-18
Iron (Fe)-Dissolved			91.6		%		80-120	23-MAY-18
Lead (Pb)-Dissolved			100.4		%		80-120	23-MAY-18
Lithium (Li)-Dissolved			104.5		%		80-120	23-MAY-18
Magnesium (Mg)-Dissolved			103.6		%		80-120	23-MAY-18
Manganese (Mn)-Dissolved			94.0		%		80-120	23-MAY-18
Molybdenum (Mo)-Dissolved			97.0		%		80-120	23-MAY-18
Nickel (Ni)-Dissolved			96.2		%		80-120	23-MAY-18
Potassium (K)-Dissolved			103.9		%		80-120	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-6 LCS								
Selenium (Se)-Dissolved			96.0		%		80-120	23-MAY-18
Silver (Ag)-Dissolved			91.4		%		80-120	23-MAY-18
Sodium (Na)-Dissolved			103.7		%		80-120	23-MAY-18
Strontium (Sr)-Dissolved			102.4		%		80-120	23-MAY-18
Thallium (Tl)-Dissolved			98.3		%		80-120	23-MAY-18
Tin (Sn)-Dissolved			92.3		%		80-120	23-MAY-18
Titanium (Ti)-Dissolved			96.0		%		80-120	23-MAY-18
Tungsten (W)-Dissolved			91.3		%		80-120	23-MAY-18
Uranium (U)-Dissolved			86.1		%		80-120	23-MAY-18
Vanadium (V)-Dissolved			98.8		%		80-120	23-MAY-18
Zinc (Zn)-Dissolved			90.7		%		80-120	23-MAY-18
WG2778669-9 LCS								
Aluminum (Al)-Dissolved			103.6		%		80-120	23-MAY-18
Antimony (Sb)-Dissolved			92.7		%		80-120	23-MAY-18
Arsenic (As)-Dissolved			94.4		%		80-120	23-MAY-18
Barium (Ba)-Dissolved			100.8		%		80-120	23-MAY-18
Beryllium (Be)-Dissolved			106.5		%		80-120	23-MAY-18
Boron (B)-Dissolved			94.9		%		80-120	23-MAY-18
Cadmium (Cd)-Dissolved			100.6		%		80-120	23-MAY-18
Calcium (Ca)-Dissolved			102.5		%		80-120	23-MAY-18
Chromium (Cr)-Dissolved			92.3		%		80-120	23-MAY-18
Cobalt (Co)-Dissolved			97.1		%		80-120	23-MAY-18
Copper (Cu)-Dissolved			98.2		%		80-120	23-MAY-18
Iron (Fe)-Dissolved			89.7		%		80-120	23-MAY-18
Lead (Pb)-Dissolved			99.2		%		80-120	23-MAY-18
Lithium (Li)-Dissolved			106.4		%		80-120	23-MAY-18
Magnesium (Mg)-Dissolved			102.2		%		80-120	23-MAY-18
Manganese (Mn)-Dissolved			91.9		%		80-120	23-MAY-18
Molybdenum (Mo)-Dissolved			100.3		%		80-120	23-MAY-18
Nickel (Ni)-Dissolved			96.4		%		80-120	23-MAY-18
Potassium (K)-Dissolved			102.4		%		80-120	23-MAY-18
Selenium (Se)-Dissolved			95.5		%		80-120	23-MAY-18
Silver (Ag)-Dissolved			89.2		%		80-120	23-MAY-18
Sodium (Na)-Dissolved			102.0		%		80-120	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-9 LCS								
Strontium (Sr)-Dissolved			107.4		%		80-120	23-MAY-18
Thallium (Tl)-Dissolved			97.8		%		80-120	23-MAY-18
Tin (Sn)-Dissolved			95.4		%		80-120	23-MAY-18
Titanium (Ti)-Dissolved			96.6		%		80-120	23-MAY-18
Tungsten (W)-Dissolved			89.4		%		80-120	23-MAY-18
Uranium (U)-Dissolved			85.6		%		80-120	23-MAY-18
Vanadium (V)-Dissolved			100.2		%		80-120	23-MAY-18
Zinc (Zn)-Dissolved			92.4		%		80-120	23-MAY-18
WG2778669-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	23-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-1 MB								
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
WG2778669-3 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	23-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-3 MB								
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
WG2778669-5 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	23-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
WG2778669-8 MB								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-8 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	23-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	23-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	23-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	23-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	23-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	23-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	23-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	23-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	23-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	23-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	23-MAY-18
WG2778669-12 MS		**L2094641-13**						
Aluminum (Al)-Dissolved			99.5		%		70-130	23-MAY-18
Antimony (Sb)-Dissolved			89.7		%		70-130	23-MAY-18
Arsenic (As)-Dissolved			95.8		%		70-130	23-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	**Water**							
Batch R4053375								
WG2778669-12 MS		**L2094641-13**						
Barium (Ba)-Dissolved			99.5		%		70-130	23-MAY-18
Beryllium (Be)-Dissolved			94.8		%		70-130	23-MAY-18
Boron (B)-Dissolved			83.0		%		70-130	23-MAY-18
Cadmium (Cd)-Dissolved			100.2		%		70-130	23-MAY-18
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	23-MAY-18
Chromium (Cr)-Dissolved			87.4		%		70-130	23-MAY-18
Cobalt (Co)-Dissolved			95.4		%		70-130	23-MAY-18
Copper (Cu)-Dissolved			94.0		%		70-130	23-MAY-18
Iron (Fe)-Dissolved			90.2		%		70-130	23-MAY-18
Lead (Pb)-Dissolved			87.4		%		70-130	23-MAY-18
Lithium (Li)-Dissolved			83.2		%		70-130	23-MAY-18
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	23-MAY-18
Manganese (Mn)-Dissolved			90.9		%		70-130	23-MAY-18
Molybdenum (Mo)-Dissolved			96.9		%		70-130	23-MAY-18
Nickel (Ni)-Dissolved			93.6		%		70-130	23-MAY-18
Potassium (K)-Dissolved			100.0		%		70-130	23-MAY-18
Selenium (Se)-Dissolved			100.1		%		70-130	23-MAY-18
Silver (Ag)-Dissolved			92.0		%		70-130	23-MAY-18
Sodium (Na)-Dissolved			N/A	MS-B	%		-	23-MAY-18
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	23-MAY-18
Thallium (Tl)-Dissolved			86.5		%		70-130	23-MAY-18
Tin (Sn)-Dissolved			88.2		%		70-130	23-MAY-18
Titanium (Ti)-Dissolved			92.2		%		70-130	23-MAY-18
Tungsten (W)-Dissolved			90.7		%		70-130	23-MAY-18
Uranium (U)-Dissolved			92.0		%		70-130	23-MAY-18
Vanadium (V)-Dissolved			97.3		%		70-130	23-MAY-18
Zinc (Zn)-Dissolved			88.8		%		70-130	23-MAY-18
NO2-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-3 DUP		**L2094929-11**						
Nitrite (as N)		<0.010	<0.010	RPD-NA	mg/L	N/A	20	18-MAY-18
WG2778590-2 LCS								
Nitrite (as N)			100.3		%		90-110	18-MAY-18
WG2778590-6 LCS								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-6 LCS								
Nitrite (as N)			100.5		%		90-110	18-MAY-18
WG2778590-1 MB								
Nitrite (as N)			<0.010		mg/L		0.01	18-MAY-18
WG2778590-5 MB								
Nitrite (as N)			<0.010		mg/L		0.01	18-MAY-18
WG2778590-4 MS		**L2094929-11**						
Nitrite (as N)			99.5		%		75-125	18-MAY-18
NO3-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-3 DUP		**L2094929-11**						
Nitrate (as N)		3.37	3.42		mg/L	1.6	20	18-MAY-18
WG2778590-7 DUP		**L2095679-14**						
Nitrate (as N)		2.40	2.46		mg/L	2.6	20	18-MAY-18
WG2778590-2 LCS								
Nitrate (as N)			96.6		%		90-110	18-MAY-18
WG2778590-6 LCS								
Nitrate (as N)			97.6		%		90-110	18-MAY-18
WG2778590-1 MB								
Nitrate (as N)			<0.020		mg/L		0.02	18-MAY-18
WG2778590-5 MB								
Nitrate (as N)			<0.020		mg/L		0.02	18-MAY-18
WG2778590-4 MS		**L2094929-11**						
Nitrate (as N)			N/A	MS-B	%		-	18-MAY-18
WG2778590-8 MS		**L2095679-14**						
Nitrate (as N)			101.0		%		75-125	18-MAY-18
PAH-BCCSR-CL	**Water**							
Batch R4050911								
WG2777807-1 LCS								
Acenaphthene			107		ug/L		60-130	21-MAY-18
Acenaphthylene			105		ug/L		60-130	21-MAY-18
Acridine			104		ug/L		60-130	21-MAY-18
Anthracene			99.3		ug/L		60-130	21-MAY-18
Benz(a)anthracene			97.2		ug/L		60-130	21-MAY-18
Benzo(a)pyrene			102		ug/L		60-130	21-MAY-18
Benzo(b&j)fluoranthene			103		ug/L		60-130	21-MAY-18
Benzo(g,h,i)perylene			105		ug/L		60-130	21-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Water**							
Batch R4050911								
WG2777807-1 LCS								
Benzo(k)fluoranthene			109		ug/L		60-130	21-MAY-18
Chrysene			103		ug/L		60-130	21-MAY-18
Dibenz(a,h)anthracene			103		ug/L		60-130	21-MAY-18
Fluoranthene			105		ug/L		60-130	21-MAY-18
Fluorene			107		ug/L		60-130	21-MAY-18
Indeno(1,2,3-c,d)pyrene			101		ug/L		60-130	21-MAY-18
2-Methylnaphthalene			112		ug/L		60-130	21-MAY-18
Naphthalene			111		ug/L		50-130	21-MAY-18
Phenanthrene			107		ug/L		60-130	21-MAY-18
Pyrene			99.7		ug/L		60-130	21-MAY-18
Quinoline			109		ug/L		60-130	21-MAY-18
1-Methylnaphthalene			104.9		%		50-150	21-MAY-18
WG2777807-4 LCS								
Acenaphthene			90.2		ug/L		60-130	22-MAY-18
Acenaphthylene			89.6		ug/L		60-130	22-MAY-18
Acridine			103		ug/L		60-130	22-MAY-18
Anthracene			95.8		ug/L		60-130	22-MAY-18
Benz(a)anthracene			100		ug/L		60-130	22-MAY-18
Benzo(a)pyrene			102		ug/L		60-130	22-MAY-18
Benzo(b&j)fluoranthene			96.9		ug/L		60-130	22-MAY-18
Benzo(g,h,i)perylene			84.2		ug/L		60-130	22-MAY-18
Benzo(k)fluoranthene			99.6		ug/L		60-130	22-MAY-18
Chrysene			90.0		ug/L		60-130	22-MAY-18
Dibenz(a,h)anthracene			87.0		ug/L		60-130	22-MAY-18
Fluoranthene			88.7		ug/L		60-130	22-MAY-18
Fluorene			92.5		ug/L		60-130	22-MAY-18
Indeno(1,2,3-c,d)pyrene			82.4		ug/L		60-130	22-MAY-18
2-Methylnaphthalene			90.7		ug/L		60-130	22-MAY-18
Naphthalene			99.3		ug/L		50-130	22-MAY-18
Phenanthrene			93.8		ug/L		60-130	22-MAY-18
Pyrene			94.2		ug/L		60-130	22-MAY-18
Quinoline			111		ug/L		60-130	22-MAY-18
1-Methylnaphthalene			101.3		%		50-150	22-MAY-18
WG2777807-5 LCS								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Water**							
Batch R4050911								
WG2777807-5 LCS								
Acenaphthene			103		ug/L		60-130	22-MAY-18
Acenaphthylene			102		ug/L		60-130	22-MAY-18
Acridine			110		ug/L		60-130	22-MAY-18
Anthracene			101		ug/L		60-130	22-MAY-18
Benz(a)anthracene			98.5		ug/L		60-130	22-MAY-18
Benzo(a)pyrene			97.0		ug/L		60-130	22-MAY-18
Benzo(b&j)fluoranthene			100		ug/L		60-130	22-MAY-18
Benzo(g,h,i)perylene			101		ug/L		60-130	22-MAY-18
Benzo(k)fluoranthene			104		ug/L		60-130	22-MAY-18
Chrysene			101		ug/L		60-130	22-MAY-18
Dibenz(a,h)anthracene			97.3		ug/L		60-130	22-MAY-18
Fluoranthene			102		ug/L		60-130	22-MAY-18
Fluorene			105		ug/L		60-130	22-MAY-18
Indeno(1,2,3-c,d)pyrene			84.6		ug/L		60-130	22-MAY-18
2-Methylnaphthalene			110		ug/L		60-130	22-MAY-18
Naphthalene			108		ug/L		50-130	22-MAY-18
Phenanthrene			106		ug/L		60-130	22-MAY-18
Pyrene			98.6		ug/L		60-130	22-MAY-18
Quinoline			110		ug/L		60-130	22-MAY-18
1-Methylnaphthalene			108.2		%		50-150	22-MAY-18
WG2777807-2 MB								
Acenaphthene			<0.010		ug/L		0.01	21-MAY-18
Acenaphthylene			<0.010		ug/L		0.01	21-MAY-18
Acridine			<0.010		ug/L		0.01	21-MAY-18
Anthracene			<0.010		ug/L		0.01	21-MAY-18
Benz(a)anthracene			<0.010		ug/L		0.01	21-MAY-18
Benzo(a)pyrene			<0.0050		ug/L		0.005	21-MAY-18
Benzo(b&j)fluoranthene			<0.010		ug/L		0.01	21-MAY-18
Benzo(g,h,i)perylene			<0.010		ug/L		0.01	21-MAY-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	21-MAY-18
Chrysene			<0.010		ug/L		0.01	21-MAY-18
Dibenz(a,h)anthracene			<0.0050		ug/L		0.005	21-MAY-18
Fluoranthene			<0.010		ug/L		0.01	21-MAY-18
Fluorene			<0.010		ug/L		0.01	21-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Water**							
Batch	**R4050911**							
WG2777807-2	**MB**							
Indeno(1,2,3-c,d)pyrene			<0.010		ug/L		0.01	21-MAY-18
2-Methylnaphthalene			<0.020		ug/L		0.02	21-MAY-18
Naphthalene			<0.050		ug/L		0.05	21-MAY-18
Phenanthrene			<0.020		ug/L		0.02	21-MAY-18
Pyrene			<0.010		ug/L		0.01	21-MAY-18
Quinoline			<0.050		ug/L		0.05	21-MAY-18
1-Methylnaphthalene			<0.050		ug/L		0.05	21-MAY-18
Surrogate: Acenaphthene d10			121.6		%		60-130	21-MAY-18
Surrogate: Chrysene d12			124.4		%		60-130	21-MAY-18
Surrogate: Phenanthrene d10			120.6		%		60-130	21-MAY-18
WG2777807-3	**MB**							
Acenaphthene			<0.010		ug/L		0.01	22-MAY-18
Acenaphthylene			<0.010		ug/L		0.01	22-MAY-18
Acridine			<0.010		ug/L		0.01	22-MAY-18
Anthracene			<0.010		ug/L		0.01	22-MAY-18
Benz(a)anthracene			<0.010		ug/L		0.01	22-MAY-18
Benzo(a)pyrene			<0.0050		ug/L		0.005	22-MAY-18
Benzo(b&j)fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Benzo(g,h,i)perylene			<0.010		ug/L		0.01	22-MAY-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Chrysene			<0.010		ug/L		0.01	22-MAY-18
Dibenz(a,h)anthracene			<0.0050		ug/L		0.005	22-MAY-18
Fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Fluorene			<0.010		ug/L		0.01	22-MAY-18
Indeno(1,2,3-c,d)pyrene			<0.010		ug/L		0.01	22-MAY-18
2-Methylnaphthalene			<0.020		ug/L		0.02	22-MAY-18
Naphthalene			<0.050		ug/L		0.05	22-MAY-18
Phenanthrene			<0.020		ug/L		0.02	22-MAY-18
Pyrene			<0.010		ug/L		0.01	22-MAY-18
Quinoline			<0.050		ug/L		0.05	22-MAY-18
1-Methylnaphthalene			<0.050		ug/L		0.05	22-MAY-18
Surrogate: Acenaphthene d10			99.8		%		60-130	22-MAY-18
Surrogate: Chrysene d12			98.5		%		60-130	22-MAY-18
Surrogate: Phenanthrene d10			95.8		%		60-130	22-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-BCCSR-CL	**Water**							
Batch R4050911								
WG2777807-6 MB								
Acenaphthene			<0.010		ug/L		0.01	22-MAY-18
Acenaphthylene			<0.010		ug/L		0.01	22-MAY-18
Acridine			<0.010		ug/L		0.01	22-MAY-18
Anthracene			<0.010		ug/L		0.01	22-MAY-18
Benz(a)anthracene			<0.010		ug/L		0.01	22-MAY-18
Benzo(a)pyrene			<0.0050		ug/L		0.005	22-MAY-18
Benzo(b&j)fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Benzo(g,h,i)perylene			<0.010		ug/L		0.01	22-MAY-18
Benzo(k)fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Chrysene			<0.010		ug/L		0.01	22-MAY-18
Dibenz(a,h)anthracene			<0.0050		ug/L		0.005	22-MAY-18
Fluoranthene			<0.010		ug/L		0.01	22-MAY-18
Fluorene			<0.010		ug/L		0.01	22-MAY-18
Indeno(1,2,3-c,d)pyrene			<0.010		ug/L		0.01	22-MAY-18
2-Methylnaphthalene			<0.020		ug/L		0.02	22-MAY-18
Naphthalene			<0.050		ug/L		0.05	22-MAY-18
Phenanthrene			<0.020		ug/L		0.02	22-MAY-18
Pyrene			<0.010		ug/L		0.01	22-MAY-18
Quinoline			<0.050		ug/L		0.05	22-MAY-18
1-Methylnaphthalene			<0.050		ug/L		0.05	22-MAY-18
Surrogate: Acenaphthene d10			110.1		%		60-130	22-MAY-18
Surrogate: Chrysene d12			115.1		%		60-130	22-MAY-18
Surrogate: Phenanthrene d10			108.1		%		60-130	22-MAY-18
PH/EC/ALK-CL	**Water**							
Batch R4049897								
WG2777473-6 DUP		**L2095619-6**						
pH		8.16	8.15	J	pH	0.01	0.2	21-MAY-18
Conductivity (EC)		4060	4040		uS/cm	0.5	10	21-MAY-18
Bicarbonate (HCO3)		476	467		mg/L	1.8	20	21-MAY-18
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	21-MAY-18
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	21-MAY-18
Alkalinity, Total (as CaCO3)		390	383		mg/L	1.8	20	21-MAY-18
WG2777473-9 DUP		**L2096131-1**						
pH		8.47	8.53	J	pH	0.06	0.2	21-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH/EC/ALK-CL	**Water**							
Batch R4049897								
WG2777473-9 DUP		**L2096131-1**						
Conductivity (EC)		466	473		uS/cm	1.5	10	21-MAY-18
Bicarbonate (HCO3)		200	206		mg/L	2.7	20	21-MAY-18
Carbonate (CO3)		9.2	10.4		mg/L	12	20	21-MAY-18
Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	21-MAY-18
Alkalinity, Total (as CaCO3)		179	186		mg/L	3.6	20	21-MAY-18
WG2777473-5 LCS								
Conductivity (EC)			103.9		%		90-110	21-MAY-18
Alkalinity, Total (as CaCO3)			99.1		%		85-115	21-MAY-18
WG2777473-8 LCS								
Conductivity (EC)			105.4		%		90-110	21-MAY-18
Alkalinity, Total (as CaCO3)			103.7		%		85-115	21-MAY-18
WG2777473-4 MB								
Conductivity (EC)			<2.0		uS/cm		2	21-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	21-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	21-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	21-MAY-18
Alkalinity, Total (as CaCO3)			<5.0		mg/L		5	21-MAY-18
WG2777473-7 MB								
Conductivity (EC)			<2.0		uS/cm		2	21-MAY-18
Bicarbonate (HCO3)			<5.0		mg/L		5	21-MAY-18
Carbonate (CO3)			<5.0		mg/L		5	21-MAY-18
Hydroxide (OH)			<5.0		mg/L		5	21-MAY-18
Alkalinity, Total (as CaCO3)			<5.0		mg/L		5	21-MAY-18
PHENOLS-4AAP-WT	**Water**							
Batch R4052668								
WG2777724-7 DUP		**L2095619-1**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	22-MAY-18
WG2777724-6 LCS								
Phenols (4AAP)			100.8		%		85-115	22-MAY-18
WG2777724-5 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	22-MAY-18
WG2777724-8 MS		**L2095619-1**						
Phenols (4AAP)			95.7		%		75-125	22-MAY-18

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PHENOLS-4AAP-WT	**Water**							
Batch R4054934								
WG2779441-3 DUP		**L2096672-4**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	23-MAY-18
WG2779441-2 LCS								
Phenols (4AAP)			102.0		%		85-115	23-MAY-18
WG2779441-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	23-MAY-18
WG2779441-4 MS		**L2096672-4**						
Phenols (4AAP)			102.7		%		75-125	23-MAY-18
SO4-IC-N-CL	**Water**							
Batch R4053131								
WG2778590-3 DUP		**L2094929-11**						
Sulfate (SO4)		63.2	64.6		mg/L	2.3	20	18-MAY-18
WG2778590-2 LCS								
Sulfate (SO4)			95.8		%		90-110	18-MAY-18
WG2778590-6 LCS								
Sulfate (SO4)			96.4		%		90-110	18-MAY-18
WG2778590-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-MAY-18
WG2778590-5 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-MAY-18
WG2778590-4 MS		**L2094929-11**						
Sulfate (SO4)			96.1		%		75-125	18-MAY-18
TEH-BC-CL	**Water**							
Batch R4055366								
WG2779782-2 LCS								
EPH10-19			102.5		%		70-130	22-MAY-18
EPH19-32			84.8		%		70-130	22-MAY-18
WG2779782-4 LCS								
EPH10-19			107.2		%		70-130	23-MAY-18
EPH19-32			92.2		%		70-130	23-MAY-18
WG2779782-6 LCS								
EPH10-19			103.2		%		70-130	23-MAY-18
EPH19-32			85.5		%		70-130	23-MAY-18
WG2779782-1 MB								
EPH10-19			<250		ug/L		250	22-MAY-18
EPH19-32			<250		ug/L		250	22-MAY-18
WG2779782-3 MB								

Quality Control Report

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TEH-BC-CL	**Water**							
Batch R4055366								
WG2779782-3 MB								
EPH10-19			<250		ug/L		250	23-MAY-18
EPH19-32			<250		ug/L		250	23-MAY-18
WG2779782-5 MB								
EPH10-19			<250		ug/L		250	23-MAY-18
EPH19-32			<250		ug/L		250	23-MAY-18
VH-HS-FID-CL	**Water**							
Batch R4052767								
WG2778320-6 DUP		**L2095783-29**						
Volatile Hydrocarbons (VH6-10)		<0.10	<0.10	RPD-NA	mg/L	N/A	30	23-MAY-18
WG2778320-2 LCS								
Volatile Hydrocarbons (VH6-10)			101.9		%		70-130	23-MAY-18
WG2778320-5 LCS								
Volatile Hydrocarbons (VH6-10)			74.8		%		70-130	23-MAY-18
WG2778320-1 MB								
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	23-MAY-18
Surrogate: 3,4-Dichlorotoluene			123.5		%		70-130	23-MAY-18
WG2778320-4 MB								
Volatile Hydrocarbons (VH6-10)			<0.10		mg/L		0.1	23-MAY-18
Surrogate: 3,4-Dichlorotoluene			104.9		%		70-130	23-MAY-18

Quality Control Report

Workorder: L2095619 Report Date: 31-MAY-18

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

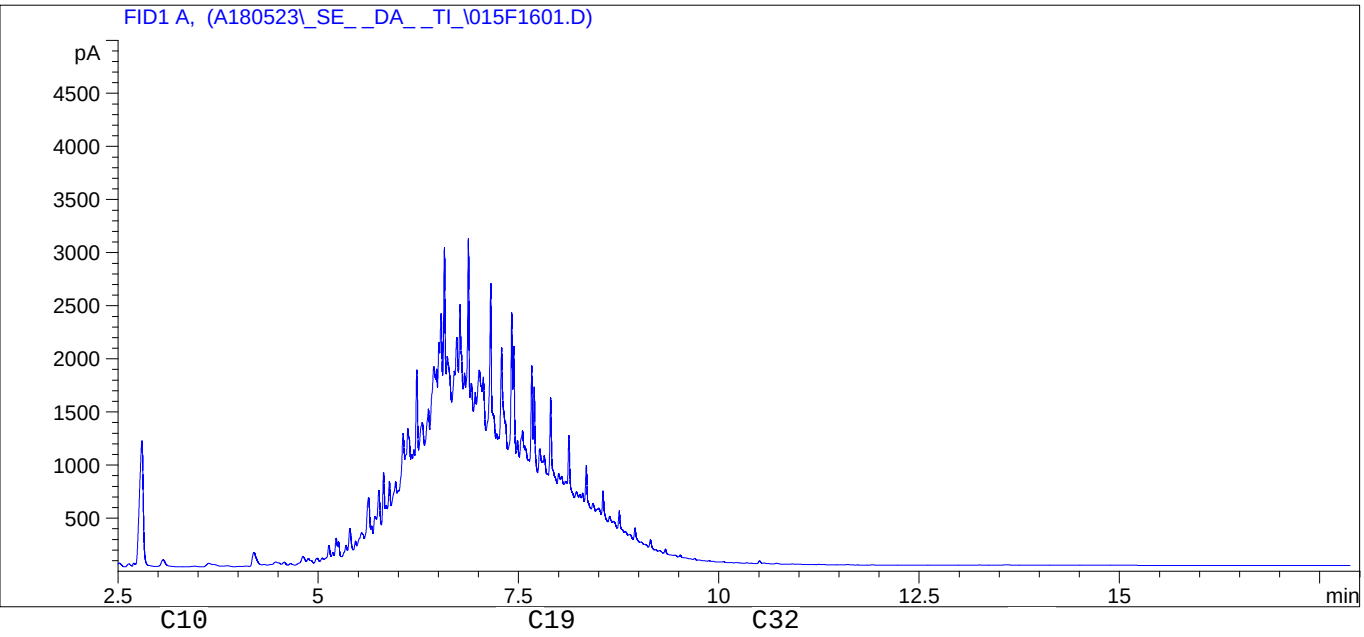
ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

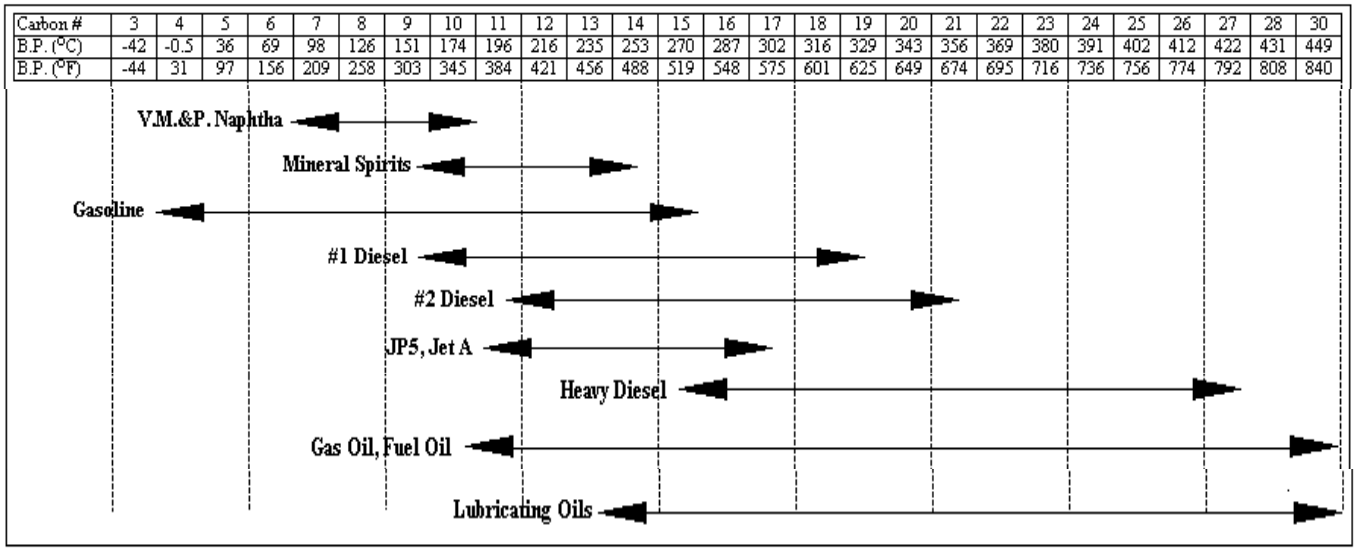
Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Client ID: 17507180515007

Sample ID: L2095619-7 V4
Injection Date: 5/22/2018
Injection Time: 11:38:03 PM
Instrument ID: HP9
Operator:



Boiling Point Distribution Range for Petroleum Based Fuel Products



Carbon #	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	30
B.P. (°C)	-42	-0.5	36	69	98	126	151	174	196	216	235	253	270	287	302	316	329	343	356	369	380	391	402	412	422	431	449
B.P. (°F)	-44	31	97	156	209	258	303	345	384	421	456	488	519	548	575	601	625	649	674	695	716	736	756	774	792	808	840

Adapted from: Drews, A.W.,ED. Manual on Hydrocarbon Analysis, 4th ed.; American Society for Testing and Materials: Philadelphia, PA., 1989: p XVIII.

Summed Peaks Report

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Final Summed Peaks Report

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Matrix Solutions Inc.
ATTN: SUE RAYNARD
200 - 150 13 Ave SW
Calgary AB T2R 0V2

Date Received: 16-MAY-18
Report Date: 27-JUN-18 12:20 (MT)
Version: FINAL

Client Phone: 403-237-0606

Certificate of Analysis

Lab Work Order #: L2095635

Project P.O. #:	305-43087-24009
Job Reference:	17507-502 SILVERBERRY LF
C of C Numbers:	md-cb1805154217507
Legal Site Desc:	Block A-08-088-20 W6M

Ryan Smyth, B.A.Sc.
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095635-1 17507180515003									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<1.5	-		2	Bq/L	-		07-JUN-18	R4070789
Gross Beta	1.0	-		0.7	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	0.03	-		0.020	Bq/L	-		07-JUN-18	R4070789
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.0027	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.054	-		0.0010	Bq/L	-		07-JUN-18	R4070789
L2095635-2 17507180515009									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<3.4	-		3	Bq/L	-		07-JUN-18	R4070789
Gross Beta	<1.5	-		2	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	0.03	-		0.020	Bq/L	-		07-JUN-18	R4070789
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.0002	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.003	-		0.0010	Bq/L	-		07-JUN-18	R4070789
L2095635-3 17507180515012									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<2.2	-		2	Bq/L	-		07-JUN-18	R4070789
Gross Beta	<1.1	-		1	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	<0.02	-		0.020	Bq/L	-		07-JUN-18	R4070789
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.035	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.67	-		0.0010	Bq/L	-		07-JUN-18	R4070789
L2095635-4 17507180515013									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<3.6	-		4	Bq/L	-		07-JUN-18	R4070789
Gross Beta	9.6	-		2	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	0.05	-		0.020	Bq/L	-		07-JUN-18	R4070789

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	MU	Qualifier*	D.L.	Units	Bias	Extracted	Analyzed	Batch
L2095635-4 17507180515013									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
NORMS									
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	0.12	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.034	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.68	-		0.0010	Bq/L	-		07-JUN-18	R4070789
L2095635-5 17507180515014									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<2.7	-		3	Bq/L	-		07-JUN-18	R4070789
Gross Beta	<1.2	-		1	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	0.04	-		0.020	Bq/L	-		07-JUN-18	R4070789
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.013	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.26	-		0.0010	Bq/L	-		07-JUN-18	R4070789
L2095635-6 17507180515015									
Sampled By: CB/MO on 15-MAY-18 @ 12:00									
Matrix: WATER									
Gross Alpha, Beta Radio Chemistry									
Gross Alpha	<2.6	-		3	Bq/L	-		07-JUN-18	R4070789
Gross Beta	<1.2	-		1	Bq/L	-		07-JUN-18	R4070789
NORMS									
Lead 210	<0.08	-		0.080	Bq/L	-		07-JUN-18	R4070789
Radium-226	0.06	-		0.020	Bq/L	-		07-JUN-18	R4070789
Radium-228	<0.2	-		0.20	Bq/L	-		07-JUN-18	R4070789
Thorium 230	<0.04	-		0.040	Bq/L	-		07-JUN-18	R4070789
Th-228	0.05	-		0.040	Bq/L	-		07-JUN-18	R4070789
U-235	0.017	-		0.000060	Bq/L	-		07-JUN-18	R4070789
U-238	0.35	-		0.0010	Bq/L	-		07-JUN-18	R4070789

* Refer to Referenced Information for Qualifiers (if any) and Methodology.

Reference Information

Test Method References:

ALS Test Code	Matrix	Test Description	Preparation Method Reference	Method Reference**
NORMS-SR	Misc.	NORMS		NORMS analysis performed by SRC
RADIO-ALPHA/BETA-SR	Water	Gross Alpha, Beta Radio Chemistry		ASTM D1943-90/D1890-90

** The indicated Method Reference is the closest nationally or internationally recognized reference for the applicable ALS test method. ALS methods may incorporate modifications from the specified reference to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
SR	Saskatchewan Research Council - Saskatoon, Saskatchewan, Can

Chain of Custody Numbers:

md-cb1805154217507

GLOSSARY OF REPORT TERMS

Surr - Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.
MU: Measurement Uncertainty. The reported uncertainty is an expanded uncertainty calculated using a coverage factor of 2 which gives a level of confidence of approximately 95%.
Bias: The reported method bias is the average long term deviation from the target value for a long term reference or control sample, measured in percent. Zero values indicate no detectable method bias.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Quality Control Report

Workorder: L2095635 Report Date: 27-JUN-18

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed

Quality Control Report

Workorder: L2095635 Report Date: 27-JUN-18

Client: Matrix Solutions Inc.
200 - 150 13 Ave SW
Calgary AB T2R 0V2
Contact: SUE RAYNARD

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

T: 306-933-6932 **F:** 306-933-7922
Toll-free: 1-800-240-8808
E: analytical@src.sk.ca

www.src.sk.ca/analytical

SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group
2559 29th St NE
Calgary, AB T1Y 7B5
Attn: Ryan Smyth

Date Samples Received: May-24-2018 Client P.O.: L2095635

All results have been reviewed and approved by a Qualified Person in accordance with the Saskatchewan Environmental Code, Corrective Action Plan Chapter, for the purposes of certifying a laboratory analysis

Results from Lab Sections 1 and 2 have been authorized by Keith Gipman, Supervisor
Results from Lab Section 3 have been authorized by Pat Moser, Supervisor
Results from Lab Sections 4 and 5 have been authorized by Vicky Snook, Supervisor
Results from Lab Section 6 have been authorized by Marion McConnell, Supervisor

---

* Test methods and data are validated by the laboratory's Quality Assurance Program.

* Routine methods follow recognized procedures from sources such as
    * Standard Methods for the Examination of Water and Wastewater APHA AWWA WEF
    * Environment Canada
    * US EPA
    * CANMET

* The results reported relate only to the test samples as provided by the client.

* Samples will be kept for 30 days after the final report is sent. Please contact the lab if you have any special requirements.

* Additional information is available upon request.

This is a final report.

SASKATCHEWAN RESEARCH COUNCIL

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SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

2559 29th St NE
Calgary, AB T1Y 7B5
Attn: Ryan Smyth

Sample #: **2018019227**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515003 L2095635-1**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.054
Uranium-235 calculated	Bq/L	0.0027
Uranium-238 (calc)	Bq/L	0.054
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<1.5
Gross beta	Bq/L	1.0±0.2
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	0.03
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	0.04
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	0.05

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

T: 306-933-6932 **F:** 306-933-7922
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SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

Sample #: **2018019228**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515009 L2095635-2**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.003
Uranium-235 calculated	Bq/L	0.0002
Uranium-238 (calc)	Bq/L	0.003
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<3.4
Gross beta	Bq/L	<1.5
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	0.03
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	<0.04
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	<0.04

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

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www.src.sk.ca/analytical

SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

Sample #: **2018019229**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515012 L2095635-3**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.67
Uranium-235 calculated	Bq/L	0.035
Uranium-238 (calc)	Bq/L	0.67
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<2.2
Gross beta	Bq/L	<1.1
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	<0.02
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	<0.04
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	<0.04

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

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SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

Sample #: **2018019230**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515013 L2095635-4**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.68
Uranium-235 calculated	Bq/L	0.034
Uranium-238 (calc)	Bq/L	0.68
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<3.6
Gross beta	Bq/L	9.6±1.6
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	0.05
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	0.12
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	0.04

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

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www.src.sk.ca/analytical

SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

Sample #: **2018019231**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515014 L2095635-5**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.26
Uranium-235 calculated	Bq/L	0.013
Uranium-238 (calc)	Bq/L	0.26
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<2.7
Gross beta	Bq/L	<1.2
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	0.04
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	<0.04
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	<0.04

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL

Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2

T: 306-933-6932 **F:** 306-933-7922
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E: analytical@src.sk.ca

www.src.sk.ca/analytical

SRC Group # 2018-6027

Jun 07, 2018

ALS Laboratory Group

Sample #: **2018019232**
Date Sampled: **May 15, 2018**
Sample Matrix: **WATER**
Description: **05/15/2018 17507180515015 L2095635-6**

Client PO #: **L2095635**
Date Received: **May 24, 2018**

Analyte	Units	Result
Lab Section 2 (ICP)		
Uranium-234 calculated	Bq/L	0.35
Uranium-235 calculated	Bq/L	0.017
Uranium-238 (calc)	Bq/L	0.35
Lab Section 4 (Radiochemistry)		
Gross alpha	Bq/L	<2.6
Gross beta	Bq/L	<1.2
Lead-210	Bq/L	<0.08
Radium-226	Bq/L	0.06
Radium-228	Bq/L	<0.2
Thorium-228	Bq/L	0.05
Thorium-230	Bq/L	<0.04
Thorium-232	Bq/L	<0.04

Symbol of "<" means "less than". This indicates that it was not detected at level stated above.

The temperature of the cooler was 12.3 °C upon receipt.

SASKATCHEWAN RESEARCH COUNCIL
Environmental Analytical Laboratories
143-111 Research Drive, Saskatoon, SK Canada S7N 3R2
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Toll-free: 1-800-240-8808
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www.src.sk.ca/analytical

Jun 07, 2018

This report was generated for samples included in SRC Group # 2018-6027

Quality Control Report

Ryan Smyth
ALS Laboratory Group
2559 29th St NE
Calgary, AB T1Y 7B5

Reference Materials and Standards:

A reference material of known concentration is used whenever possible as either a control sample or control standard and analyzed with each batch of samples. These "QC" results are used to assess the performance of the method and must be within clearly defined limits; otherwise corrective action is required.

QC Analysis	Units	Target Value	Obtained Value
Gross alpha	Bq/L	17.5	13.9
Gross alpha	Bq	0.40	0.51
Gross beta	Bq/L	11.7	10.9
Gross beta	Bq	0.35	0.23
Lead-210	Bq/L	20.9	19.0
Lead-210	Bq	1.99	1.78
Radium-226	Bq/L	21.4	17.5
Radium-226	Bq	2.13	1.99
Radium-228	Bq/L	0.38	0.41
Thorium-230	Bq/L	20.5	19.1
Thorium-232	Bq	0.203	0.186

Duplicates:

Duplicates are used to assess problems with precision and help ensure that samples within a given batch were processed appropriately. The difference between duplicates must be within strict limits, otherwise corrective action is required. Please note, the duplicate(s) in this report are duplicates analyzed within a given batch of test samples and may not be from this specific group of samples.

Duplicate Analysis	Units	Sample ID	First Result	Second Result
Gross alpha	Bq/L	19193	<0.43	<0.45
Gross alpha	Bq/L	19232	<2.6	<2.6
Gross beta	Bq/L	19193	0.19	<0.18
Gross beta	Bq/L	19232	<1.1	1.3
Lead-210	Bq/L	19231	<0.08	<0.08
Radium-228	Bq/L	19229	<0.2	<0.2
Radium-226	Bq/L	19227	0.03	0.03
Thorium-232	Bq/L	19232	<0.04	<0.04

All quality control results were within the specified limits and considered acceptable.

Roxane Ortmann - Quality Assurance Supervisor

Matrix Solutions Inc
ENVIRONMENT & ENGINEERIN

L2095635-COFC

Page: 1 of: 1

Lab Submitted To: ALS Labs
Lab Agreement No.:
Job ID:

Invoice to:	Require Report: Y: ☐ N: ☐	**Copy of Report to:**	
Company Name:	Tervita Corporation	Matrix Solutions - Environmental Data Services (EDS)	
Contact Name:	Scott Crowe	Suite 600, 214 - 11th Avenue SW	
Address:		Calgary Alberta Canada	
	Canada PC:	T2R 0K1	
Phone/Fax #:	Ph Fax.	Ph: 403-237-0606	Fax:403-263-2493

Matrix Project #:	17507 - 502
Matrix Proj. Name:	Tervita Corporation
Location:	Block A-08-088-20 W6M
Sampler's Name:	C. Bromba, M. O'Hanley

AFE #:

REGULATORY REQUIREMENTS: (check):

- ☐ Alberta Tier 1
- ☐ Alberta SWFAL
- ☐ Canadian Drinking Water
- ☐ CCME FAL
- ☐ SPIGEC
- ☐ SEQG ☒ BC CSR
- ☐ Other.

SERVICE REQUESTED: (check):

- ☐ **RUSH (Please ensure you contact the lab): Due Date:**
- ☒ REGULAR Turnaround **(mmm dd yyyy)**

REPORT DISTRIBUTION: **Always send to eds@matrix-solutions.com**

- ☐ Add'l Emails: ahum@matrix-solutions.com; ehenson@matrix-solutions.com; cbromba@matrix-solutions.com

	Sample Number (14 digits only) yr-mth-day	Sample Point Name	Depth (m)	Sample Type	Date/Time Sampled (mmm dd yyyy)	Quantity # of Jars	Bags	Vials	GROSS-ALPHA+BETA FC	PB210L-FC	RA226-GFPC-FC	RA228-FC	ISOTH-FC	ISOU-FC	Lab Sample Number	HOLD
1	17507180515003	MW92-6A		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
2	17507180515009	BH-103		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
3	17507180515012	BH-105(R)		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
4	17507180515013	15-9		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
5	17507180515014	15-10		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
6	17507180515015	15-11		Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		
7	17507180515017			Water	May 15 2018	0	0	BT2	X	X	X	X	X	X		X
8																
9																
10																
11																
12																
13																
14																
15																
	*For metals in water samples indicate if you want Total(T) or Dissolved(D) as part of 'Analysis Required'							Preserved/Filtered								

Relinquished by: Caleb Bromba **Date/Time:** Wednesday, May 16, 2018 **Received by:** Dawn **Date/Time:** May 16/18 10°C 12:00 pm

Signature: **Signature:**

COMMENTS/SPECIAL INSTRUCTIONS BT represents Bottle Limited size - please use 100 mL for each test

L2095635

APPENDIX H
Data Quality Evaluation Procedure

APPENDIX H

DATA QUALITY EVALUATION PROCEDURE

1 INTRODUCTION

The analytical data received from laboratories are used extensively to monitor soil and water quality and to make decisions and recommendations about work completed for a project. Because of this, it is necessary to ensure that the analytical data received and used by Matrix Solutions Inc. are of the highest quality. To accomplish this, a number of measures are used to assess the quality of the data. A description of these measures and subsequent criteria for evaluation are detailed in this document.

2 QUALITY CONTROL MEASURES

Quality control (QC) measures, including duplicate samples, field blanks, trip blanks, equipment blanks, and spiked samples, can provide valuable information with respect to sampling protocols and laboratory performance. An overview of these measures is provided in the following subsections.

2.1 Blind Samples

Samples collected by Matrix are each assigned a unique sample number and submitted to the laboratory as a blind sample using this number for identification to ensure that the sample location cannot be identified by the laboratory and bias the results. The sample number follows Matrix's sample naming protocol of SITE#YYMMDDXXX, where SITE# is a five-digit project code, YYMMDD is the sampling date, and XXX is a three-digit number indicating the sample number for that date. For example, 11428121006001 is the first sample collected for Project 11428 on October 6, 2012.

All samples, including QC samples, are given these blind sample numbers.

2.2 Duplicate Samples

Results obtained from duplicate sample analysis are used to monitor the reproducibility (precision) and the expected variability of the sampling method and laboratory analysis. A representative duplicate sample is obtained by collecting both field samples in duplicate, ensuring that the same sampling techniques are used and that the environmental conditions in which the samples are collected are as similar as possible. The duplicate samples are submitted as blind samples to the laboratory and are typically not given sequential unique sample numbers. A minimum of 10% of all samples is collected in duplicate.

3 EVALUATION CRITERIA FOR QUALITY CONTROL MEASURES

The Matrix data management group provides the initial review of all analytical data that are received from the laboratory. Results of the QC review are summarized electronically on the *Data Quality Checklist* that is saved along with the report of laboratory results. Evaluation criteria for the QC measures are provided in the following subsections.

3.1 Evaluation of Duplicate Sample Results

The criteria for evaluation of the field duplicate samples take into account the method detection limit (MDL), the reliable detection limit (RDL; 5 times the MDL), the absolute difference between the duplicate values, and/or the relative percent difference (RPD) calculated for each set of duplicate parameter analyses (U.S. EPA 1992, 1993; Zeiner 1994). As well, the criteria take into consideration the matrix of the sample and the concentration of the specific parameter (Zeiner 1994). Three data scenarios require different methods of evaluation.

For each set of duplicate parameter results:

Scenario 1 - if both results are <MDL

- The duplicate samples cannot be assessed using absolute difference or RPD; however, the duplicate samples show acceptable precision (both duplicate samples display no results above the MDL).

Scenario 2 - if one result is non-detected (<MDL) and the other result is positive (>MDL)

- The duplicates show acceptable precision if the positive result is ≤ 2 × RDL.

Scenario 3 - if both results are >MDL

- If both results are <RDL, then the duplicates show acceptable precision.
- If one result is <RDL and the other result is >RDL, then the duplicates show acceptable precision if the absolute difference between results is ≤ 2 × RDL.
- If both results are >RDL, then reproducibility is acceptable if the RPD is:

  a) <30% for inorganic waters
  b) <40% for solids and organics

The results of the field duplicate sample analyses are indicated on the *Data Quality Checklist,* and the results of the duplicate analyses are summarized in a project-specific QC sample results table.

The RPD is calculated as follows (Eaton et al. 1998):

$$RPD = \frac{Absolute\ difference\ \ between\ the\ two\ duplicate\ results}{Mean\ of\ \ the\ two\ duplicate\ results} \times 100$$

3.2 Evaluation of Laboratory Quality Control

The Canadian Association for Laboratory Accreditation approved environmental laboratories used by Matrix employ QC measures to ensure that the data released by the laboratory are as accurate and precise as possible. These measures include using laboratory blank samples, duplicate samples, and spiked samples, and measuring surrogate recoveries. Upon receipt of the analytical report, the data management group checks to ensure that the data have passed the laboratory's QC measures for blanks, duplicates, spikes, and surrogate recoveries. If a discrepancy is found, the laboratory is contacted

and asked to explain the discrepancy and, if necessary, a recheck is requested, or all of the samples are reanalyzed for the parameter of concern. The data management group also reviews holding time, extraction time, detection limits, and ion balances. Results of this evaluation are indicated on the *Data Quality Checklist* for each batch of samples analyzed.

3.2.1 Holding Time

Holding time is the maximum amount of time that a sample can be stored before analysis. The date that a sample was analyzed or extracted is noted on the report from the laboratory; the data management group checks to ensure that samples were analyzed or extracted within the holding time appropriate for that parameter. Data review results are indicated on the *Data Quality Checklist* for each batch of samples analyzed.

3.2.2 Extraction Time

Extraction time is the maximum amount of time that a sample can be stored before extraction, measured from the sample collection date. Extraction time for

- organics in water is 14 days
- volatile organics in soil is 7 days
- semi-volatile organics in soil is 14 days

3.2.3 Detection Limits

The data management group checks to ensure that the MDLs reported by the laboratory are adequate to meet the applicable assessment guidelines defined for the project. MDLs for a parameter should not be greater than the applicable guideline value for that parameter. If any MDLs are found to be higher than the applicable guideline, a second analysis may be requested at the discretion of the project manager.

3.2.4 Ion Balance

The data management group evaluates any ion balance reported by the laboratory to ensure that the balance is acceptable. For water and soil samples, it is Matrix's experience that ion balances between 90 and 110 for water and between 80 and 120 for soil are indicative of acceptable laboratory data quality. For soil samples, the cation/electrical conductivity (EC) ratio is also calculated on samples with EC >2 dS/m, and ratios between 9 and 15 are considered acceptable.

3.3 Historical Comparison of Data

The data management group compares laboratory results from a sample point to historical parameter levels, if available. Significant changes from historical levels are identified, and rechecks may be requested from the laboratory.

REFERENCES

Eaton A.D., Clesceri, L.S., and A.E. Greenberg. 1998. *Standard Methods for the Examination of Water and Wastewater*. 20th Edition. American Public Health Association. Washington, D.C.

United States Environmental Protection Agency (U.S. EPA). 1993. *Region III Modifications to the Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses*. Cincinnati, Ohio.

United States Environmental Protection Agency (U.S. EPA). 1992. *Region III Modifications to National Functional Guidelines for Organic Data Review multi-media, Multi-concentration*. Cincinnati, Ohio.

Zeiner S.T. 1994. "Realistic criteria for the evaluation of field duplicate sample results." Reprinted from the proceedings of *Superfund XV*. Washington, D.C. November 29-December 1, 1994.

APPENDIX I
Quality Control Sample Results

APPENDIX I

QUALITY CONTROL SAMPLE RESULTS

In accordance with Matrix Solutions Inc.'s standard practices, quality control (QC) protocols were followed for the sampling program. The QC measures included collecting and analyzing QC samples and reviewing the laboratory QC sample results. A detailed description of these QC measures is provided in the Matrix Data Quality Evaluation Procedure (Appendix H).

During the course of the sampling program, duplicate sample sets were collected from well BH-103 and BH-105(R) in 2018. All samples were analyzed for general and inorganic parameters, dissolved metals, dissolved hydrocarbons, polycyclic aromatic hydrocarbons and NORM isotopes. The results of the QC samples are presented as follows:

- Table I1 (Field Parameters)
- Table I2(General and Inorganic Parameters)
- Table I3 (Dissolved Metals)
- Table I4 (Dissolved Hydrocarbons)
- Table I5 (Polycyclic Aromatic Hydrocarbons)
- Table I6 (Isotopes Duplicates)

The reproducibility of all parameters was judged to be acceptable in 2018, with the exception of:

- Reproducibility of nitrate-nitrogen and nitrite + nitrate-nitrogen in duplicate samples collected in July.

- Reproducibility of cadmium and manganese and boron, cobalt, lithium, titanium and uranium in duplicate samples collected in July and December, respectively.

TABLE I1

Water Quality Control Sample Results - Field Parameters

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Temp °C	Field pH	Field EC µS/cm
BH-103	27-Jul-18	17507180727009	16.3	5.98	4530
BH-103	27-Jul-18	17507180727010	16.3	5.98	4530
Detection Limit (DL)			1	---	10
Reliable Detection Limit (RDL)**			5	---	50
Absolute Difference*			0	0	0
Absolute Relative Percent Difference (RPD)*			0	---	0
Duplicate Sample Results Evaluation			Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)
- pH is evaluated based on Absolute Difference (unacceptable if > 0.5)

TABLE I2

Water Quality Control Sample Results - General and Inorganic Parameters

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Lab pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L
BH-105(R)	15-May-18	17507180515010	7.72	3960	518	215	334	8.44	<2.5	2110	<0.10	<0.050	<0.10	<0.11	532	649	2180	3500
BH-105(R)	15-May-18	17507180515012	7.83	3900	510	211	327	8.39	2.5	2040	0.11	<0.050	<0.10	<0.11	542	661	2140	3420
Detection Limit (DL)			---	2	0.5	0.5	5	2.5	2.5	1.5	0.1	0.05	0.1	0.11	5	5	1	1
Reliable Detection Limit (RDL)**			---	10	2.5	2.5	25	12.5	12.5	7.5	0.5	0.25	0.5	0.55	25	25	5	5
Absolute Difference*			0.11	60	8	4	7	0.05	---	70	---	---	---	---	10	12	40	80
Absolute Relative Percent Difference (RPD)*			---	2	2	2	2	---	---	3	---	---	---	---	2	2	2	2
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Lab pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L
BH-103	27-Jul-18	17507180727009	6.96	4840	382	355	422	8.5	1.0	3230	0.34	<0.01	0.63	0.63	122	149	2420	4470
BH-103	27-Jul-18	17507180727010	7.05	4950	379	357	494	9.5	1.3	3500	0.38	<0.01	0.97	0.97	120	146	2420	4820
Detection Limit (DL)			---	5	0.3	0.2	0.6	0.6	0.6	0.6	0.01	0.01	0.02	0.02	5	5	0.5	1
Reliable Detection Limit (RDL)**			---	25	1.5	1	3	3	3	3	0.05	0.05	0.1	0.1	25	25	2.5	5
Absolute Difference*			0.09	110	3	2	72	1	0.3	270	0.04	---	0.34	0.34	2	3	0	350
Absolute Relative Percent Difference (RPD)*			---	2	1	1	16	11	---	8	11	---	43	43	2	2	0	8
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	***Poor***	***Poor***	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Lab pH	EC µS/cm	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Cl mg/L	SO_4 mg/L	F mg/L	NO_2-N mg/L	NO_3-N mg/L	NO_2+NO_3-N mg/L	T-Alkalinity mg/L	HCO_3 mg/L	Hardness mg/L	TDS mg/L
BH-105(R)	07-Dec-18	17507181207011	7.62	4120	498	211	340	7.9	2.7	2210	0.08	<0.01	0.07	0.07	734	896	2110	3710
BH-105(R)	07-Dec-18	17507181207012	7.72	4070	503	212	343	7.8	3	2190	0.08	<0.01	0.06	0.06	641	782	2130	3640
Detection Limit (DL)			---	5	0.3	0.2	0.6	0.6	0.6	0.6	0.01	0.01	0.02	0.02	5	5	0.5	1
Reliable Detection Limit (RDL)**			---	25	1.5	1	3	3	3	3	0.05	0.05	0.1	0.1	25	25	2.5	5
Absolute Difference*			0.1	50	5	1	3	0.1	0.3	20	0	---	0.01	0.01	93	114	20	70
Absolute Relative Percent Difference (RPD)*			---	1	1	0	1	1	---	1	0	---	---	---	14	14	1	2
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)
- pH is evaluated based on Absolute Difference (unacceptable if > 0.5)

TABLE I3

Water Quality Control Sample Results - Dissolved Metals

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
BH-105(R)	15-May-18	17507180515010	0.0058	<0.00050	0.00071	0.00857	<0.00050	0.281	0.000477	<0.00050	0.0124	0.001	0.424	<0.00025	0.0544	0.282	0.000022	0.00126	0.0127	<0.00025	<0.000050	---	0.00005	<0.00050	<0.0015	0.0534	<0.0025	0.0235
BH-105(R)	15-May-18	17507180515012	<0.0050	<0.00050	0.0008	0.0091	<0.00050	0.283	0.000494	<0.00050	0.0123	0.0047	0.424	<0.00025	0.0559	0.28	<0.0000050	0.00136	0.014	0.00025	<0.000050	5.46	0.000051	<0.00050	<0.0015	0.0552	<0.0025	0.0251
Detection Limit (DL)			0.005	0.0005	0.0005	0.00025	0.0005	0.05	0.000025	0.0005	0.0005	0.001	0.15	0.00025	0.005	0.025	0.000005	0.00025	0.0025	0.00025	0.00005	0.001	0.00005	0.0005	0.0015	0.00005	0.0025	0.005
Reliable Detection Limit (RDL)**			0.025	0.0025	0.0025	0.00125	0.0025	0.25	0.000125	0.0025	0.0025	0.005	0.75	0.00125	0.025	0.125	0.000025	0.00125	0.0125	0.00125	0.00025	---	0.00025	0.0025	0.0075	0.00025	0.0125	0.025
Absolute Difference*			---	---	0.00009	0.00053	---	0.002	0.000017	---	1E-04	0.0037	0	---	0.0015	0.002	---	0.0001	0.0013	---	---	---	1E-06	---	---	0.0018	---	0.0016
Absolute Relative Percent Difference (RPD)*			---	---	---	6	---	1	4	---	1	---	---	---	3	1	---	8	10	---	---	---	---	---	---	3	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	---	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
BH-103	27-Jul-18	17507180727009	0.056	<0.001	<0.001	<0.05	<0.001	1.36	0.00236	<0.001	0.0014	0.0049	<0.1	<0.0005	0.381	0.25	<0.000025	<0.001	0.043	0.0042	<0.0001	---	0.0002	---	0.002	<0.001	<0.001	0.065
BH-103	27-Jul-18	17507180727010	0.053	<0.001	<0.001	<0.05	<0.001	1.31	0.00373	<0.001	0.0023	0.0056	<0.1	<0.0005	0.41	0.75	<0.000025	<0.001	0.054	0.0034	<0.0001	---	0.0002	---	0.002	<0.001	<0.001	0.081
Detection Limit (DL)			0.004	0.001	0.001	0.05	0.001	0.01	0.00005	0.001	0.0009	0.0008	0.1	0.0005	0.001	0.005	0.000025	0.001	0.003	0.0005	0.0001	---	0.0001	---	0.001	0.001	0.001	0.004
Reliable Detection Limit (RDL)**			0.02	0.005	0.005	0.25	0.005	0.05	0.00025	0.005	0.0045	0.004	0.5	0.0025	0.005	0.025	0.000125	0.005	0.015	0.0025	0.0005	---	0.0005	---	0.005	0.005	0.005	0.02
Absolute Difference*			0.003	---	---	---	---	0.05	0.00137	---	0.0009	0.0007	---	---	0.029	0.5	---	---	0.011	0.0008	---	---	0	---	0	---	---	0.016
Absolute Relative Percent Difference (RPD)*			6	---	---	---	---	4	45	---	---	13	---	---	7	100	---	---	23	21	---	---	---	---	---	---	---	22
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	***Poor***	Good	Good	Good	Good	Good	Good	***Poor***	Good	Good	Good	Good	Good	---	Good	---	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Al mg/L	Sb mg/L	As mg/L	Ba mg/L	Be mg/L	B mg/L	Cd mg/L	Cr mg/L	Co mg/L	Cu mg/L	Fe mg/L	Pb mg/L	Li mg/L	Mn mg/L	Hg mg/L	Mo mg/L	Ni mg/L	Se mg/L	Ag mg/L	Sr mg/L	Tl mg/L	Sn mg/L	Ti mg/L	U mg/L	V mg/L	Zn mg/L
BH-105(R)	07-Dec-18	17507181207011	0.02	<0.001	<0.001	<0.05	<0.001	0.34	0.00043	<0.001	0.0101	0.001	0.3	<0.0005	0.06	0.325	<0.000025	0.001	0.012	0.001	<0.0001	5.13	<0.0001	<0.0005	0.007	0.061	<0.001	0.017
BH-105(R)	07-Dec-18	17507181207012	0.005	<0.001	<0.001	<0.05	<0.001	0.33	0.00035	<0.001	0.0101	<0.0008	0.2	<0.0005	0.064	0.33	<0.000025	0.001	0.013	0.0013	<0.0001	5.11	<0.0001	<0.0005	0.014	0.059	<0.001	0.019
Detection Limit (DL)			0.004	0.001	0.001	0.05	0.001	0.01	0.00005	0.001	0.0009	0.0008	0.1	0.0005	0.001	0.005	0.000025	0.001	0.003	0.0005	0.0001	---	0.0001	---	0.001	0.001	0.001	0.004
Reliable Detection Limit (RDL)**			0.02	0.005	0.005	0.25	0.005	0.05	0.00025	0.005	0.0045	0.004	0.5	0.0025	0.005	0.025	0.000125	0.005	0.015	0.0025	0.0005	---	0.0005	---	0.005	0.005	0.005	0.02
Absolute Difference*			0.015	---	---	---	---	0.01	0.00008	---	0	---	0.1	---	0.004	0.005	---	0	0.001	0.0003	---	---	---	---	0.007	0.002	---	0.002
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	3	21	---	0	---	---	---	6	2	---	---	---	---	---	---	---	---	67	3	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	---	Good	---	***Poor***	Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE I4

Water Quality Control Sample Results - Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19}) mg/L	HEPHw (C_{19}-C_{32}) mg/L
BH-105(R)	15-May-18	17507180515010	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25
BH-105(R)	15-May-18	17507180515012	<0.00050	<0.00050	<0.00050	<0.00071	<0.00050	<0.10	<0.10	<0.25	<0.25	<0.25	<0.25
Detection Limit (DL)			0.0005	0.0005	0.0005	0.00071	0.05	0.1	0.1	0.25	0.25	0.25	0.25
Reliable Detection Limit (RDL)**			0.0025	0.0025	0.0025	0.00355	0.25	0.5	0.5	1.25	1.25	1.25	1.25
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19}) mg/L	HEPHw (C_{19}-C_{32}) mg/L
BH-103	27-Jul-18	17507180727009	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH-103	27-Jul-18	17507180727010	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Detection Limit (DL)			0.0005	0.0003	0.0005	0.0005	0.0005	0.1	0.1	0.1	0.1	0.1	0.1
Reliable Detection Limit (RDL)**			0.0025	0.0015	0.0025	0.0025	0.0025	0.5	0.5	0.5	0.5	0.5	0.5
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Benzene mg/L	Toluene mg/L	Ethylbenzene mg/L	Xylenes mg/L	Styrene mg/L	VPHw mg/L	VHw (C_6-C_{10}) mg/L	EPHw (C_{10}-C_{19}) mg/L	EPHw (C_{19}-C_{32}) mg/L	LEPHw (C_{10}-C_{19}) mg/L	HEPHw (C_{19}-C_{32}) mg/L
BH-105(R)	07-Dec-18	17507181207011	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
BH-105(R)	07-Dec-18	17507181207012	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Detection Limit (DL)			0.0005	0.0003	0.0005	0.0005	0.0005	0.1	0.1	0.1	0.1	0.1	0.1
Reliable Detection Limit (RDL)**			0.0025	0.0015	0.0025	0.0025	0.0025	0.5	0.5	0.5	0.5	0.5	0.5
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE I5

Water Quality Control Sample Results - Polycyclic Aromatic Hydrocarbons

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
BH-105(R)	15-May-18	17507180515010	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
BH-105(R)	15-May-18	17507180515012	<0.010	<0.010	<0.010	<0.010	<0.0050	<0.010	<0.010	<0.010	<0.050	<0.020	<0.010	<0.050
Detection Limit (DL)			0.01	0.01	0.01	0.01	0.005	0.01	0.01	0.01	0.05	0.02	0.01	0.05
Reliable Detection Limit (RDL)**			0.05	0.05	0.05	0.05	0.025	0.05	0.05	0.05	0.25	0.1	0.05	0.25
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
BH-103	27-Jul-18	17507180727009	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-103	27-Jul-18	17507180727010	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
Detection Limit (DL)			0.00001	0.00005	0.00001	0.00001	7E-06	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00004
Reliable Detection Limit (RDL)**			0.00005	0.00025	0.00005	0.00005	3.5E-05	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.0002
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Sample Point	Sample Date	MSI Sample Number	Acenaphthene µg/L	Acridine µg/L	Anthracene µg/L	Benz[a]anthracene µg/L	Benzo[a]pyrene µg/L	Chrysene µg/L	Fluoranthene µg/L	Fluorene µg/L	Naphthalene µg/L	Phenanthrene µg/L	Pyrene µg/L	Quinoline µg/L
BH-105(R)	07-Dec-18	17507181207011	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
BH-105(R)	07-Dec-18	17507181207012	<0.01	<0.05	<0.010	<0.01	<0.007	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.04
Detection Limit (DL)			0.01	0.05	0.01	0.00001	0.007	0.01	0.01	0.01	0.01	0.01	0.01	0.04
Reliable Detection Limit (RDL)**			0.05	0.25	0.05	0.00005	0.035	0.05	0.05	0.05	0.05	0.05	0.05	0.2
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

TABLE I6

Water Quality Control Sample Results - Isotopes

Tervita Corporation

Block A-18-088-20 W6M

Sample Point	Sample Date	MSI Sample Number	Pb-210 bq/l	Ra-226 bq/l	Ra-228 bq/l	Gross Alpha bq/l	Gross Beta bq/l	Th-228 bq/l	Th-230 bq/l	Th-232 bq/l	U-234 bq/l	U-235 bq/l	U-238 bq/l
BH-103	27-Jul-18	17507180727009	<0.04	<0.02	<0.07	<1.5	<1.0	<0.02	<0.02	<0.02	0.003	0.0002	0.003
BH-103	27-Jul-18	17507180727010	<0.04	0.04	<0.09	<1.8	<1.3	<0.02	<0.02	<0.02	0.006	0.0003	0.006
Detection Limit (DL)			0.04	0.02	0.07	1.5	1	0.02	0.02	0.02	0.001	0.00006	0.001
Reliable Detection Limit (RDL)**			0.2	0.1	0.35	7.5	5	0.1	0.1	0.1	0.005	0.0003	0.005
Absolute Difference*			---	---	---	---	---	---	---	---	0.003	0.0001	0.003
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
BH-103	11-Sep-18	17507180911009	---	---	---	<1.8	<1.3	---	---	---	---	---	---
BH-103	11-Sep-18	17507180911010	---	---	---	5.9±2.3	2.6±0.5	---	---	---	---	---	---
Detection Limit (DL)			---	---	---	1.8	1.3	---	---	---	---	---	---
Reliable Detection Limit (RDL)**			---	---	---	9	6.5	---	---	---	---	---	---
Absolute Difference*			---	---	---	---	---	---	---	---	---	---	---
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			---	---	---	Good	Good	---	---	---	---	---	---
BH-103	07-Dec-18	17507181207009	<0.04	0.02	<0.08	3.1±1.4	2.5±0.5	<0.02	<0.02	<0.02	0.006	0.0003	0.006
BH-103	07-Dec-18	17507181207010	<0.02	0.02	<0.05	<2.5	1.7±0.4	<0.01	<0.01	<0.01	0.004	0.0002	0.004
Detection Limit (DL)			0.02	0.005	0.05	2.3	1.3	0.01	0.01	0.01	0.001	0.00006	0.001
Reliable Detection Limit (RDL)**			0.1	0.025	0.25	11.5	6.5	0.05	0.05	0.05	0.005	0.0003	0.005
Absolute Difference*			---	0	---	---	---	---	---	---	0.002	0.0001	0.002
Absolute Relative Percent Difference (RPD)*			---	---	---	---	---	---	---	---	---	---	---
Duplicate Sample Results Evaluation			Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good

Notes:

--- - not applicable

* - non-detectable concentrations are assessed at 95% of the detection limit

** - the reliable detection limit (RDL) or practical detection limit (PDL) is defined as 5 times the DL

Good - evaluation indicates acceptable reproducibility

Poor - evaluation indicates poor reproducibility

Evaluation of Duplicate Analyses:

- reproducibility is unacceptable if RPD is > 30% for inorganic waters and > 40% for soils and organics
- if RPD is not applicable (---), reproducibility is evaluated based on Absolute Difference (unacceptable if > 2 x RDL)
- if Absolute Difference is not applicable (---), reproducibility is evaluated based on the parameter concentration (unacceptable if > 2 x RDL)

Appendix 5
Hydrogeological Siting Suitability Investigation

Hydrogeological Siting Suitability Investigation
Block A, Section 8-TWP88-RGE20-W6M
British Columbia

File C1548 12 February 2002

Prepared by:
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Confidential

Copy No. 7 of 10

Distribution List:

Copies 1 to 8	Canadian Crude Separators Inc.
Copies 9 & 10	Clifton Associates Ltd.

Executive Summary

Clifton Associates Ltd. was retained by Canadian Crude Separators Inc. to conduct a preliminary hydrogeological siting suitability investigation in Block A, Section 8, Township 88, Range 20, West of Sixth Meridian. Canadian Crude Separators Inc. is proposing to construct a Secure Landfill at the Site as defined in the British Columbia Waste Management Act, Special Waste Regulations.

The objective of this investigation was to assess the suitability of the proposed Site with respect to requirements for landfill siting as required by British Columbia Ministry of Environment Water, Land and Air Protection Waste Management Act, Special Waste Regulation and other applicable documents.

Development of the regional setting was established from data collected within a 15 km radius of the Site (Study Area). The Study Area is bounded to the north by the Blueberry River, to the southwest by the Alaska Highway and to the east by the Beatton River. The Study Area lies at the western edge of the Alberta Plateau of the Great Plains of North America. The predominant landforms in the Study Area are characterized as rolling uplands and low relief platforms.

A total of 16 surface water bodies were identified within the Study Area. The nearest permanent surface water body to the Site is an unnamed creek located 1.4 km north of the Site. Drainage from the northern portion of the Study Area flows north into the Blueberry River. Drainage from the southern portion of the Study Area flows south into the Beatton River.

Based on a review of available regional geological information the Study Area is underlain by glacial till and glaciolacustrine deposits associated with glacial Lake Peace. Mathews (1978) indicated the bedrock surface is likely located within approximately 15 m of ground surface and would be consistent with the surface topography in the Study Area.

The Dunvegan Formation is the youngest bedrock unit in the Study Area. The lithology of the Dunvegan Formation consists of marine and non-marine beds ranging from clay shale to boulder conglomerate. In the Study Area, the lithology consists primarily of interbedded clay shale, mudstone and sandstone. The

Dunvegan Formation in the Study Area ranges in thickness from 50 m to 250 m thick.

Based on available hydrogeology information within the Study Area, no known major aquifers were identified. A search of British Columbia Ministry of Water, Land, and Air Protection water well records indicated 14 water wells have been drilled within approximately a 16 km radius of the Site. The closet known water well is located approximately 8.5 km south of the Site.

The hydrogeological siting suitability investigation consisted of a bore hole drilling and test pit excavation program, topographic survey of the Site, laboratory geotechnical soil testing, and groundwater analytical testing. Subsurface conditions were investigated by seven bore holes drilled between 7 m and 20 m below ground surface in November 2001. Piezometers were installed in bore holes completed at the Site to establish shallow groundwater conditions and piezometric conditions at depth.

Laboratory testing was performed to determine soil classification, in-situ water content, unified soil classification, grain size distribution and hydraulic conductivity of selected soil samples. Groundwater monitoring was conducted in December 2001 and January 2002. A total of five field response tests were conducted on selected piezometers. A groundwater sampling program was conducted on 18 January 2002.

The topography of the Site is sloped from the southeast to northwest at approximately 45 horizontal to 1 vertical (45:1). Approximately 30 m of vertical relief is present within the proposed Secure Landfill Site.

Stratigraphy at the Site generally consists of clay or silt overlying clay till to approximately 20 m below ground surface. In two bore holes, a clay and silt stratum was encountered beneath the till at a depth of between 13.8 m and 15.1 m below ground surface and extended to the depth of exploration.

The groundwater monitoring results indicate the presence of a shallow water table that varies between 1.8 m below surface to 3.8 m below existing surface. The depth to groundwater is deepest in the north central portion of the Site. Groundwater flow is directed horizontally towards the north west under a hydraulic gradient of 0.03 m/m (shallow) and 0.04 m/m (deep). Stacked piezometers located at the Site

and in the vicinity of the Site indicate a downward vertical gradient ranging between 0.4 m/m and 1.3 m/m.

The laboratory hydraulic conductivity tests conducted by Clifton Associates Ltd. on selected undisturbed samples in the clay till ranged from 6×10^{-9} cm/s to 2×10^{-8} cm/s. The hydraulic conductivity of the clay till as determined from the field response tests ranged from 3×10^{-7} cm/s to 8×10^{-7} cm/s.

The laboratory results of selected groundwater samples collected from the Site suggest that the parameter concentrations are reflective of natural background conditions and groundwater within 20 m of surface would not be considered potable for aesthetic reasons due to high sulphate, sulphide, and TDS concentrations. No discernable water quality variations were observed between groundwater samples collected from the shallow piezometers and groundwater samples collected from the deeper piezometers.

The proposed landfill Site meets all General Landfill Siting Requirements. The proposed landfill Site also meets all Secure Landfill Siting Requirements with the exception of the depth of unsaturated soil above the seasonally high water table.

Development of the proposed Site as a Landfill at or below the seasonally high water table must address the following potential issues:

- Seepage into the Landfill; and
- Potential impact of shallow groundwater in the vicinity of the proposed Landfill

Given the low hydraulic conductivity of the near surface soils (0 m to 20 m below surface) seepage rates would be low. An engineered liner and leachate collection system would mitigate any potential seepage issues related to the proposed Landfill development.

Based on the results of the Siting Suitability Investigation, near surface soils have low hydraulic conductivity and no appreciable water resource has been identified below the Site (within 20 m below surface) or within several kilometers of the proposed Site. Groundwater and potential impact migration rates would be in the order of centimeters per year based on an advective dominant flow system. Likely diffusion would be a predominant process given the low hydraulic flow system present at the Site.

Based on the Hydrogeologic Siting Suitability Investigation the Site is considered favorable for the proposed Landfill development based on the following:

- Meets all siting requirements in the British Columbia Waste Management Act, Special Waste Regulations with engineered design alternatives to mitigate the noted exceptions;
- No surface water courses and/or major drainage courses are present in the vicinity of the Site;
- The near surface soils (0 m to 20 m below surface) have a low hydraulic conductivity; and
- No appreciable groundwater resource has been identified below the Site (within 20 m of surface) or within several kilometers of the Site.

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Appendix A

AGRA Earth & Environmental Bore Hole Logs & Groundwater Elevation Letter

Appendix B

Water Well Search Results

Appendix C

Field Response Test Results

1.0 Introduction

Clifton Associates Ltd. was retained by Canadian Crude Separators Inc. to conduct a preliminary hydrogeological siting suitability investigation at km 11 of the Mile 73 (Beatton River) Road off the Alaska Highway. Canadian Crude Separators Inc. is proposing to construct a Secure Landfill at the Site.

1.1 Site Location

The Site is located approximately 45 km northwest of Fort St. John, British Columbia, in Block A, Section 8, Township 88, Range 20, West of Sixth Meridian. Block A consists of an area of approximately 72 ha (1200 m east-west and 600 m north-south) in the northwest portion of Section 8. Drawing No. 1 shows the location of the proposed landfill Site.

Located directly northwest of the Site in Block A, Section 18, Township 88, Range 20, West of Sixth Meridian is the Silverberry Environmental Waste Treatment Facility. This facility is currently owned and operated by Canadian Crude Separators Inc. The facility is operated as a Special Waste Treatment Facility.

1.2 Objective

The objective of this investigation was:

- To assess the suitability of the proposed Site with respect to requirements for landfill siting as required by British Columbia Ministry of Environment Water, Land and Air Protection Waste Management Act, Special Waste Regulation and other applicable documents.

1.3 Scope of Work

The scope of work for this investigation was:

- To review the regional geology and hydrogeology based on available information from published reports and data bases;
- To drill seven bore holes and install seven piezometers to assess soil and groundwater conditions;

- To excavate six test pits on the west half of Block A;
- To conduct geotechnical soils testing, including laboratory hydraulic conductivity testing;
- To monitor piezometric conditions and conduct in-situ hydraulic conductivity testing;
- To conduct groundwater sampling to characterize groundwater quality; and,
- To compile a report documenting the findings and provide recommendations with respect to the suitability of the Site for siting a Secure Landfill.

2.0 Project Description

Canadian Crude Separators proposes to construct a Secure Landfill at the Site as defined in the British Columbia Waste Management Act, Special Waste Regulations (01 April 1988). Details with respect to specific waste streams are provided in the Environmental Impact Assessment. Specific detailed design components of the landfill have not been established; however, initial concepts include a below grade landfill with liner and leachate collection system.

3.0 Previous Investigation

Previous investigation work conducted at the Site available for review included the following:

- AGRA Earth and Environmental Group – Preliminary Site Assessment Proposed Landfill/Landfarm Site, Mile 73, Alaska Highway, British Columbia, February 1993.

The above noted report was prepared for the existing Silverberry Environmental Waste Treatment Facility northwest of the Site. The investigation consisted of drilling bore holes and installing piezometers in Block A, Section 18-Twp88-Rge20-W6M northwest of the Site and Block A Section 17-Twp88-Rge20-W6M immediately to the north of the Site. Relevant data from the AGRA report has been summarized in this report for completeness.

AGRA provided subsequent correspondence (letter dated 31 March 1994) related to BC Environments requests in a letter dated 15 February 1994. The AGRA correspondence provided additional groundwater monitoring data and estimated hydraulic conductivity values based on the monitor well groundwater level data.

Bore hole logs from the AGRA investigation and a copy of correspondence provided to Rudiger Enterprises Ltd. dated 31 March 1994 are included in Appendix A.

4.0 Regional Setting

For discussion purposes, development of the regional setting was established from data collected within a 15 km radius of the Site (Study Area) as shown on Drawing No.1. In general the Study Area is bounded to the north by the Blueberry River, to the southwest by the Alaska Highway and to the east by the Beatton River. A BCRAIL line is located approximately in the center of the Study Area running north south. Specific data with respect to climate was collected from the nearest weather station (Ft. St. John) and Regional Geology and Hydrogeology information was collected for the Charlie Lake Region (NTS Map 94A).

Drawing No. 2 presents an aerial photograph covering the immediate vicinity around the Site (4 km radius) at a scale of 1:25,000.

4.1 Geomorphology and Topography

The Study Area lies at the western edge of the Alberta Plateau of the Great Plains of North America. The predominant landforms in the Study Area are characterized as rolling uplands and low relief platforms. Located at the north edge of the Study Area is a stream cut trench now containing the Blueberry River.

The Study Area elevation generally ranges between 650 m above sea level (ASL) to 850 m ASL. The topographic high within the Study Area is located near the Alaska Highway. Generally, the north portion of the Study Area slopes northwards towards the Blueberry River with approximately 200 m of elevation change. The southern portion of the Study Area generally slopes south towards the Peace River with approximately 100 m of elevation change.

4.2 Climate

The climate of the Peace River Region of British Columbia is characterized by Catto (1991) as continental boreal, having *cold winters (mean January temperature – 18°C), warm summers (mean July temperature 17°C), moderate annual precipitation (600 mm), and prevailing westerly winds.* Climate normals for the period 1951 to 1980 for Fort St. John, the nearest station for which records are available, indicate mean annual precipitation of 494 mm, a mean January temperature of -18°C and a mean July temperature of 16°C. Evapo-transpiration data indicates potential evaporation of 545 mm/year. The evapo-transpiration at the Landfill Site is expected to be greater than precipitation.

4.3 Surface Water Bodies

A summary of surface water bodies located within the Study Area is presented in Table 4.1. A total of 16 surface water bodies were identified within the Study Area. The nearest permanent surface water body to the Site is an unnamed creek located 1.4 km north of the Site. Creeks are located north, west and southeast of the Site and two small lakes (sloughs) are located approximately 3.4 km east of the Site. Drawing No. 2 identifies the location of surface water bodies located within 4 km of the Site.

4.4 Regional Hydrology

Drainage patterns within the Study Area are primarily dendritic. Drainage from the northern portion of the Study Area flows north within approximately 7 major creeks which ultimately discharge into the Blueberry River. Drainage from the southern portion of the Study Area flows south within approximately 2 major creeks which directly discharge into the Beatton River. Two additional major creeks collecting drainage from the south portion of the Study Area discharge into Charlie Lake which flows into the Beatton River.

Localized peat and/or bog areas have been identified within the eastern portion of the Study Area approximately 3.5 km east of the proposed Landfill Site.

The major water course within the Study Area is the Blueberry River located approximately 7 km north of the Site. The elevation of the Site is greater than 100 m

above the elevation of the Blueberry River. It is unlikely that the site is located within the Blueberry River 200 year floodplain.

4.5 Regional Geology

Regional geologic information for the Study Area was compiled from the following sources:

- Quaternary Stratigraphy and Geomorphology of Charlie Lake (94A) Map-Area, British Columbia, Mathews, W.H., 1978.
- Lower Cretaceous Fort St. John Group and Upper Cretaceous Dunvegan Formation of the Foothills and Plains of Alberta, British Columbia, District of Mackenzie and Yukon Territory. Geological Survey of Canada, Stott, D.F., 1982.
- Water well records within a 15 km radius of the Site

4.5.1 Bedrock Geology

Mathews (1978) indicates that the bedrock surface is likely within approximately 15 m of ground surface within the Study Area. The bedrock surface topography would be consistent with the surface topography in the Study Area (relatively low relief).

Based on a review of available information, relevant Bedrock Geology within the Study Area consists of the following (oldest to youngest):

Bedrock – Cretaceous

Gething Formation

Fort St. John Group – consisting of Buckinghorse, Sikanni and Sully Formations

Dunvegan Formation

Gething Formation

The Gething Formation is the oldest Cretaceous unit in the Study Area. The lithology of the Gething Formation consists of fine to coarse grained, calcareous, carbonaceous sandstone, coal, and shale.

Fort St. John Group

Buckinghorse Formation

The Buckinghorse Formation is the oldest unit in the Fort St. John Group. The lithology consists of dark grey to black shale or mudstone. Bentonite layers are found in the lower part of the formation. The upper Buckinghorse mudstones grade into the sandstones of the Sikanni Formation. The Buckinghorse Formation in the Study Area ranges from 700 m to 800 m thick.

Sikanni Formation

The Sikanni Formation may or may not be present in the Study Area. The lithology consists of three to four fine grained, finely laminated sandstone units separated by silty shale. The sandstone grades into interbedded silty sandstone, siltstone and shale in an eastward direction from the foothills. The Sikanni Formation in the Study Area ranges from 0 m to 150 m thick.

Sully Formation

The Sully Formation is the youngest unit of the Fort St. John Group. The Sully Formation consists of three members. The lithology of the basal member consists of silty, dark grey to black mudstone. The middle member consists of mudstone. The upper member consists of interbedded fine-grained sandstone, siltstone and mudstone. The mudstone is silty, and dark grey to black. The siltstone and fine-grained sandstone are laminated in 12 mm to 75 mm beds. The Sully Formation in the Study Area ranges in thickness from 250 m to 300 m.

Dunvegan Formation

The Dunvegan Formation is the youngest bedrock unit in the Study Area. The lithology of the Dunvegan Formation consists of marine and non-marine beds ranging from clay shale to boulder conglomerate. Near the Rocky Mountain

foothills, the Dunvegan Formation consists of conglomerates. In the Study Area, the lithology consists primarily of interbedded clay shale, mudstone and sandstone. The Dunvegan Formation in the Study Area ranges in thickness from 50 m to 250 m thick.

4.5.2 Glacial Geology

Based on a review of available information, Glacial Geology within the Study Area consists of the following:

Glacial – ***Quaternary***

Tills and glaciolacustrine deposits

Glacial and Glaciolacustrine Deposits

The Study Area is underlain by glacial till and glaciolacustrine deposits associated with glacial Lake Peace. In the Fort St. John area surficial materials were derived from the Cordilleran ice and Laurentide ice sheets. During the retreat of the ice sheets, Lake Peace was formed and glaciolacustrine deposits were formed in portions of the Study Area. Along the Blueberry River in the northern portion of the Study Area terrace deposits of sand, gravel, and silt are found.

The till in the Study Area is described as being *massive, clay rich, containing scattered pebbles and boulders* (Mathews, 1978). The till in the Study Area contains boulders derived from the Canadian Shield. West of the Alaska Highway, the till contains boulders derived from the Rocky Mountains.

Glaciolacustrine deposits overlay till deposits in most of the Study Area, ranging from a thin veneer in the immediate vicinity of the Site to thick deposits in low lying areas to the east and north of the Site. The glaciolacustrine deposits are predominantly clay, although silt deposits are commonly found within the clay deposits. Sand and gravel, as glaciolacustrine deposits, are generally only found along the shorelines of the former glacial lakes. The clay and silt in the deposits is varved reflecting seasonal differences in depositional patterns.

4.5.3 Geology From Water Well Records

A search of British Columbia Ministry of Water, Land, and Air Protection water well records indicated 14 water wells have been drilled within approximately a 15 km radius of the Site. Table 4.2 provides a summary of the water wells drilled in the area. Drawing No. 3 shows the location of the water well locations to the nearest section.

Based on the water well records, bedrock was typically encountered at depths of between 6 m and 18 m below ground surface within the Study Area where indicated. Based on the water well logs the bedrock material consisted of sandstone or clay shale. The surficial material in all the water wells was clay. The water well logs were not sufficient in detail to determine if the surficial clay is of glacial origin.

4.6 Regional Hydrogeology

Limited information was available with respect to hydrogeology within the Study Area. No known major aquifers were identified. Water bearing units were identified based on a review of regional geologic information and available water well records collected within the Study Area.

Bedrock Aquifers

Within the Study Area bedrock aquifers may be present in sandstone units of the Dunvegan Formation. Of the 14 water wells records collected within the Study Area only one record contained well completion data. This one well (located approximately 10 km west of the Site), is reportedly completed in sandstone, likely of the Dunvegan Formation. The sandstone in the driller's log was recorded to be from 8 m to 11 m below ground surface. Groundwater quality and quantity in the Dunvegan Formation is not known.

Sandstone of the Sikanni Formation of the Fort St. John Group, which may or may not be present within the Study Area at a depth of greater than 300 m, may contain quantities of developable groundwater. The quality of groundwater in the Sikanni Formation is not known.

Bedrock Aquitards

Clay shale and mudstone of the Dunvegan Formation and Fort St. John Group are expected to be present within the Study Area. The thickness of these aquitards is not known.

Pre-Glacial and Inter-till Aquifers

Matthews (1978) reports that pre-glacial aquifers of Saskatchewan sands and gravels and inter-till aquifers may be present within the Study Area. However, there is no indication in the available water well records collected within the Study Area of pre-glacial sands or gravels.

Surficial Drift Aquifers

Surficial drift aquifers include those sands and gravels deposited over the last glacial till by processes including meltwater and wind. Terrace deposits of silt, sand or gravel are located along the Blueberry River located in the northern portion of the Study Area. Wells in Township 113 (exact location not provided on well records), although not shown as being located along the Blueberry River, likely are withdrawing water from the terrace deposits along the Blueberry River. Shoreline features which may contain sand or gravel were identified by Mathews (1978) 5 km southwest of the Site. Mathews also identified drumlinized features within the Study Area which may contain localized sand and gravel deposits.

Surficial Drift Aquitards

The till and clayey glaciolacustrine deposits are generally expected to have low hydraulic conductivities within the Study Area. Based on water well records the surficial drift thickness in the Study Area likely ranges from 5 m to greater than 20 m.

4.7 Water Well Inventory

A search of British Columbia Ministry of Water, Land, and Air Protection water well records indicated 14 water wells have been drilled within approximately a 15 km radius of the Site. No field verification survey was undertaken to determine how many of the wells are actively being used for water withdrawal.

Table 4.2 provides a summary of the water wells drilled in the area. Drawing No. 3 shows the location of the water well locations to the nearest section. The closet known water well is located approximately 8.5 km south of the Site. All other water wells of record are located greater than 10 km from the Site. Appendix B contains a copy of the water well search results.

4.8 Regional Physical/Environmental Constraints

Based on a review of aerial photographs, no slope failures were identified within 100 m of the Site. No national, provincial, regional or municipal parks, wildlife management areas, sanctuary, ecological reserves, etc. were identified within the Study Area. The only community within the Study Area is the Blueberry River First Nations Reserve, located approximately 7.5 km north of the Site.

The Study Area is located in an region with a peak horizontal ground acceleration of less than 4 Percent of gravity with a probability of exceedance of 10 Percent in 50 years based on the National Building Code of Canada. Based on the geologic summary of the *Quaternary Stratigraphy and Geomorphology of Charlie Lake (94A) Map-Area, British Columbia, Paper 76-20* prepared by Mathew (1978), no Holocene faults were identified in the Study Area.

5.0 Site Investigation

5.1 Purpose

The purpose of the investigation was to establish existing subsurface conditions at the Site, with respect to hydrogeology, soil properties, and groundwater chemistry. The investigation consisted of a bore hole drilling and test pit excavation program, topographic survey of the Site, laboratory geotechnical soil testing, and groundwater analytical testing.

5.2 Bore Hole Drilling and Test Pit Excavation

Subsurface conditions were investigated by seven bore holes drilled between 26 November and 28 November 2001 and by six test pits excavated on 29 November 2001 at the locations shown on Drawing No. 4. The bore hole locations were selected to provide a reasonable representation of the subsurface conditions across the proposed Secure Landfill Site (Block A Section 8-Twp88-

Rge20-W6M). The test pit program was focused on the western portion of the proposed Site as initial development is planned in this area.

Bore holes were drilled with a B-53 truck mounted drill rig using 150 mm diameter solid stem continuous flight auger. Bore hole depths ranged from 7.3 m to 21.0 m below surface. Test pits were excavated with a Cat 225 LC tracked excavator. Test pit depths ranged from 4.6 m to 5.5 m below surface. Representative disturbed and undisturbed samples were recovered for laboratory analysis. Samples were recovered at maximum 1.5 m intervals or at changes in stratigraphy.

5.3 Piezometer and Monitor Well Construction Details

Piezometers were installed in bore holes completed at the Site to establish shallow groundwater conditions and piezometric conditions at depth. Shallow (BH101 and BH107) and Deep piezometers (BH102, BH105 and BH106) were installed at depths of approximately 7 m to 20 m below surface. Shallow monitor wells (BH103 and BH104) were installed at depths of approximately 7 m to 7.5 m below surface.

Standpipe piezometers were constructed with 50 mm diameter Schedule 40 PVC pipe and a machine slotted PVC (No. 10 slot) screen. The machine slotted screen sections varied from 1.5 m to 3 m in length. The piezometer screen was surrounded with silica sand, sealed with bentonite and backfilled to surface with a mixture of sand and bentonite chips. Above ground protective steel casings were placed over the completed piezometers.

Monitor wells were constructed with 50 mm diameter Schedule 40 PVC pipe with a machine slotted PVC (No. 10 slot) screen. The machine slotted screen sections varied from 5.5 m to 6 m in length. The monitor well screen was surrounded with silica sand, sealed with bentonite and backfilled to surface with a mixture of sand and bentonite chips. Above ground protective steel casings were placed over the completed monitor wells.

5.4 Laboratory Testing Program

Soil

Laboratory testing was performed to determine soil classification, in-situ water content, unified soil classification, grain size distribution and hydraulic conductivity

of selected soil samples. Two bulk samples were tested to determine standard Proctor density and hydraulic conductivity. Observations made during the field investigation, visual descriptions of the soils, and the results of laboratory tests are presented in the Bore Hole Logs and the Summary of Sampling and Laboratory Test Data appended to this report.

A total of five hydraulic conductivity tests were conducted on selected undisturbed soil samples. All five selected soil samples (IH12, IH18, IH47, IH62 and IH74) were tested in the Clifton Associates Ltd. laboratory using a falling head test methodology. The undisturbed soil samples were trimmed and placed in consolidation rings under a seating pressure of approximately 12 kPa. The falling head tests were run using an average hydraulic gradient ranging from 2.5 to 7.2. Similarly, two bulk (composite samples) soil samples were tested for hydraulic conductivity after the samples were compacted to approximately 95 Percent standard proctor density and 2 Percent above optimum moisture content. The hydraulic conductivity of the two bulk samples were determined using the falling head test methodology.

A duplicate sample (IH12) was submitted to EBA Engineering Consultants Ltd. for determination of the hydraulic conductivity using a constant head test methodology. The constant head test on sample IH12 was conducted under a gradient of 55.

Groundwater

A total of six groundwater samples were obtained from the piezometers and monitor wells (three samples representing the shallow groundwater from BH101, BH103, and BH107; and three samples representing the deep groundwater from BH102, BH105, and BH106) and submitted to Enviro-Test Laboratories in Edmonton, Alberta. Analyses were conducted to characterize the shallow and deeper groundwater chemical concentrations with respect to hydrocarbons, major ions, metals, inorganics, phenols, total organic carbon, and nutrients.

5.5 Groundwater Monitoring and Sampling Program

Groundwater monitoring was conducted on 10 December 2001, 17 December 2001, and 12 January 2002. The monitoring program consisted of measuring the depth to groundwater surface using an electronic water level indicator.

Groundwater samples were obtained from all piezometers and monitor wells installed as part of this investigation, with the exception of monitor well BH104. BH104 was dry at the time of groundwater sampling. The groundwater sampling program was conducted on 18 January 2002.

All groundwater samples were collected at the completion of the field rising head tests with the exception of the sample collected from BH107. Prior to collecting the groundwater samples, each well had at least three well volumes of groundwater removed or the well was bailed dry.

A groundwater sample was collected from each well using a dedicated disposable plastic bailer. The samples were placed into appropriate bottles supplied by the laboratory. Where required, preservatives were added to the sample. The sample bottles were stored and transported in coolers containing ice.

5.6 Field Hydraulic Response Tests

Field hydraulic response tests were conducted to estimate the in-situ hydraulic conductivities of the subsurface soils at the Site. The field response tests were conducted on BH101, BH102, BH103, BH105 and BH106.

The hydraulic response tests were initiated on 12 January 2002 and completed on 18 January 2002. The tests were conducted by bailing water from the well and recording the recovery at regular intervals over the six day time period. The data recorded was assessed according to the Bower and Rice methodology for determination of hydraulic conductivity.

The methodology used in conducting the hydraulic response tests, the calculations used, and assumptions made in estimating the hydraulic conductivities from the field data are provided in Appendix C.

5.7 Survey

A topographic survey was conducted by McElhanney Associates Ltd. of Fort St. John and included the following; the Site, Block A, Section 18-Twp88-Rge20-W6M north west of the Site, Block A Section 17-Twp88-Rge20-W6M north of the Site and Block B, Section 7-Twp88-Rge20-W6M directly west of the Site. Survey of bore hole and test pit locations were included as part of the work conducted by

McElhanney with elevations determined relative to geodetic datum and locations determined relative to the UTM co-ordinate system.

6.0 Site Investigation Results

6.1 Topography

The topography of the Site is sloped from the southeast to northwest at approximately 45 horizontal to 1 vertical (45:1). Approximately 30 m of vertical relief is present within the proposed Secure Landfill Site.

6.2 Surface Drainage

The Site is cleared with the surrounding land wooded. Drainage from the Site is in a northwesterly direction towards unnamed creeks located 1.4 km north and 1.4 km west of the Site. These creeks flow into Blueberry River located approximately 6.3 km north of the Site.

A surface water divide running in a northeast – southwest direction is located within 200 m of the southeast corner of the proposed Landfill Site. Drainage on the south side of the divide is southward towards Stoddart, St. John and Roseland Creeks. Drawing No. 2 shows the location of nearby surface drainage features.

6.3 Stratigraphy

Drawing No. 4 shows the location of representative stratigraphic cross sections and the location of the bore holes including the bore holes drilled in 1992 as part of the AGRA investigation. Drawing Nos. 5 and 6 present stratigraphic cross sections A-A' and B-B' respectively.

Stratigraphy at the Site generally consists of clay or silt overlying clay till consistent with the previous investigation conducted in the vicinity of the Site. The surficial clay or silt was absent in bore holes BH102, BH105, and BH106 and in all the test pits. In bore hole BH105 a clay and silt stratum was encountered beneath the till at a depth of 13.8 m below ground surface and extended to the depth of exploration at 21.0 m. In bore hole BH106 a clay stratum was encountered beneath the till at a depth of 15.1 m below ground surface, extending to the depth of exploration at 19.2 m. Based on the bore holes drilled on the proposed Site, bedrock of the

Dunvegan Formation was not encountered. However in the 1992 investigation conducted by AGRA, BH92-2 indicated clay stone at a depth of 3.5 m. Bore hole BH107 drilled in the vicinity of BH92-2 did not conclusively identify bedrock material.

Surficial Clay or Silt

The surficial clay and silt ranged in thickness from 0.4 m to 1.0 m when encountered. The surficial deposits were primarily clay in the western portion of the Site (BH101 and BH104) coinciding with areas of lower elevations. The surficial deposits were primarily silt in the eastern portion of the Site (BH103 and BH107) coinciding with areas of higher elevation. The surficial clay encountered at the western portion of the Site contained a trace of silt and a trace of sand. It was moist and firm to stiff in consistency. The surficial silt encountered at the eastern portion of the Site contains some sand and a trace of clay. The silt was dry to moist.

Clay Till

Clay till was encountered in all bore holes and test pits from surface (except where surficial clay and silt was encountered) and extended to the maximum depth of the investigation (approximately 20 m) in all bore holes and test pits except for BH105 and BH106. The till was silty, with some sand and a trace of gravel. It was moist and firm to stiff in consistency. The till varied in color from dark greyish brown to light grey. The till exhibited signs of oxidation at all depths encountered. The till was jointed. Shale, sandstone and coal inclusions were commonly identified in the till. Based on the bore holes completed at the Site no significant inter till sand and/or gravel lenses were identified in the till stratum. Fine grained sand lenses and silt lenses were sporadically encountered within the till; however, the presence of these lenses appeared to be localized and not extensive.

Unified soil classification tests, sieves and/or hydrometers were conducted on eight samples of the till stratum. Table 6.1 presents a summary of the grain size analysis conducted on the eight selected samples of till. The till had a minimum of 76 Percent fines, a maximum of 99 Percent fines, and an average of 85 Percent fines. Samples on which hydrometers were performed indicated 31 Percent to 78 Percent clay sized particles and 21 Percent to 47 Percent silt sized particles. The minimum sand content in the till was 1 Percent, the maximum was 19 Percent and the average

was 13 Percent. The till had a trace of gravel with gravel content ranging from 0 Percent to 12 Percent and an average of 3 Percent. The till has low plasticity, with a minimum plastic limit of 16 Percent and maximum of 27 Percent, and an average of 19 Percent and a minimum liquid limit of 27 Percent, a maximum of 51 Percent and an average of 35 Percent.

Clay and Silt

In bore hole BH105, from 13.7 m to the depth of exploration (21.0 m below surface) a clay and silt stratum was encountered. A Unified Soil Classification test was performed on one sample of the clay and silt. The results indicated a low plasticity clay with plastic limit of 21 Percent, liquid limit of 46 Percent and a plasticity index of 24 Percent. The clay sample was composed of 1 Percent sand, 42 Percent silt and 57 Percent clay sized particles.

In bore hole BH106 from 15.1 m to the depth of exploration (19.2 m below surface), a clay stratum was encountered. A Unified Soil Classification test was performed on one sample of the clay stratum. The results indicated a low plasticity clay with plastic limit of 14 Percent, liquid limit of 23 Percent and a plasticity index of 9 Percent. The clay sample was composed of 35 Percent sand, 38 Percent silt and 27 Percent clay sized particles.

Based on visual and laboratory testing results the clay and silt layers identified at the bottom of BH105 and BH106 are not considered to be bedrock.

6.4 Piezometric Conditions

Groundwater Levels

Groundwater levels measured in all wells at the Site and in the vicinity of the Site are summarized in Table 6.2. Groundwater elevations are also shown in Section A-A' and B-B' in Drawings No. 5 and 6. Drawing No. 7 shows a contour map of depth to groundwater below existing ground surface.

The groundwater monitoring results indicate the presence of a shallow water table that varies between 1.8 m below surface to 3.8 m below existing surface. The depth to groundwater is deepest in the north central portion of the Site. Bore hole BH104

completed in the northwest corner of the Site to a depth of 7 m was dry during monitoring conducted in December 2001 and January 2002.

Direction of Flow and Gradients

Drawing Nos. 8 and 9 indicate groundwater elevation contours of the shallow piezometric conditions (7 m below surface) and deep piezometric conditions (20 m below surface), respectively.

Groundwater flow is directed horizontally towards the north west under a hydraulic gradient of 0.03 m/m (shallow) and 0.04 m/m (deep). Stacked piezometers (BH101 and BH102) located in the south west corner of the Site indicated a downward vertical gradient of 1.3 m/m. Stacked piezometers completed in 1992 by AGRA north (92-8) and west (92-4) of the Site indicate downward vertical gradients of 0.7 m/m and 0.4 m/m, respectively.

6.5 Hydraulic Conductivity Testing

Laboratory

Table 6.3 below provides a summary of the laboratory hydraulic conductivity results completed on selected soil samples collected from the Site. Table 6.3 also presents the results of the laboratory hydraulic conductivity testing results from the AGRA investigation conducted in 1992 north west of the Site.

The laboratory hydraulic conductivity tests conducted by Clifton Associates Ltd. on selected undisturbed samples in the clay till ranged from 6×10^{-9} cm/s to 2×10^{-8} cm/s. These values are similar to the results obtained in the 1992 AGRA investigation which indicated the laboratory hydraulic conductivity of selected till samples ranged from 4×10^{-9} cm/s to 6×10^{-9} cm/s. The average laboratory hydraulic conductivity from all till samples tested is 7×10^{-9} cm/s. The laboratory hydraulic conductivity of the clay and silt sample collected from BH105 was 3×10^{-7} cm/s.

Two remolded bulk (composite samples) soil samples were compacted to approximately 95 Percent standard proctor density and 2 Percent above optimum moisture content. The remolded samples, considered to be representative of

potential liner construction material, had hydraulic conductivity values of 9×10^{-9} cm/s to 1×10^{-8} cm/s from TP201 and TP203, respectively.

Field Response Tests

Table 6.4 provides a summary of the field hydraulic conductivity results. Appendix C resents the response test plots. The field hydraulic conductivity testing was completed only once for each well. To verify the field response test results presented below, two additional response tests should be conducted on each well.

The hydraulic conductivity of the clay till as determined from the field response tests ranged from 3×10^{-7} cm/s to 8×10^{-7} cm/s. The field response test conducted in piezometer BH103 was interpreted to be dominated by flow from a 0.6 m silt lens within the Till and the screen length in the Bower and Rice analysis was modified to reflect this interpretation. The hydraulic conductivity of the clay stratum in BH106 as determined from one field response test was 1×10^{-7} cm/s.

Based on the field hydraulic conductivity test results presented in Table 6.4, a one to two order of magnitude increase in hydraulic conductivity of the Till was observed when compared to the laboratory hydraulic conductivity results. This inherent discrepancy is expected based on differences between measuring a bulk (field) and matrix (laboratory) hydraulic conductivity.

Included in Appendix A are field hydraulic conductivity values estimated by AGRA based on monitoring results conducted in 1993 and 1994 on the AGRA wells installed in 1992. The field hydraulic conductivity values estimated by AGRA are approximately one to two orders of magnitude lower than the hydraulic conductivity values estimated from the field response tests conducted by Clifton Associates Ltd. in 2002. The variation in results are likely are result of two issues:

- The hydraulic conductivity values estimated by AGRA are based on groundwater levels measured over a significant period of time (one year) rather than regular interval monitoring consistent with appropriate response testing methodologies. Estimated hydraulic conductivities using the monitoring data presented may not have accounted for a seasonal fluctuation in groundwater levels.

- The hydraulic response tests conducted in 2002 may not have been initiated under static conditions. Long term monitoring is required to confirm static levels before additional hydraulic response tests are conducted.

6.6 Chemistry Results

The groundwater chemical analyses results for general water quality parameters, metals, and hydrocarbons are presented on Tables 6.5, 6.6, and 6.7 respectively. The aquatic life criteria has been presented for comparison purposes. A trilinear plot (piper plot) of the major ion chemistry is presented on Figure 1. The results indicate that the groundwater is predominately a sulphate type water with no dominant cation with total dissolved solids (TDS) concentration ranging from 1160 mg/L in BH107 to 7060 mg/L in BH106. The water would be considered brackish based upon the TDS concentration. No discernable water quality variations were observed between groundwater samples collected from the shallow piezometers and groundwater samples collected from the deeper piezometers.

The results suggests that the parameter concentrations are reflective of natural background conditions and groundwater within 20 m of surface would not be considered potable for aesthetic reasons due to high sulphate, sulphide, and TDS concentrations.

7.0 Site Suitability Assessment

Table 7.1 provides a summary of the siting requirements provided in the British Columbia Waste Management Act, Special Waste Regulations (01 April 1988). The proposed landfill Site meets all General Landfill Siting Requirements.

The proposed landfill Site also meets all Secure Landfill Siting Requirements with the exception of the depth of unsaturated soil above the seasonally high water table.

Development of the proposed Site as a Landfill at or below the seasonally high water table must address the following potential issues:

- Seepage into the Landfill; and
- Potential impact of shallow groundwater in the vicinity of the proposed Landfill

Given the low hydraulic conductivity of the near surface soils (0 m to 20 m below surface) seepage rates would be low. An engineered liner and leachate collection system would mitigate any potential seepage issues related to the proposed Landfill development.

Based on the results of the Siting Suitability Investigation, near surface soils have low hydraulic conductivity and no appreciable water resource has been identified below the Site (within 20 m below surface) or within several kilometers of the proposed Site. Groundwater and potential impact migration rates would be in the order of centimeters per year based on an advective dominant flow system. Likely diffusion would be a predominant process given the low hydraulic flow system present at the Site.

Based on the Hydrogeologic Siting Suitability Investigation the Site is considered favorable for the proposed Landfill development based on the following:

- Meets all siting requirements in the British Columbia Waste Management Act, Special Waste Regulations with engineered design alternatives to mitigate the noted exceptions;
- No surface water courses and/or major drainage courses are present in the vicinity of the Site;
- The near surface soils (0 m to 20 m below surface) have a low hydraulic conductivity; and
- No appreciable groundwater resource has been identified below the Site (within 20 m of surface) or within several kilometers of the Site.

8.0 Closure

This report was prepared by Clifton Associates Ltd. for the use of Canadian Crude Separators Inc. and their agents for the Hydrogeological Siting Suitability Investigation at Block A, Section 8, Township 88, Range 20, West of Sixth Meridian. The material in it reflects Clifton Associates Ltd. best judgement available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Clifton Associates Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

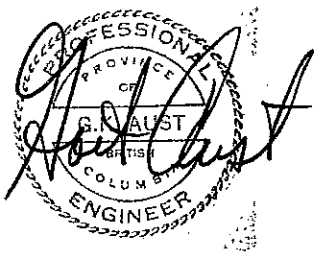
This report has been prepared in accordance with generally accepted engineering practice common to the local area. No other warranty, expressed or implied is made.

Our conclusions are preliminary and based upon the information obtained from the referenced subsurface exploration. The bore holes and test pits indicate subsurface and groundwater conditions only at the specific locations and time investigated, only to the depth penetrated and only for the soil properties tested. The subsurface conditions may vary between the bore holes and with time. The subsurface interpretation provided is a professional opinion of conditions and not a certification of the Site conditions. The nature and extent of subsurface variation may not become evident until construction or further investigation. If variations or other latent conditions do become evident, Clifton Associates Ltd. should be notified immediately so that we may reevaluate our conclusions and recommendations. Although subsurface conditions have been explored, we have not conducted analytical laboratory testing on soil samples obtained nor evaluated the Site with respect to the potential presence of contaminated soil conditions.

The enclosed report contains the results of our investigation as well as certain recommendations arising out of such investigation. Our recommendations do not constitute a design, in whole or in part, of any of the elements of the proposed work. Incorporation of any or all of our recommendations into the design of any such element does not constitute us as designers or co-designers of such elements, nor does it mean that such design is appropriate in geotechnical terms. The designers of such elements must consider the appropriateness of our recommendations in the light of all design criteria known to them, many of which may not be known to us. Our mandate has been to investigate and recommend which we have completed by means of this report. We have had no mandate to design, or review the design of, any elements of the proposed work and accept no responsibility for such design or design review.

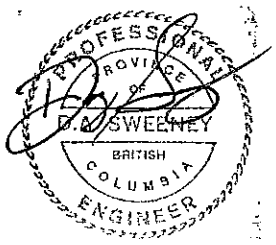
Clifton Associates Ltd.

Jason S. Pentland, M.Sc.



Goetz Aust, P.Eng.
Senior Project Engineer

Reviewed by,



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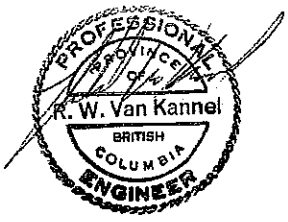

Richard Van Kannel, P.Eng.
Senior Project Engineer

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Tables

Table 4.1
Summary of Surface Water Bodies
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Water Body No.	Name of Water Body	Direction From Site	Distance From Site (km)	Direction of Flow	Receiving Water Body
Surface Water Bodies within 10 km of the Site					
1	Unnamed Creek	West	1.4	North	Blueberry River
2	Unnamed Creek	North	1.4	North	Blueberry River
3	Upset Creek	Northeast	2.5	North	Blueberry River
4	St. John Creek	East	3	South	Beatton River
5	Unnamed Creek	Southwest	3	North	Blueberry River
6	Unnamed Lake or Slough	East	3.5	N/A	N/A
7	Unnamed Lake or Slough	East	3.5	N/A	N/A
8	Stoddart Creek	South	6.25	South	Charlie Lake
9	Fox Creek	East	6.3	North	Blueberry River
10	Blueberry River	North	6.75	East	Beatton River
11	Unnamed Creek	Southeast	8.75	South	St. John Creek
12	Unnamed Creek	East	8.75	North	Beatton River
13	Aitken Creek	Northwest	8.75	South	Blueberry River
14	Snyder Creek	North	8.75	South	Blueberry River
15	Roseland Creek	East	10	Southeast	Beatton River
16	Unnamed Creek	East	10	North	Beatton River

Notes:
N/A No discernible outlet noted.

Table 4.2
Summary of Groundwater Withdrawal Well Information
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Well Tag No.	Well Location					Well Owner	Distance from Site (km)	Date Completed	Withdrawal Interval (m)	Material	Comments
	District Lot	Sec.	Twp.	Rge.	W. Mer						
Groundwater Withdrawal Wells Possibly Located Within 16 km of the Site											
44900	284	2	87	21	6	Mike Spruyt	12.5	29-Apr-80	N/A	N/A	
42379		2	87	21	6	Dennis Beattie	12.5	23-May-79	N/A	N/A	
42254		2	87	21	6	Dennis Beattie	12.5	01-May-79	N/A	N/A	
40373	153	11	87	21	6	Rod Wark	11.5	12-Aug-78	N/A	N/A	
42323	3183	11	87	21	6	Coonty Kitchen	11.5	11-May-79	N/A	N/A	
21155		11	87	21	6	Charles Comer	11.5	01-Jan-68	N/A	N/A	
22091		11	87	21	6	Dorvel	11.5	01-Jan-69	N/A	N/A	
21154		18	87	20	6	A. Teteris	8.5	01-Jan-68	N/A	N/A	
36490		11	87	20	6	Dennis Augustine	11.5	01-Jan-77	N/A	N/A	
81620		30	88	21	6	Terry Wiebe	12	10-Nov-00	9.5 to 14.9	Sandstone	
16445		10	113		6	Nurnberger Ranch Ltd.	12	01-Jan-60	N/A	N/A	
31563		13	113		6	Geo Mercer	15	01-Nov-74	N/A	N/A	
58205		30	113		6	Han Binsch	14	10-Jun-88	N/A	N/A	
33800		33	113		6	Terry Iverson	16	01-Nov-85	N/A	N/A	

Note:

Water well information obtained from Groundwater Branch, Ministry of Water, Land and Air Protection of British Columbia
The current status of the wells in this survey were not confirmed.

Table 6.1
Summary of Soil Properties
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Location	Sample No.	Depth (m)	Plastic Limit	Liquid Limit	USC	Gravel (%)	Sand (%)	Silt (%)	Clay (%)
Till									
BH102	IH13	4.4	18	33	CL	3	14	83	
BH102	IH19	9.0	16	29	CL	3	16	46	36
BH102	IH26	19.4	16	33	CL	12	18	76	
BH103	IH29	2.7	19	31	CL	3	17	80	
BH103	IH31	4.6	19	37	CL	1	10	90	
BH103	IH34	7.3	27	51	CH	0.0	1	21	78
BH105	IH51	7.5	17	32	CL	1	13	47	39
BH106	IH65	0.3	23	41	CL	1	14	42	44
BH106	IH75	8.5	17	27	CL	4	19	47	31
BH107	IH88	1.2	20	36	CL	4	19	78	
BH107	IH92	5.8	21	38	CL	0.0	3	44	53
	Minimum		16	27		1	1	76	
	Maximum		27	51		12	19	99	
	Average		19	35		3	13	85	
Clay									
BH105	IH63	19.8	21	46	CL	0.0	2	41	57
BH106	IH81	14.9	14	23	CL	1	35	37	27
Silt									
BH103	IH30	4.0	19	20	ML	0	29	71	

Notes:

Table 6.2
Summary of Well Monitoring
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Monitor Well	Date	Top of Pipe Elevation (m)	Ground Elevation (m)	Depth to Water From Ground Surface (m)	Water Elevation (m)	Comments
92-1	21-Mar-93	747.51	746.90	16.76	730.14	
	19-May-94	747.51	746.90	4.87	742.03	
	10-Dec-01	747.51	746.90	14.07	732.83	
92-1A	21-Mar-93	747.35	746.90	3.58	743.32	
	19-May-94	747.35	746.90	1.33	745.57	
	10-Dec-01	747.35	746.90	7.30	739.60	
92-2A	21-Mar-93	792.05	791.60	n/a	n/a	Frozen
	19-May-94	792.05	791.60	n/a	n/a	Frozen
	10-Dec-01	792.05	791.60	n/a	n/a	Destroyed
92-3	21-Mar-93	777.01	776.40	18.07	758.33	
	19-May-94	777.01	776.40	11.59	764.81	
	10-Dec-01	777.01	776.40	n/a	n/a	Destroyed
92-3A	21-Mar-93	777.01	776.40	2.38	774.02	
	19-May-94	777.01	776.40	0.79	775.61	
	10-Dec-01	777.01	776.40	1.90	774.50	
92-4	21-Mar-93	761.12	760.45	6.87	753.58	
	19-May-94	761.12	760.45	4.48	755.97	
	10-Dec-01	761.12	760.45	6.26	754.19	
92-4A	21-Mar-93	760.98	760.35	5.74	754.61	
	19-May-94	760.98	760.35	1.62	758.73	
	10-Dec-01	760.98	760.35	1.57	758.78	
92-5	21-Mar-93	774.13	773.40	6.61	766.79	
	19-May-94	774.13	773.40	6.17	767.23	
	10-Dec-01	774.13	773.40	7.35	766.05	
92-5A	21-Mar-93	773.72	773.30	6.31	766.99	
	19-May-94	773.72	773.30	0.58	772.72	
	10-Dec-01	773.72	773.30	1.72	771.58	
92-6	21-Mar-93	777.32	776.90	19.17	757.73	
	19-May-94	777.32	776.90	16.78	760.12	
	10-Dec-01	777.32	776.90	n/a	n/a	Damaged
92-6A	21-Mar-93	777.40	777.00	6.74	770.26	
	19-May-94	777.40	777.00	0.80	776.20	
	10-Dec-01	777.40	777.00	3.78	773.22	
92-7	21-Mar-93	760.12	759.40	20.40	739.00	
	19-May-94	760.12	759.40	2.78	756.62	
	10-Dec-01	760.12	759.40	n/a	n/a	Frozen
92-7A	21-Mar-93	759.61	759.20	6.61	752.59	
	19-May-94	759.61	759.20	2.19	757.01	
	10-Dec-01	759.61	759.20	3.16	756.04	
92-8	21-Mar-93	757.17	756.80	10.38	746.42	
	19-May-94	757.17	756.80	9.33	747.47	
	10-Dec-01	757.17	756.80	10.60	746.20	

Table 6.2
Summary of Well Monitoring
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Monitor Well	Date	Top of Pipe Elevation (m)	Ground Elevation (m)	Depth to Water From Ground Surface (m)	Water Elevation (m)	Comments
92-8A	21-Mar-93	757.17	756.80	1.68	755.12	
	19-May-94	757.17	756.80	n/a	n/a	Frozen
	10-Dec-01	757.17	756.80	1.29	755.51	
BH101	10-Dec-01	780.35	779.50	5.58	773.92	
	17-Dec-01	780.35	779.50	2.01	777.49	
	12-Jan-02	780.35	779.50	1.82	777.68	
BH102	10-Dec-01	780.55	779.60	18.87	760.73	
	17-Dec-01	780.55	779.60	18.84	760.76	
	12-Jan-02	780.55	779.60	n/a	n/a	NM
BH103	10-Dec-01	799.13	798.30	2.54	795.76	
	17-Dec-01	799.13	798.30	2.43	795.87	
	12-Jan-02	799.13	798.30	2.02	796.28	
BH104	10-Dec-01	770.27	769.40	n/a	n/a	Dry
	17-Dec-01	770.27	769.40	n/a	n/a	Dry
	12-Jan-02	770.27	769.40	n/a	n/a	Dry
BH105	10-Dec-01	770.28	769.40	15.50	753.90	
	17-Dec-01	770.28	769.40	15.43	753.97	
	12-Jan-02	770.28	769.40	15.57	753.83	
BH106	10-Dec-01	796.75	795.90	7.77	788.13	
	17-Dec-01	796.75	795.90	7.07	788.83	
	12-Jan-02	796.75	795.90	5.35	790.56	
BH107	10-Dec-01	795.46	794.60	2.76	791.84	
	17-Dec-01	795.46	794.60	2.71	791.89	
	12-Jan-02	795.46	794.60	2.74	791.87	
REL2	10-Dec-01	n/a	756.70	n/a	n/a	Frozen
REL3	10-Dec-01	n/a	752.70	n/a	n/a	Frozen
REL4	10-Dec-01	n/a	749.70	n/a	n/a	Frozen
REL5	10-Dec-01	n/a	746.34	n/a	n/a	NM
REL5A	10-Dec-01	n/a	746.34	n/a	n/a	NM

Notes:

1 The 92 series (ie 92-1) were installed by HBT Agra Limited from 14 to 21 December 1992.
The REL series (ie REL2) were installed by Rudiger Enterprises Ltd. after December 1992.
The boreholes series (ie BH101) were installed by Clifton Associates Ltd. from 26 to 28 November 2001.

2 Elevation shown are Geodetic.

NM Not Monitored

n/a Not Available

Table 6.3
Laboratory Hydraulic Conductivity Results
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Sample No.	Bore Hole	Depth Interval (m)	Soil Type	Type	Hydraulic Conductivity (cm/s)
Clifton Associates Ltd. Results					
IH12	BH102	4.3 to 4.6	Till	Undisturbed	6×10^{-9}
IH12*	BH102	4.3 to 4.6	Till	Undisturbed	4×10^{-8}
IH18	BH102	8.8 to 8.9	Till	Undisturbed	1×10^{-8}
IH47	BH105	4.3 to 4.5	Till	Undisturbed	2×10^{-8}
IH62	BH105	18.0 to 18.4	Clay and Silt	Undisturbed	3×10^{-7}
IH74	BH106	7.3 to 7.5	Till	Undisturbed	6×10^{-9}
IH97, 99, & 100	TP201	2.4 to 4.9	Till	Remolded	1×10^{-8}
IH108, 109, &110	TP203	3.4 to 5.3	Till	Remolded	8×10^{-9}
AGRA Earth & Environmental Results					
	92-1A	7.3 to 7.8	Till	Undisturbed	6×10^{-9}
	92-2A	4.3 to 4.6	Silt	Undisturbed	2×10^{-8}
	92-3	16.5 to 16.8	Till	Undisturbed	3×10^{-9}
	92-7	1.2 to 1.7	Clay	Undisturbed	3×10^{-8}
	92-7	5.8 to 6.3	Till	Undisturbed	4×10^{-9}
	92-7	0 to 1.2	Clay	Remolded	4×10^{-9}
	92-7	1.8 to 2.7	Till	Remolded	5×10^{-9}

* - Constant head test conducted by EBA

Table 6.4
Field Hydraulic Conductivity Results
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Bore Hole	Screen Interval (m)	Soil	Hydraulic Conductivity (cm/s)
BH101	4.8 to 7.3	Clay Till	3×10^{-7}
BH102	16.9 to 19.5	Clay Till	8×10^{-7}
BH103	0.5 to 7.3*	Silt lens*	7×10^{-6}
BH106	16.6 to 19.2	Clay	1×10^{-7}

* - "Piezometer" completed in two different soil types, assumed for analysis screen length equal to most permeable soil (silt lens in clay till).

Table 6.5 - Summary of Laboratory Analyses - Groundwater (Routine & Major Ions)
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

PARAMETERS	UNITS	BH101	BH102	BH103	BH105	BH106	BH107	CSR[1] 1997 Standards for Aquatic Life	CSR[2] 2000 Draft Standards Aquatic Life
General Parameters									
Ammonia-N	mg/L	0.07	0.6	0.37	0.7	5.81	<0.05	1.3-18.4 (3)	1.3-18.4 (3)
Conductivity (uS/cm)	uS/cm	3,690	3,890	4,780	4,120	7,140	1,480	na	na
Cyanide, Weak Acid	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.05	0.05
Cyanide, Total	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	na	na
Fluoride	mg/L	0.14	0.11	0.14	0.07	0.08	0.21	2 - 3 (4)	2 - 3 (4)
Nitrate+Nitrite-N	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	400	400
Nitrate	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	400	400
Nitrite	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.2 - 2 (5)	0.2 - 2 (5)
Total-Alkalinity	mg/L	397	398	164	699	699	178	na	na
pH	pH	6.9	7.5	6.3	7	6.9	6.6	na	na
Sulphide	mg/L	0.04	0.006	0.006	<0.003	<0.003	<0.003	0.02	0.02
Total-Hardness	mg/L	2,430	1,870	2,730	2,310	3,320	817	na	na
Total Organic Carbon	mg/L	6		8	4	14	16	na	na
Major Ions									
Bicarbonate	mg/L	484	486	200	853	853	217	na	na
Calcium	mg/L	469/435	386/365	437/387	484	381/381	154/147	na	na
Carbonate	mg/L	<5	<5	<5	<5	<5	<5	na	na
Chloride	mg/L	<1	5	<1	2	2	<1	na	na
Hydroxide	mg/L	<5	<5	<5	<5	<5	<5	na	na
Magnesium	mg/L	306/282	220/195	398/351	219	575/534	105/99	na	na
Potassium	mg/L	8.3/7.3	12.3/12.3	10.8/10.1	8.9	21.3/22.9	4.2/4	na	na
Sodium	mg/L	152/159	386/417	413/411	335	891/1040	37/39	na	na
Sulphate	mg/L	2,480	2,420	3,540		4,770	752	1,000	1,000
TDS	mg/L	3,650	3,670	4,900	3,880	7,060	1,160	na	na

Notes:
CSR[1] 1997 British Columbia Contaminated Sites Regulation (CSR)-Schedule 6 - Generic Numerical Water Standards - Exceedences indicated by shading.
CSR[2] 2000 British Columbia Contaminated Sites Regulation (CSR)-Draft Schedule 6 - Generic Numerical Water Standards - Exceedances indicated by underlining.
(3) CSR Aquatic Life Standard pH dependent: 6.3 <pH <7.5
(4) CSR Aquatic Life Standard Hardness (H) dependent: H> 200 mg/L
(5) CSR Aquatic Life Standard Chloride conc. Dependent: 0 <Cl< 5 mg/L
na No Applicable Criteria
- Parameter Not Tested
Bold and **Underlined** values indicate excedance of CSR 1997 Standards
Bold and **Double Underlined** values indicate excedance of CSR 2000 DRAFT Standards
Shaded values indicate excedence of hoth CSR 1997 and 2000 DRAFT Standards

Table 6.6 - Summary of Laboratory Analyses - Groundwater (Metals)
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Metals	UNITS	BH101	BH102	BH103	BH105	BH106	BH107	CSR[1] 1997 Standards for Aquatic Life	CSR[2] 2000 Draft Standards Aquatic Life
Aluminum (Al)	mg/L	0.05	**1.4**	0.1	0.03	0.05	**0.66**	0.05-0.5 (3)	na
Antimony (Sb)	mg/L	0.0007	0.0019	0.0008	0.0009	0.0022	0.0009	0.3	0.3
Arsenic (As)	mg/L	<0.0004	0.0028	0.0004	0.0008	0.0012	0.0005	0.5	0.05
Barium (Ba)	mg/L	0.033	0.057	0.033	0.054	0.043	0.063	10	10
Beryllium (Be)	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.053	0.053
Boron (B)	mg/L	0.29	0.26	0.73	0.25	0.52	0.29	na	na
Cadmium (Cd)	mg/L	0.001	0.003	0.002	<0.001	0.001	<0.001	0.002-0.018 (4)	0.0001-0.0006 (4)
Chromium (Cr)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02	0.01/0.09 (5)
Cobalt (Co)	mg/L	0.005	**0.014**	**0.012**	0.009	0.04	0.007	0.5	0.009
Copper (Cu)	mg/L	0.002	0.029	0.004	0.003	0.008	0.004	0.02-0.09 (4)	0.02-0.09 (4)
Iron (Fe)	mg/L	0.071	**4.11**	0.09	0.04	0.04	0.372	3	na
Lead (Pb)	mg/L	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	0.04-0.16 (4)	0.04 - 0.16 (4)
Manganese (Mn)	mg/L	**1.01**	**1.55**	**1.11**	0.804	**4.6**	0.427	1	na
Mercury (Hg)	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.001	0.0002
Molybdenum (Mo)	mg/L	<0.005	0.016	<0.005	<0.005	0.007	<0.005	10	10
Nickel (Ni)	mg/L	0.016	0.046	0.065	0.029	0.093	0.027	0.25-1.5 (4)	0.25-1.5 (4)
Selenium (Se)	mg/L	<0.0004	0.0311	0.0006	0.0012	0.0025	<0.0004	0.01	0.01
Silicon (Si)	mg/L	2.13	2.71	1.54	4.12	4.21	0.529	na	na
Silver (Ag)	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.001	0.0005-0.015 (4)
Strontium (Sr)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	na	na
Thallium (Tl)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.003	0.003
Tin (Sn)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	na	na
Titanium (Ti)	mg/L	0.002	0.017	0.005	0.001	0.003	0.01	na	1
Vanadium (V)	mg/L	<0.001	0.006	<0.001	<0.001	<0.001	0.003	na	na
Zinc (Zn)	mg/L	0.024	0.082	0.044	0.023	0.052	0.039	0.3	0.075 - 2.4 (4)

Notes:
CSR[1] 1997 British Columbia Contaminated Sites Regulation (CSR)-Schedule 6 - Generic Numerical Water Standards - Exceedences indicated by shading.
CSR[2] 2000 British Columbia Contaminated Sites Regulation (CSR)-Draft Schedule 6 - Generic Numerical Water Standards - Exceedances indicated by underlining.
(3) CSR Aquatic Life Standard pH dependent: 6.3 <pH <7.5
(4) CSR Aquatic Life Standard Hardness (H) dependent: H> 200 mg/L
(5) Standards Specific to: chromium VI/chromium III
na No Applicable Criteria
- Parameter Not Tested
Bold and **Underlined** values indicate excedance of CSR 1997 Standards
Bold and **Double Underlined** values indicate excedance of CSR 2000 DRAFT Standards
Shaded values indicate excedence of both CSR 1997 and 2000 DRAFT Standards

Table 6.7 - Summary of Laboratory Analyses - Groundwater (Hydrocarbons)
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

PARAMETER (mg/L)	UNITS	BH101	BH102	BH103	BH105	BH106	BH107	CSR[1] 1997 Standards for Aquatic Life	CSR[2] 2000 Draft Standards Aquatic Life
Hydrocarbons									
Benzene	ug/L	<0.5	-	<0.5	<0.5	<0.5	<0.5	3,000	4,000
Toluene	ug/L	<0.5	-	<0.5	<0.5	<0.5	<0.5	3,000	390
Ethylbenzene	ug/L	<0.5	-	<0.5	<0.5	<0.5	<0.5	7,000	2,000
Xylenes	ug/L	<0.5	-	<0.5	<0.5	<0.5	<0.5	na	na
HEPH	ug/L	<50	-	<50	<50	<50	<50	5,000	5,000
LEPH	ug/L	<50	-	<50	<50	<50	<50	500	500
Volatile Hydrocarbons	ug/L	<100	-	<100	<100	<100	<100	1,500	1,500
Volatile Petroleum HCs	ug/L	<100	-	<100	<100	<100	<100	15,000	15,000
Phenols (4AAP)	mg/L	<0.001	-	<0.001	<0.001	<0.001	<0.001	0.01	3
Polycyclic Aromatic Hydrocarbons									
Acenaphthene	ug/L	<5	-	<5	<5	<5	<5	60	60
Acridine	ug/L	<5	-	<5	<5	<5	<5	0.5	0.5
Anthracene	ug/L	<5	-	<5	<5	<5	<5	1	1
Benzo(a)anthracene	ug/L	<5	-	<5	<5	<5	<5	1	1
Benzo(a)pyrene	ug/L	<5	-	<5	<5	<5	<5	0.1	0.1
Fluoranthene	ug/L	<5	-	<5	<5	<5	<5	2	2
Fluorene	ug/L	<5	-	<5	<5	<5	<5	120	120
Naphthalene	ug/L	<5	-	<5	<5	<5	<5	10	10
Phenanthrene	ug/L	<5	-	<5	<5	<5	<5	3	3
Pyrene	ug/L	<5	-	<5	<5	<5	<5	0.2	0.2

Notes:

CSR[1] 1997 British Columbia Contaminated Sites Regulation (CSR)-Schedule 6 - Generic Numerical Water Standards

CSR[2] 2000 British Columbia Contaminated Sites Regulation (CSR)-Draft Schedule 6 - Generic Numerical Water Standards

na No Applicable Criteria

\- Parameter Not Tested

Bold and Underlined values indicate excedance of CSR 1997 Standards

Bold and Double Underlined values indicate excedance of CSR 2000 DRAFT Standards

Shaded values indicate excedence of both CSR 1997 and 2000 DRAFT Standards

Table 7.1 – Site Suitability Assessment
Hydrogeological Siting Suitability Investigation
Block A, Sec. 8, Twp. 88, Rge. 20, W6M
British Columbia

Criteria	Proposed Secure Landfill Site	Meets Criteria
General Landfill Siting Requirements		
Not in a 200 year floodplain	Not likely	Yes
Not within 100 m of a holocene fault	None identified	Yes
Not subject to tsunamis	No	Yes
Not within 100 m of land subject to slope failure	No unstable land identified within 100 m of site	Yes
Not within boundaries of parks, wildlife sanctuary, ecological reserve, bird sanctuary	No parks etc. identified within the 14 km of site	Yes
Secure Landfill Siting Requirements		
Not in or having natural drainage to wetland	None identified	Yes
Not on land with predicted maximum peak seismic acceleration greater than 8% with a probability of 10% exceedence in 50 years	< 4%	Yes
Must be entirely above seasonally high water table	Piezometers installed in November, seasonally high water table expected in late spring or early summer	To be established
Must have 3 m unsaturated soil with hydraulic conductivity less than 1×10^{-6} cm/s above seasonally high water table	Based on January monitoring results, approximately 1 m to 3m unsaturated soil with a hydraulic conductivity of 3×10^{-7} cm/s underlie the site	See Discussion section in report (Section 7.0)
Not in a recharge area for an unconfined aquifer with high capacity wells	No wells within 7 km of site	Yes
Must have 5 m of fine grained "unconsolidated" soil with hydraulic conductivity of 1×10^{-6} cm/s when site is underlain by fractured or permeable bedrock formations	Greater than 5 m of "unconsolidated" soil in all boreholes drilled at site with a hydraulic conductivity value of 3×10^{-7} cm/s.	Yes
Not within 300 m of any nonintermittent watercourses or other permanent water body	Nearest permanent water body is 1.4 km from site	Yes
Not with a community water supply watershed	None identified	Yes
Not in an area where monthly precipitation is greater than evapotranspiration plus storage in landfill cover	Dependent on design of cover	To be established in design
Not in an area where annual precipitation is greater than evapotranspiration	Evapotranspiration is likely greater than precipitation at the Site based on available data	Yes

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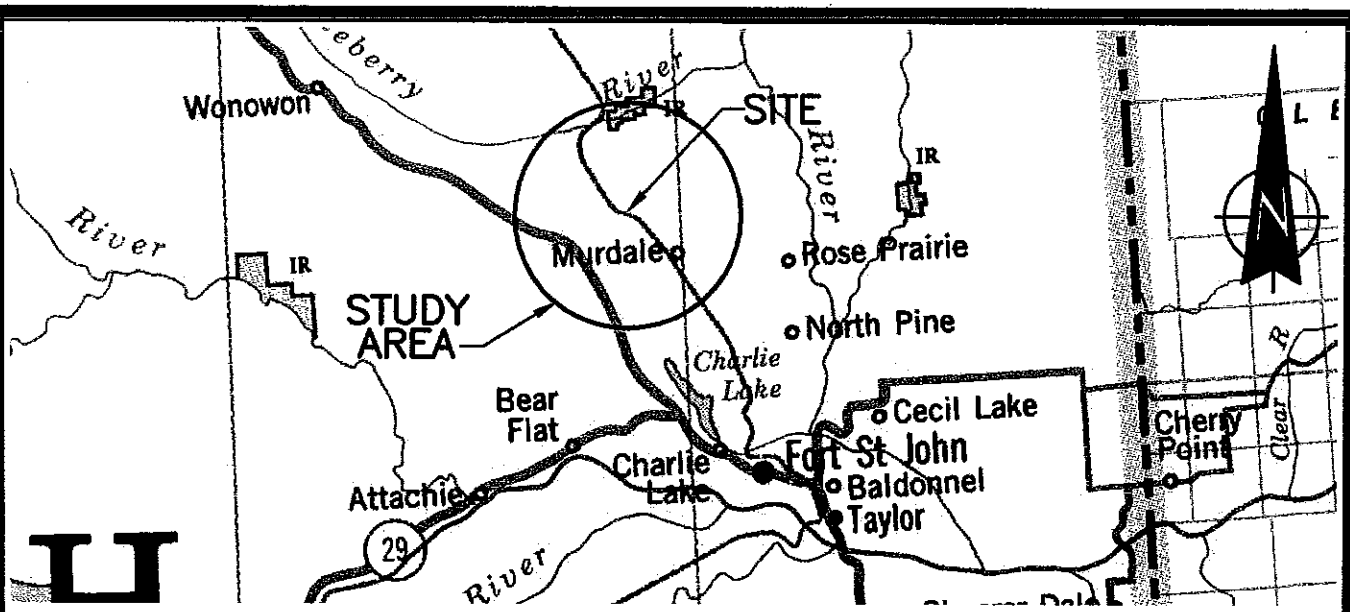
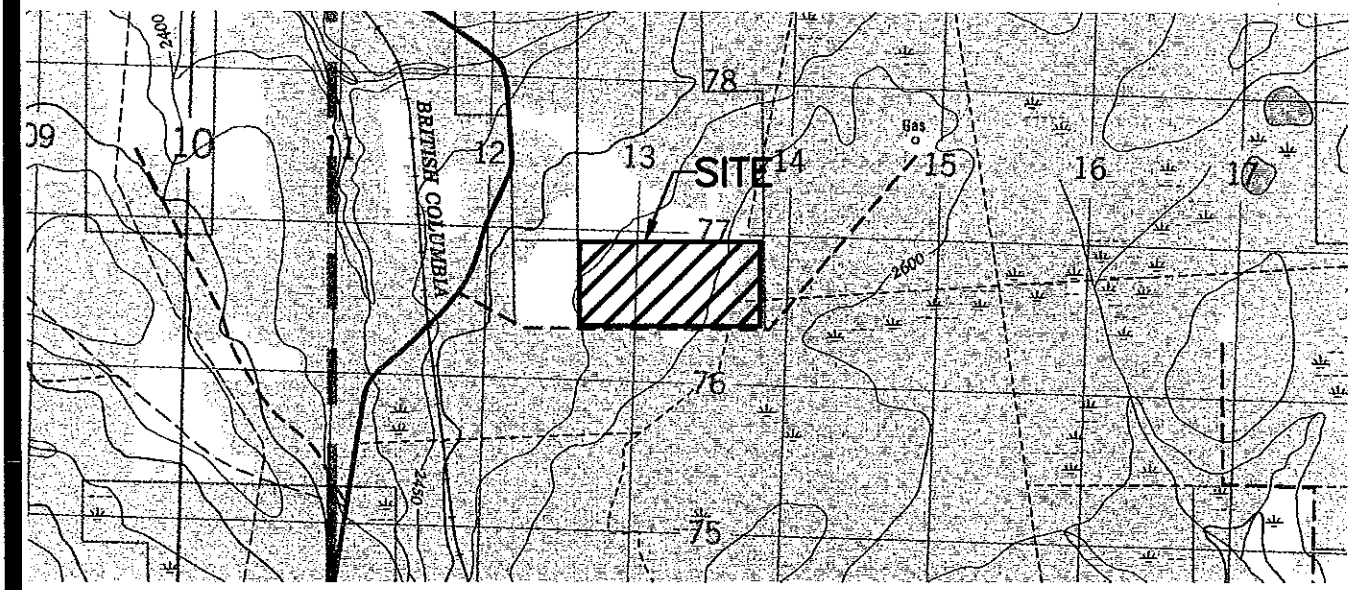
Drawings



SITE LOCATION

SCALE 1:1 000 000

0 25 50 100 150 km



TOPOGRAPHIC SITE LOCATION

SCALE 1:50 000

0 0.5 1.0 1.5 2.0 2.5 km

NOTE:

DRAWING COMPILED FROM REGIONAL BASE MAP TITLED "BRITISH COLUMBIA" & FROM NATIONAL TOPOGRAPHIC SYSTEM MAP 94 A/11 TITLED "MURDALE" (EDITION 3, 1980) PRODUCED BY SURVEYS AND MAPPING BRANCH, DEPARTMENT OF ENERGY, MINES AND RESOURCES.

DATE	LAST REVISED DATE	DRAWN BY	SCALE	FILE NO.	DRAWING NO.
02/01/25		DWW	AS SHOWN	C1548A2C	1

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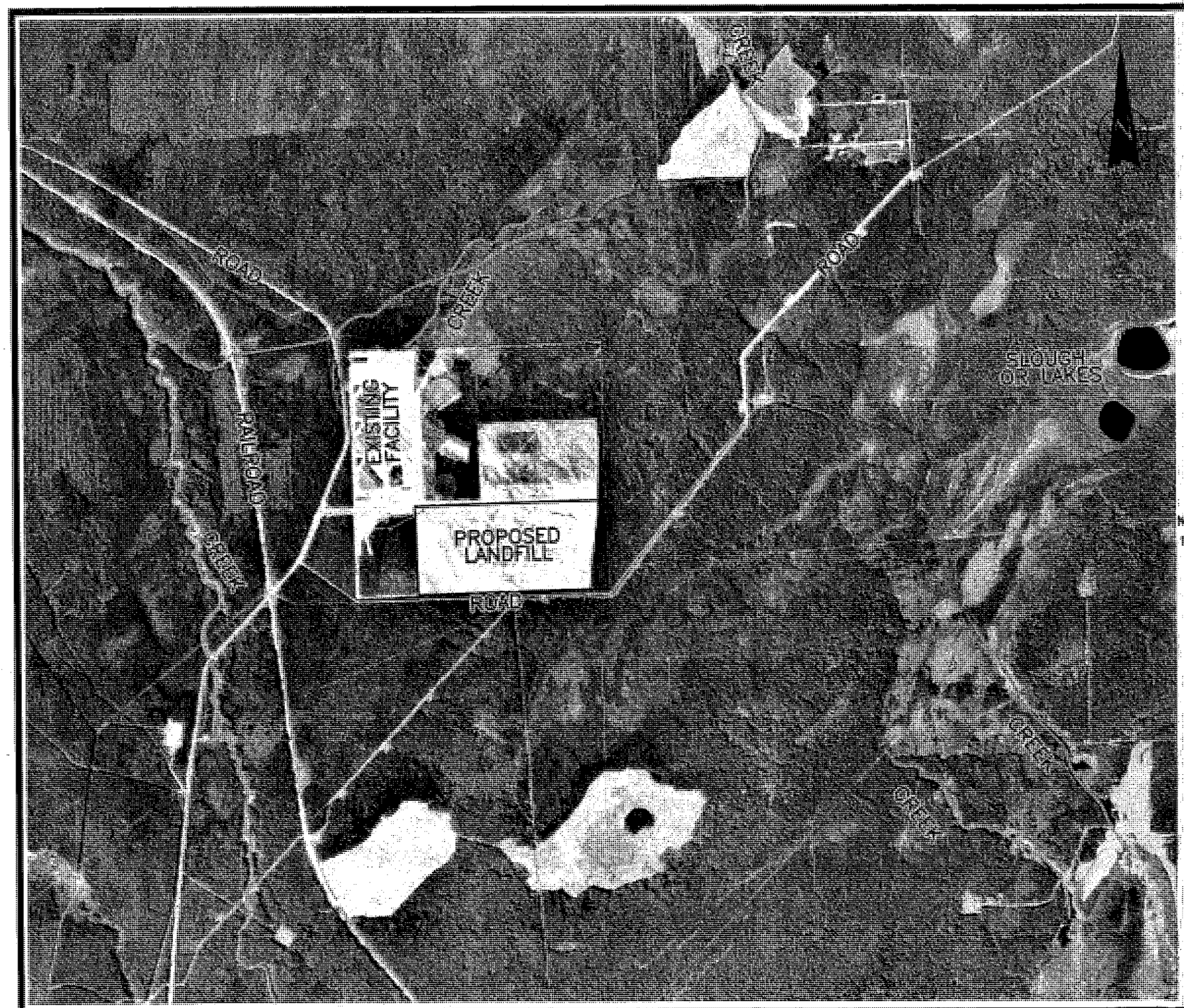
PROJECT HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 – TWP 88 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
SITE LOCATION



NOTES:

1 DRAWING COMPILED FROM AIR PHOTO NO. 72X88008-104

0 0.5 1.0 1.5 2.0 km

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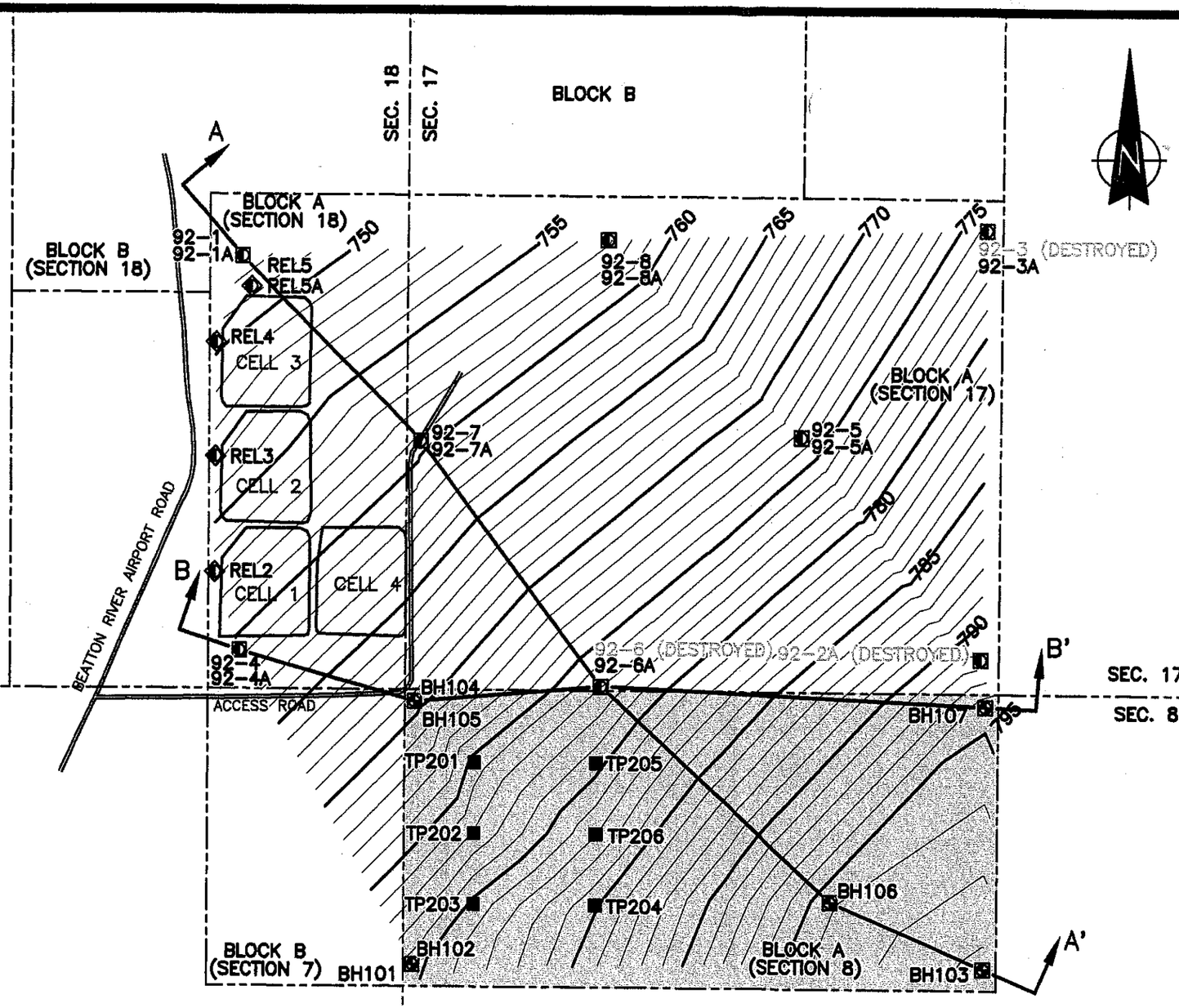
BLOCK A, SECTION 8 – TWP 68 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
AERIAL PHOTOGRAPH

DATE 02/01/30	APPD. BY	FILE NO. C1548A08
SCALE 1:25 000	DWN. BY DWW	DWG. NO. 2



LEGEND:

- BOREHOLE LOCATION (CLIFTON NOV 2001)
- BOREHOLE LOCATION (BY OTHERS)
- PIEZOMETER LOCATION
- MONITOR WELL
- TEST PIT LOCATION (CLIFTON NOV 2001)
- GROUND CONTOUR (1 m CONTOUR INTERVAL)
- LEGAL LINE
- PROPOSED LANDFILL LOCATION

NOTES:

1 DRAWING COMPILED FROM McELHANNEY ASSOCIATES DRAWING NO. 9479-16SP & SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION OF PROPOSED LANDFILL: BLOCK A, 8-88-20 W6M

3 THE 92 SERIES (i.e. 92-1) PIEZOMETERS WERE INSTALLED BY HBT AGRA LTD. IN DEC 1992 & THE REL SERIES (i.e. REL2) MONITOR WELLS WERE INSTALLED BY RUDIGER ENTERPRISES LTD. AFTER 1992.

0 100 200 300 400 500 m

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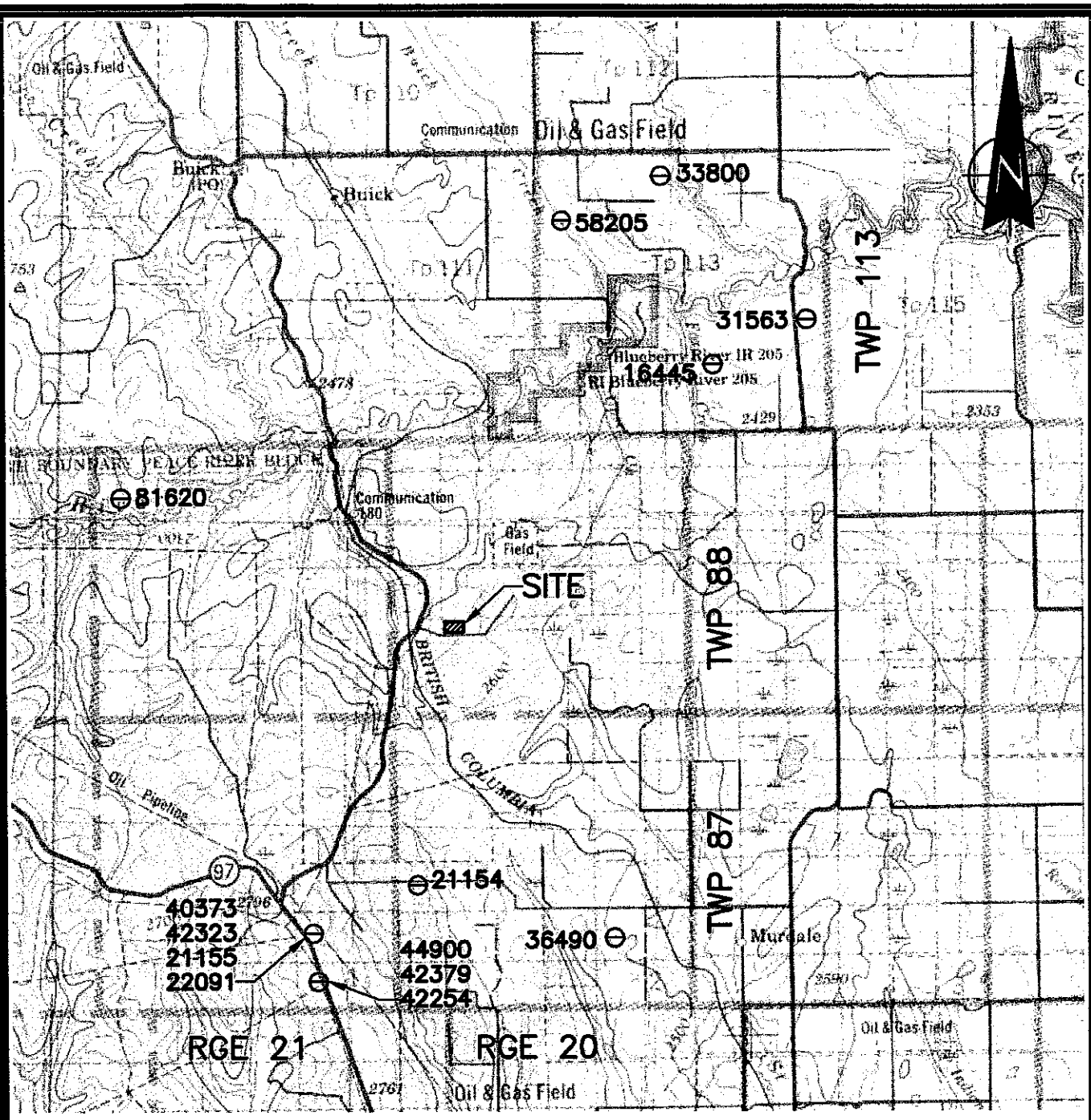
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 - TWP 88 - RGE 20 - W6M
BRITISH COLUMBIA

TITLE
BOREHOLE & TEST PIT LOCATION PLAN

REV	DESCRIPTION	BY	DATE

DATE 02/01/08	APPD. BY	FILE NO. C1548A1A
SCALE 1:10000	DWN. BY DWW	DWG. NO. 4



LEGEND:

WATER WELL ⊖

NOTE:

DRAWING COMPILED FROM NATIONAL TOPOGRAPHIC SYSTEM MAP 94 A TITLED "CHARLIE LAKE" (EDITION 3, 1985). PRODUCED BY SURVEYS AND MAPPING BRANCH, DEPARTMENT OF ENERGY, MINES AND RESOURCES & WATER WELL DATABASE, GROUNDWATER BRANCH, MINISTRY OF WATER, LAND & AIR PROTECTION OF BRITISH COLUMBIA.

DATE	LAST REVISED DATE	DRAWN BY	SCALE	FILE NO.	DRAWING NO.
02/01/28		DWW	1:200 000	C1548A5B	3

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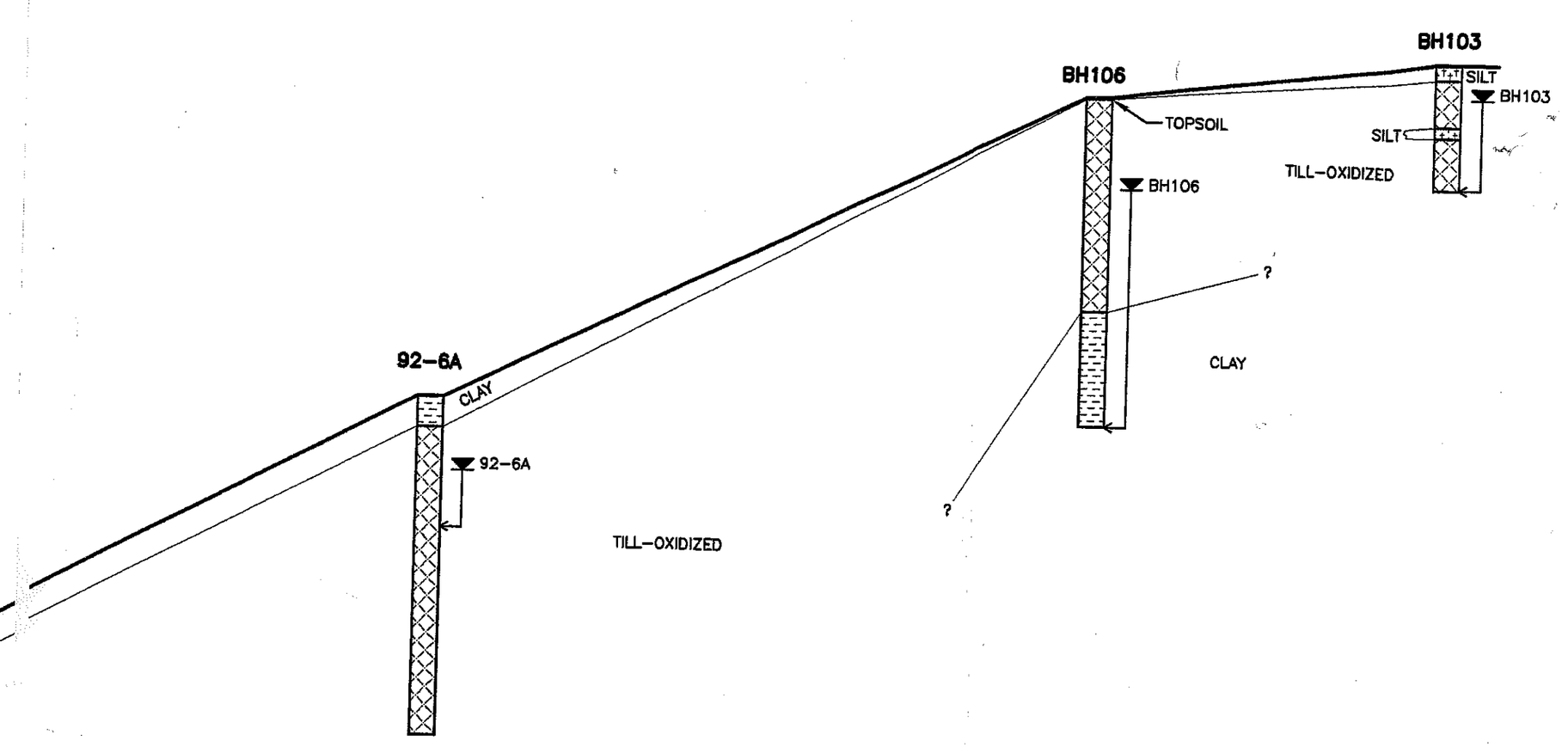
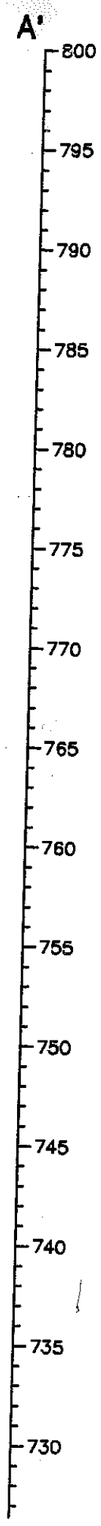
BLOCK A, SECTION 8 – TWP 88 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
WATER WELL LOCATIONS





LEGEND:

GROUNDWATER ELEVATION (yy/mm/dd) ▼

PIEZOMETER TIP ←

PIEZOMETER NO. 92–1

STRATIGRAPHIC CROSS SECTION A – A'

SCALE; HORIZ: 1:5000
VERT: 1:300

THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR

0 50 100 150 200 250 m

NOTES:

1 SEE DRAWING 3 FOR LOCATION OF STRATIGRAPHIC CROSS SECTION.

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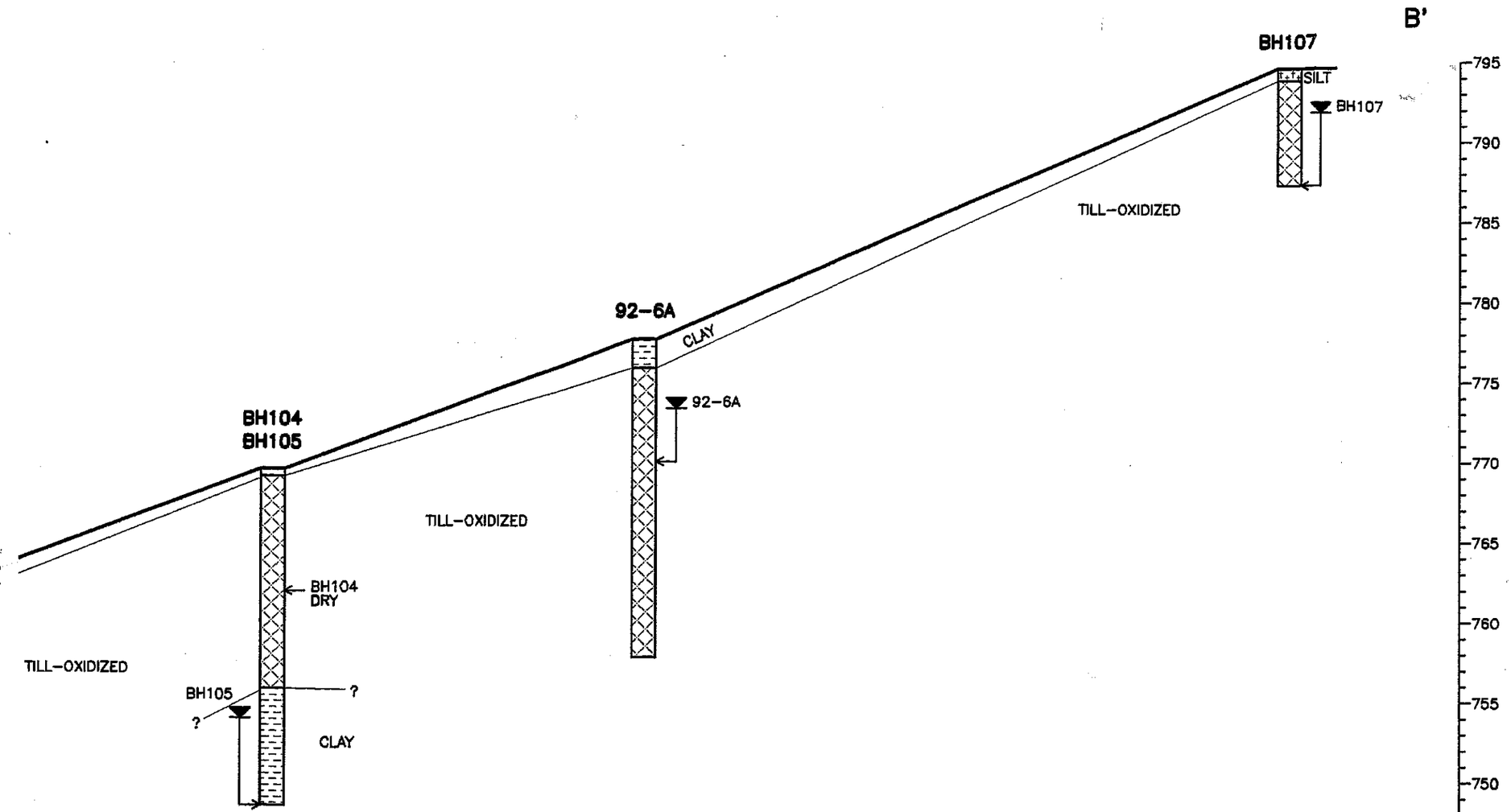
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 – TWP 88 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
STRATIGRAPHIC CROSS SECTION A – A'

DATE	APPD. BY	FILE NO.
02/01/25		C1548A3A
SCALE AS NOTED	DWN. BY DWW	DWG. NO. 5



LEGEND:

GROUNDWATER ELEVATION (yy/mm/dd) ▼

PIEZOMETER TIP ←

PIEZOMETER NO. 92–1

NOTES:

1 SEE DRAWING 3 FOR LOCATION OF STRATIGRAPHIC CROSS SECTION.

STRATIGRAPHIC CROSS SECTION B – B'

SCALE; HORIZ: 1:5000
VERT: 1:300

THE BOUNDARIES BETWEEN SOIL STRATA HAVE BEEN ESTABLISHED ONLY AT BOREHOLE LOCATIONS. BETWEEN BOREHOLES THE BOUNDARIES ARE ASSUMED FROM GEOLOGICAL EVIDENCE AND MAY BE SUBJECT TO CONSIDERABLE ERROR

0 50 100 150 200 250 m

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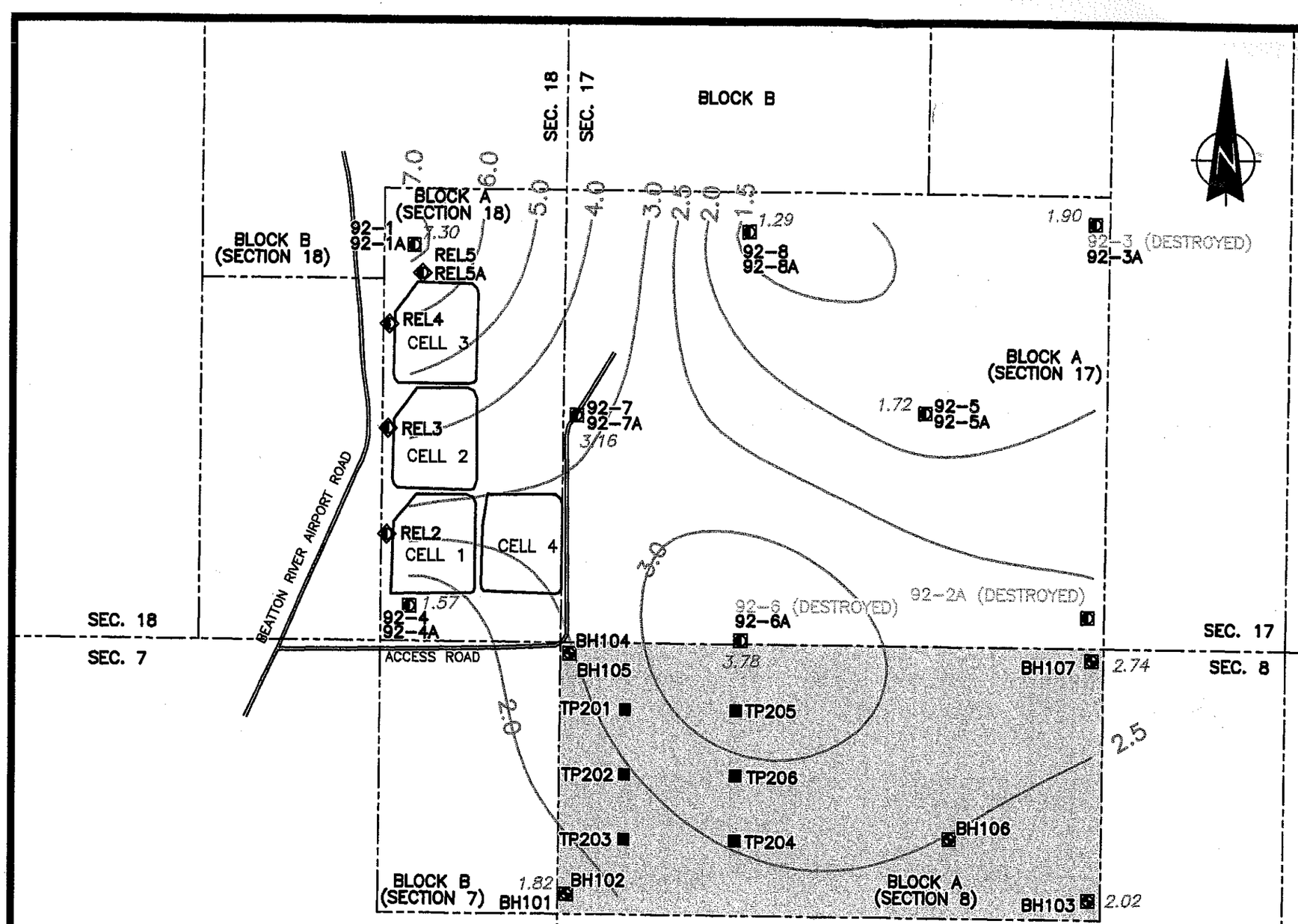
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 – TWP 88 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
STRATIGRAPHIC CROSS SECTION B – B'

DATE	APPD. BY	FILE NO.
02/01/25		C1548A4A
SCALE AS NOTED	DWN. BY DWW	DWG. NO. 6



LEGEND:

- BOREHOLE LOCATION (CLIFTON NOV 2001)
- BOREHOLE LOCATION (BY OTHERS)
- PIEZOMETER LOCATION
- MONITOR WELL
- TEST PIT LOCATION (CLIFTON NOV 2001)
- LEGAL LINE
- PROPOSED LANDFILL LOCATION

DEPTH TO GROUNDWATER (m)

- DEPTH 1.90
- DEPTH CONTOUR ~~2.0~~

NOTES:

1 DRAWING COMPILED FROM McELHANNEY ASSOCIATES DRAWING NO. 9479-16SP & SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION OF PROPOSED LANDFILL: BLOCK A, 8-88-20 W6M

3 THE 92 SERIES (i.e. 92-1) PIEZOMETERS WERE INSTALLED BY HBT AGRA LTD. IN DEC 1992 & THE REL SERIES (i.e. REL2) MONITOR WELLS WERE INSTALLED BY RUDIGER ENTERPRISES LTD. AFTER 1992.

0 100 200 300 400 500 m

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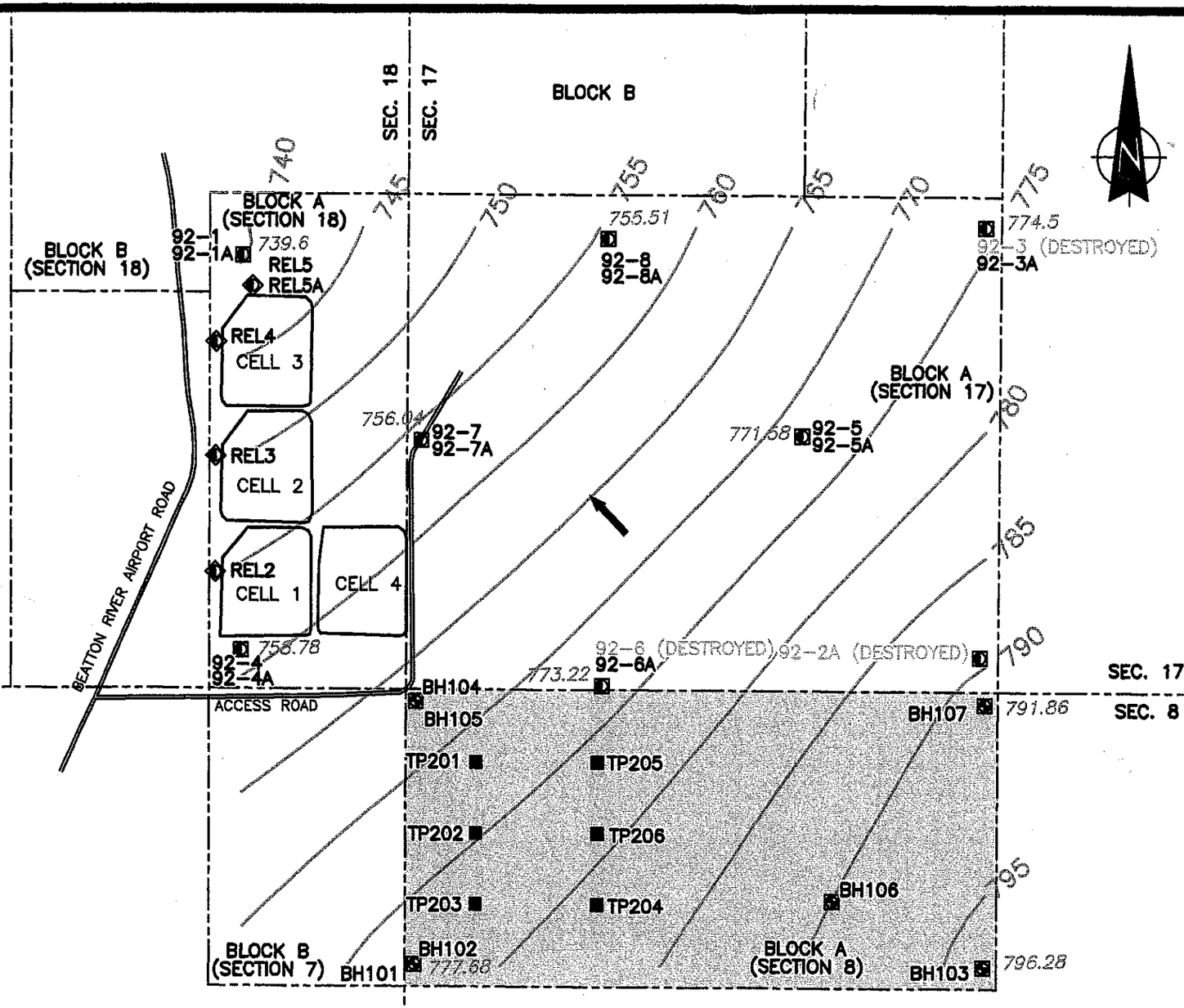
PROJECT
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 - TWP 88 - RGE 20 - W6M
BRITISH COLUMBIA

TITLE
DEPTH TO GROUNDWATER CONTOURS
DECEMBER 2001 & JANUARY 2002

REV	DESCRIPTION	BY	DATE

DATE 02/01/30 | APPD. BY | FILE NO. C1548A8A
SCALE 1:10000 | DWN. BY DWW | DWG. NO. 7



LEGEND:

- BOREHOLE LOCATION (CLIFTON NOV 2001)
- BOREHOLE LOCATION (BY OTHERS)
- PIEZOMETER LOCATION
- MONITOR WELL
- TEST PIT LOCATION (CLIFTON NOV 2001)
- LEGAL LINE
- PROPOSED LANDFILL LOCATION
- POTENTIOMETRIC SURFACE (m)
  - POTENTIOMETRIC ELEVATION 739.15
  - POTENTIOMETRIC CONTOUR ~~755~~
  - PRINCIPLE DIRECTION OF GROUNDWATER FLOW

NOTES:

1 DRAWING COMPILED FROM McELHANNEY ASSOCIATES DRAWING NO. 9479-16SP & SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION OF PROPOSED LANDFILL: BLOCK A, 8-88-20 W6M

3 THE 92 SERIES (i.e. 92-1) PIEZOMETERS WERE INSTALLED BY HBT AGRA LTD. IN DEC 1992 & THE REL SERIES (i.e. REL2) MONITOR WELLS WERE INSTALLED BY RUDIGER ENTERPRISES LTD. AFTER 1992.

0 100 200 300 400 500 m

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PROJECT
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 – TWP 88 – RGE 20 – W6M
BRITISH COLUMBIA

TITLE
SHALLOW POTENTIOMETRIC SURFACE CONTOURS
DECEMBER 2001 & JANUARY 2002

REV	DESCRIPTION	BY	DATE

DATE 02/01/30	APPD. BY	FILE NO. C1548A6A
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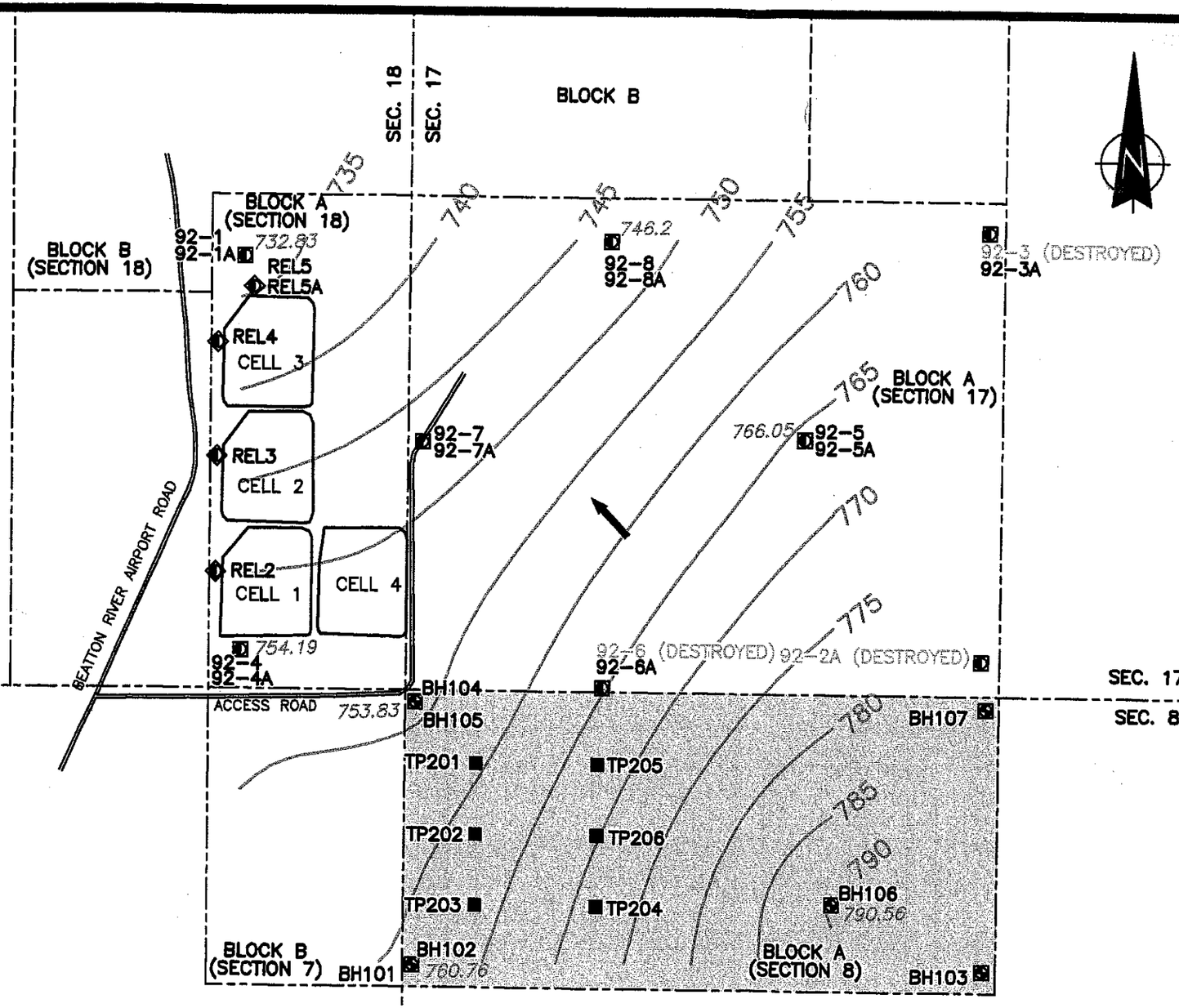

LEGEND:

- BOREHOLE LOCATION (CLIFTON NOV 2001)
- BOREHOLE LOCATION (BY OTHERS)
- PIEZOMETER LOCATION
- MONITOR WELL
- TEST PIT LOCATION (CLIFTON NOV 2001)
- LEGAL LINE
- PROPOSED LANDFILL LOCATION
- POTENTIOMETRIC SURFACE (m)
  - POTENTIOMETRIC ELEVATION 765.82
  - POTENTIOMETRIC CONTOUR ~~755~~
  - PRINCIPLE DIRECTION OF GROUNDWATER FLOW

NOTES:

1 DRAWING COMPILED FROM McELHANNEY ASSOCIATES DRAWING NO. 9479-16SP & SITE INVESTIGATION INFORMATION.

2 LEGAL DESCRIPTION OF PROPOSED LANDFILL: BLOCK A, 8-88-20 W6M

3 THE 92 SERIES (i.e. 92-1) PIEZOMETERS WERE INSTALLED BY HBT AGRA LTD. IN DEC 1992 & THE REL SERIES (i.e. REL2) MONITOR WELLS WERE INSTALLED BY RUDIGER ENTERPRISES LTD. AFTER 1992.

0 100 200 300 400 500 m

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PROJECT
HYDROGEOLOGICAL SITING SUITABILITY INVESTIGATION
BLOCK A, SECTION 8 - TWP 88 - RGE 20 - W6M
BRITISH COLUMBIA

TITLE
DEEP POTENTIOMETRIC SURFACE CONTOURS
DECEMBER 2001 & JANUARY 2002

REV	DESCRIPTION	BY	DATE

DATE	APPD. BY	FILE NO.
02/01/30		C1548A7A
SCALE 1:10000	DWN. BY DWW	DWG. NO. 9

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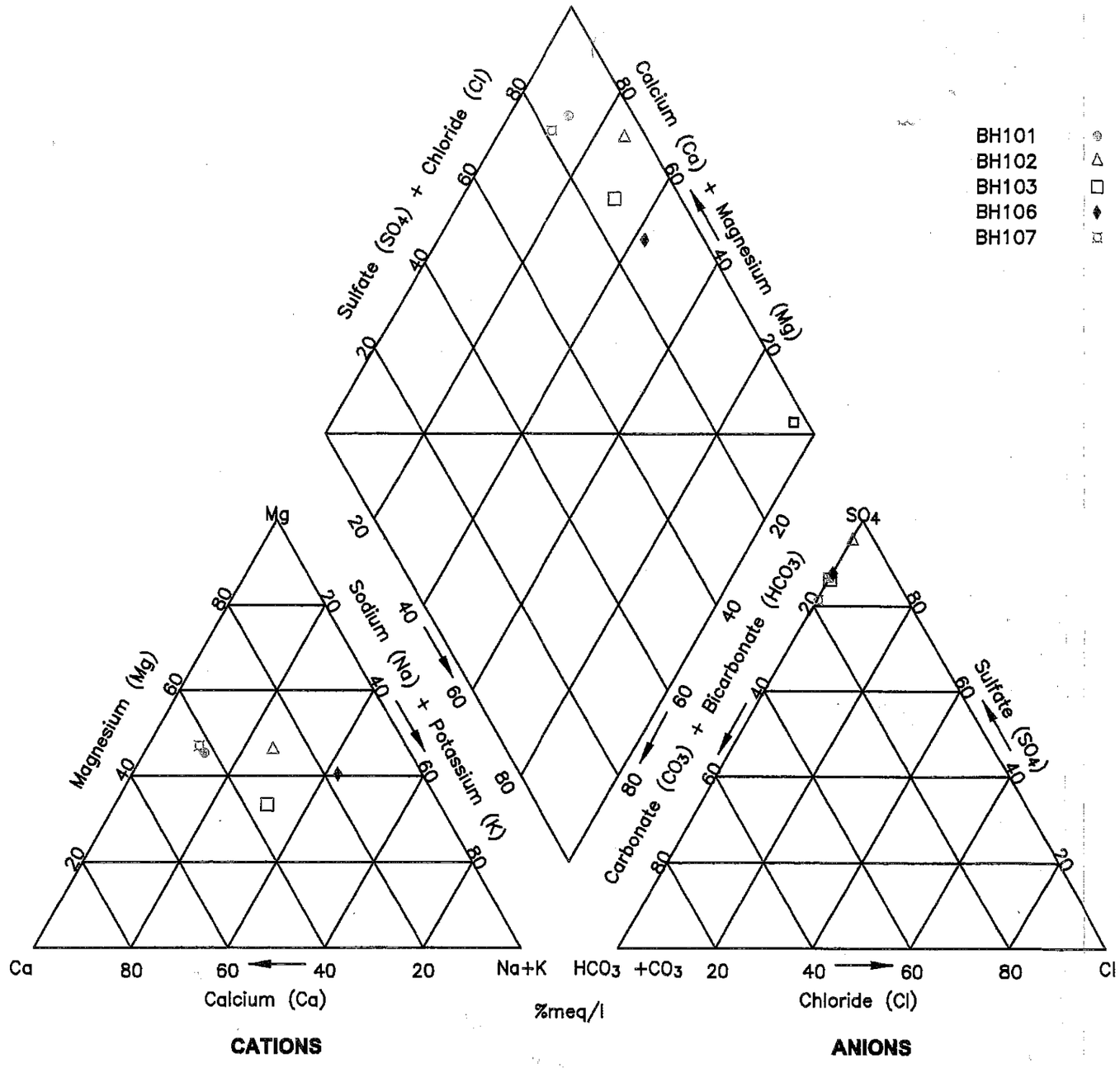
Figure



GROUNDWATER MONITORING RESULTS

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FILE NO. CGFIGC4A

FIGURE NO. 1

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Symbols & Terms

Soil Descriptive Terms

A soil description for geotechnical applications includes a description of the following properties:

- texture
- color, oxidation
- consistency ond condition
- primary and secondary structure

Texture

The soil texture refers to the size, size distribution and shape of the individual soil particles which comprise the soil. The Unified Soil Classification System (ASTM D2487-85) is a quantitative method of describing the soil texture. The basis of this system is presented overleaf. The following terms are commonly used to describe the soil texture.

Particle Size (ASTM D2487-85)

Boulder	300 mm plus
Cobble	75 - 300 mm
Gravel	4.75 - 75 mm
Coarse	19 - 75 mm
Fine	4.75 - 19 mm
Sand	0.075 - 4.75 mm
Coarse	2 - 4.75 mm
Medium	0.425 - 2 mm
Fine	0.075 - 0.425 mm
Silt and Cloy	smaller than 0.075 mm

Relative Proportions (CFEM, 3rd Ed., 1992)

Trace	1 - 10 %
Some	10 - 20 %
Gravelly, sandy, silty, clayey, etc.	20 - 35 %
and	>35 %
Gravel, Sand, Silt, Clay	>35 % and main fraction

Gradation

Well Graded	having a wide range of grain sizes and substantial amount of all intermediate sizes.
Uniform or Poorly Groded	possessing particles of predominontly one size.
Gap Groded	possessing particles of two distinct sizes.

Particle Shape

Angular	sharp edges and relatively plane sides with unpolished surfaces.
Subangular	similar to 'angular' but have rounded edges.
Subrounded	well-rounded corners and edges, neorly plane sides.
Rounded	no edges ond smoothly curved sides.

Also may be flat, elongated or both.

Color And Oxidation

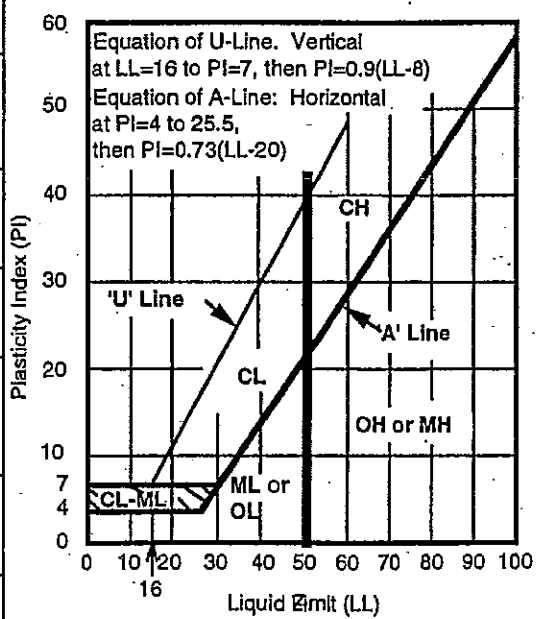
The soil color at its naturol moisture content is described by common colors and, quantitatively, in terms of the Munsell color notation; (eg. 5Y 3/1). The notation combines three variables, hue, value and chroma to describe the soil color. The hue indicates its relation to red, yellow, green, blue and purple. The volue indicates its lightness. The chroma indicates its strength of departure from a neutral of the same lightness.

Departure of the soil color from a neutrol color indicates the soil has been oxidized. Oxidation of o soil occurs in a oxygen rich environment where most commonly metallic iron, oxidizes and turns a neutral colored soil 'rusty' or reddish brown. Oxidized manganese gives a purplish tinge to the soil. Oxidation may occur throughout the entire soil mass or on fracture/joint/fissure surfaces.

Classification of Soils for Engineering Purposes

ASTM Designation D 2487-85 (Unified Soil Classification System)

Major divisions			Group Symbols	Typical names	Classification criteria
Coarse-grained soils: More than 50% retained on No. 200 sieve* (>0.075 mm)	Gravels: More than 50% of coarse fraction retained on No. 4 sieve(≥4.75 mm)	Clean gravels <5% fines	GW	Well-graded gravel	Classification on basis of percentage of fines: Less than 5% pass No. 200 sieve.....GW, GP, SW, SP; More than 12% pass No. 200 sieve.....GM, GC, SM, SC; 5 to 12% pass No. 200 sieve.....Borderline classifications requiring use of dual symbols: $C_U = \frac{D60}{D10}$ greater than 4; $C_C = \frac{(D30)^2}{D10 \times D60}$ between 1 and 3
			GP	Poorly graded gravel	Not meeting either C_U or C_C criteria for GW
		Gravels with fines >12% fines	GM	Silty gravel	Atterberg limits below "A" line or PI less than 4 / Atterberg limits on or above "A" line and PI greater than 7: Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC	Clayey gravel	
	Sands: 50% or more of coarse fraction passes No. 4 sieve(<4.75 mm)	Clean sands <5% fines	SW	Well-graded sand	$C_U = \frac{D60}{D10}$ greater than 4; $C_C = \frac{(D30)^2}{D10 \times D60}$ between 1 and 3
			SP	Poorly graded sand	Not meeting either C_U or C_C criteria for SW
		Sands with fines >12% fines	SM	Silty sand	Atterberg limits below "A" line or PI less than 4 / Atterberg limits on or above "A" line and PI greater than 7: Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC	Clayey sand	
Fine-grained soils: 50% or more passes No. 200 sieve* (≤0.075 mm)	Silts and Clays: Liquid limit <50%	Inorganic	ML	Silt	Plasticity Chart
			CL	Lean Clay -low plasticity	
		Organic	OL	Organic silt or clay	
	Silts and Clays: Liquid limit ≥50%	Inorganic	MH	Elastic silt	
			CH	Fat Clay -high plasticity	
		Organic	OH	Organic clay or silt	
	Highly organic soils		PT	Peat, muck and other highly organic soils	



*Based on the material passing the 3 in.(75 mm) sieve

Consistency And Condition

The consistency of a cohesive soil is a qualitative description of its resistance to deformatian and can be correlated with the undrained shear strength of the soil. The condition of a coarse grained soil qualitatively describes the soil campactness and can be correlated with the standard penetration resistance (ASTM D1586-84).

Consistency Of Cohesive Soil (CFEM, 2nd Edit., 1985)

Consistency	Undrained Shear Strength (kPa) (CFEM, 2nd Edt., 1985)	Field Identification (ASTM D 2488-84)
Very Soft	<12	Thumb will penetrate soil more than 25 mm.
Soft	12-25	Thumb will penetrate soil about 25 mm.
Firm	25-50	Thumb will indent soil about 6 mm.
Stiff	50-100	Thumb will indent, but penetrate only with great effort (CFEM).
Very Stiff	100-200	Readily indented by thumbnail (CFEM).
Hard	>200	Thumb will not indent soil but readily indented with thumbnail.
Very Hard	N/A	Thumbnail will not indent soil.

Condition Of Coarse Grained Soil (CFEM, 2nd Edt., 1985)

Compactness Condition	SPT N - Index (Blows/300mm)
Very Loase	0 - 4
Loase	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	over 50

Moisture Conditions (ASTM D2488-84)

Description	Criteria
Dry	Absence of moisture, dusty, dry to touch.
Maist	Damp, but no visible water.
Wet	Visible, free water, usually soil is below water table.

Symbols Used on Bore Hole Logs

Soil Type


CLAY


TILL-oxidized


CLAY SHALE


SILT


TILL-unoxidized


SANDSTONE


SAND


TOPSOIL or
ORGANIC SOIL


MUDSTONE


GRAVEL


PEAT


BEDROCK
(Undifferentiated)


COBBLES


FILL
(Undifferentiated)

Sampling Symbols


Thin Walled Tube


Core (any type)


Driven Spoon


No Recovery


Disturbed

Field and Laboratory Test Symbols

○ Natural Moisture Content

◇ Liquid Limit

\+ Plastic Limit

△ Dry Density

Shear Strength

■ Compression Test

◇ Lab Vane

□ Pocket Penetrometer

NOTE: Other laboratory testing presented on "Summary of Laboratory Testing" sheet

Groundwater Symbols

▼ Piezometric elevation as determined by a piezometer installation

▽ Water levels measured in borings at the time and under the conditions noted

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Bore Hole and Test Pit Logs

Geotech BH Log m CAL V1.tdf

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BORE HOLE LOG

Bore Hole: BH101
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	779.50 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	780.35 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample: Type	Sample: No.	Sample: SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt, trace sand. Light brown. Moist. Loose.		IH1						Protective standpipe cover, 0.85 m stickup
1		CLAY: Trace silt, trace sand. Mottled light gray and light brown. Oxidized iron staining. Moist. Stiff. Brecciated. Non-calcareous.		IH2 IH3						Bentonite Seal
2		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Light brown. Oxidized iron staining. Moist. Firm. Blocky. Occasional coal fragments and gypsum crystals. Silt and sand lenses. Non to weakly calcareous.								Water Level: 12 Jan. 2002
3				IH4						Sil 9 Sand and Bentonite
4		@ 4.6 m, stiff								50 mm Schedule 40 Solid Pipe
5				IH5						Bentonite Seal
6				IH6						Sil 9 Sand
7				IH7						50 mm Schedule 40 Slotted Pipe
8		NOTES: End of borehole at 7.3 m. Piezometer completed to 7.0 m with an above ground, locked, steel protective cover sticking-up 0.85 m. No seepage or slough encountered.								
9										
10										

Geotech BH Log m CAL V1.tif

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BORE HOLE LOG

Bore Hole: BH102
Page: 1 of 2

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	779.60 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	780.55 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10⁻⁹	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt, trace sand. Light brown. Moist. Loose.		IH8						Protective standpipe cover, 0.95 m stickup
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Very dark grayish brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky. Brecciated. Calcareous. Coal and sandstone fragments. Low plasticity.		IH9	13					Bentonite Seal
2				IH10						
3		@ 3.0 m, blocky, non to weakly calcareous		IH11						
4				IH12			44.1			
		@ 4.4 m, gray, stiff		IH13	31	CL				Sil 9 Sand and Bentonite
5				IH14						
6		@ 5.8 m, sandstone fragments		IH15	33					
				IH16						
7		@ 6.9 m, coal lens								
8		@ 7.3 m, dry, cuttings are loose on auger, calcareous		IH17						50 mm Schedule 40 Solid Pipe
9				IH18			11			
				IH19	28	CL				
10										

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BORE HOLE LOG

Bore Hole: BH102
Page: 2 of 2

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	779.60 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	780.55 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-3}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1600 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
10		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Gray. Oxidized iron staining. Dry. Stiff. Blocky. Calcareous. Coal and sandstone fragments. Low plasticity.		IH20						
11										Sil 9 Sand and Bentonite
12				IH21	24					
13		@ 13.4 m, non to weakly calcareous		IH22	24					
14										50 mm Schedule 40 Solid Pipe
15				IH23	22					
16		@ 16.3 m, silt and fine sand lenses		IH24						Bentonite Seal
17		@ 16.8 m, very dark grayish brown (2.5Y 3/2), hard								Sil 9 Sand
18		Notes: End of borehole at 19.5 m. Piezometer completed to 19.2 m with an above ground, locked, steel protective cover sticking up 0.95 m. Borehole remained open following drilling and no seepage or slough was encountered.		IH25	51					Water Level: 17 Dec. 2001
19				IH26		CL				50 mm Schedule 40 Slotted Pipe
20										

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BORE HOLE LOG

Bore Hole: BH103
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	26 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	798.30 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	799.13 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt, trace sand. Light brown. Moist. Loose.		IH27						Protective standpipe cover, 0.83 m stickup
1		SILT: Some sand, some gravel, trace clay, trace rootlets. Light brown. Oxidized. Dry. Loose. Weakly calcareous.		IH28						Bentonite Seal
2		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Stiff to hard. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH29		CL				50 mm Schedule 40 Solid Pipe
3										Water Level on 12 Jan. 2002
4				IH30		ML				
		SILT: Some sand, some clay, trace gravel. Brown. Oxidized iron staining. Moist. Firm. Coal fragments. Weakly calcareous.		IH31		CL				Sil 9 Sand
5		@ 4.3 m, wet								
		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Gray. Oxidized iron staining. Moist. Hard. Blocky. Silt and fine grained sand lenses. Weakly calcareous. Coal and sandstone fragments. Low plasticity.		IH32						
6				IH33						50 mm Schedule 40 Slotted Pipe
7		@ 7.3 m, light gray, high plasticity		IH34		CH				
		Notes: End of borehole at 7.3 m. Piezometer completed to 7.0 m with an above ground, locked, steel protective cover sticking up 0.83 m. Borehole remained open following drilling, no slough was encountered. Seepage at 4.0 m.								
8										
9										
10										

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BORE HOLE LOG

Bore Hole: BH104
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.40 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.26 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		CLAY: Silty, trace sand. Brown. Oxidized. Moist. Firm. Blocky with occasional silt and sand lenses. Weakly calcareous.		IH35						Protective standpipe cover, 0.87 m stickup
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized. Moist. Firm to stiff. Blocky. Coal fragments and gypsum crystals. Non-calcareous.		IH36						Bentonite Seal
2										50 mm Schedule 40 Solid Pipe
3				IH37						
4				IH38						Sil 9 Sand
5										50 mm Schedule 40 Slotted Pipe
6		@ 5.8 m, calcareous		IH39						
7		@ 7.2 m, silt lens, non-calcareous		IH40						
8		NOTES: End of borehole at 7.6 m. Monitoring well completed to 7.3 m with an above ground, locked, steel protective cover sticking up 0.87 m. Borehole remained open following drilling and no seepage or slough was encountered.								
9										
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 1 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH41						Protective standpipe cover, 0.88 m stickup
				IH42						
1				IH43						Bentonite Seal
				IH44	16					
2										
3				IH45						
				IH46						
4				IH47			21			
		@ 4.4 m, very dark grayish brown (2.5Y 3/2)		IH48	25					
5										Sil 9 Sand and Bentonite
		@ 5.8 m, calcareous		IH49						
6										
7				IH50						
		@ 7.4 m, noncalcareous		IH51	36	CL				
8										50 mm Schedule 40 Solid Pipe
		@ 8.5 m, silt lens		IH52						
9										
10										

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BORE HOLE LOG

Bore Hole: BH105
Page: 2 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
10		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Mottled light brown and light gray. Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Non to weakly calcareous. Coal and sandstone fragments. Gypsum crystals. Low plasticity.		IH53	30					
11										
12				IH54						Sil 9 Sand and Bentonite
13										
				IH55						
				IH56	28					50 mm Schedule 40 Solid Pipe
14		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.								
15				IH57						
		@ 15.0 m, sand lens		IH58						Water Level: 12 Jan. 2002
16										
				IH59						
				IH60	32					
17										
		@ 17.6 m, clayshale and sandstone fragments		IH61						
18		@ 18.0 m, wet		IH62			310			Bentonite Seal
		@ 18.8 m. sand lens								
19		@ 19.2 m, less silt								Sil 9 Sand
				IH63		CL				50 mm Schedule 40 Slotted Pipe
20										

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BORE HOLE LOG

Bore Hole: BH105
Page: 3 of 3

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	27 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	769.4 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	770.28 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 ▲ 50 ◆ 100 ♦)	Dry Density - kg/m3 (1800 – 2200) / Shear Strength - kPa Unconf. ■ Pocket Pen. ◆ Lab Vane ♦ (100 200 300 400)	Piezometer Construction Detail
20		CLAY: and silt, trace fine sand. Gray (5Y 5/1). Oxidized. Moist. Firm. Blocky. Fractures at 60 degrees. Iron staining along fissures. Silt and fine grained sand lenses. Low plasticity. Non-calcareous.		IH64						
21										
22		NOTES: End of borehole at 21.0 m. Piezometer completed to 20.7 m with an above ground, locked, steel protective cover sticking up 0.88 m. Borehole remained open following drilling and no slough was encountered. Seepage at 18.0 m.								
23										
24										
25										
26										
27										
28										
29										
30										

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BORE HOLE LOG

Bore Hole: BH106
Page: 1 of 2

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	28 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	795.90 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	796.75 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay and silt, trace sand, trace organics. Dark brown. Oxidized. Moist. Loose.		IH65		CL				Protective standpipe cover, 0.85 m stickup
1		TILL, OXIDIZED: Clay, silty, trace to some fine sand, trace gravel. Very dark grayish brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Coal and sandstone fragments. Gypsum crystals. Non to weakly calcareous. Low plasticity.		IH66						Bentonite Seal
2				IH67						
				IH68						
3		@ 2.3 m, gravel lense		IH69	28					
4		@ 4.1 m, sand lense @ 4.4 m, non-calcareous		IH70						
5				IH71						Sil 9 Sand and Bentonite
				IH72	28					
6		@ 6.3 m, silt lense		IH73						Water Level: 12 Jan. 2002
7				IH74			5.7			
8		@ 8.5 m, silt lense		IH75		CL				
9		@ 9.1 m, dry								50 mm Schedule 40 Solid Pipe
10										

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BORE HOLE LOG

Bore Hole: BH106
Page: 2 of 2

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	28 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	795.90 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	796.75 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	Sample SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
10		TILL, OXIDIZED: Clay, silty, trace to some fine sand, trace gravel. Very dark grayish brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky. Silt and fine grained sand lenses. Coal and sandstone fragments. Gypsum crystals. Low plasticity. Non-calcareous.		IH76						
11				IH77	53					
12				IH78						
13		@ 13.4 m, gray, silt lens, blocky, fractures at 60 degrees		IH79						Sil 9 Sand and Bentonite
14				IH80						
15		@ 14.9 m, wet		IH81						50 mm Schedule 40 Solid Pipe
		CLAY: Some silt, trace sand. Light gray. Oxidized. Dry. Sample is loose. Blocky. Iron staing along fractures. Hard clayshale and sandstone fragments. Non to weakly calcareous.		IH82	54					
16										Bentonite Seal
17				IH83						Sil 9 Sand
18		NOTES: End of borehole at 19.2 m. Piezometer completed to 18.9 m with an above ground, locked, steel protective cover sticking up 0.85 m. Borehole remained open following drilling and no slough was encountered. Seepage at 14.9 m.		IH84						50 mm Schedule 40 Slotted Pipe
19				IH85						
20										

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BORE HOLE LOG

Bore Hole: BH107
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	28 November 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	B-53
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	794.60 m	Drilling Method:	Solid Stem Auger
Project No.:	C1548	Top Casing Elev.:	795.46 m	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/s) x10^{-9}	Moisture Content (percent): Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		SILT: and clay, trace fine sand, trace gravel, trace organics. Very dark grayish brown (2.5Y 3/2). Oxidized. Dry. Soft. Loose. Non-calcareous.		IH86						Protective standpipe cover, 0.86 m stickup
				IH87						
1		@ 0.5 m, bottom of frost.		IH88		CL				50 mm Schedule 40 Solid Pipe
		TILL, OXIDIZED: Clay, silty, tract to some sand, trace gravel. Dark brown. Oxidized. Moist. Hard. Blocky. Silt, fine grained sand and gravel lenses. Weakly calcareous. Low plasticity.								
2										Bentonite Seal
				IH89						Water Level: 12 Jan. 2002
3		@ 3.0 m, dark brown								
		@ 3.6 m, non-calcareous		IH90						
4				IH91						
5		@ 3.7 m, gravel lens with abundant iron staining.								Sil 9 Sand
6		@ 5.3 m, gravel lens with abundant iron staining.		IH92		CL				50 mm Schedule 40 Slotted Pipe
7		@ 6.6 m, light gray, dry, sample is loose, iron staining along fractures		IH93						
8		NOTES: End of borehole at 7.3 m. Piezometer completed to 7.2 m with an above ground, locked, steel protective cover sticking up 0.86 m. Borehole remained open following drilling and no seepage or slough was encountered.								
9										
10										

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TEST PIT LOG

Test Pit: TP201
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	775.40 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x10^{-3}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800, 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100, 200, 300, 400)	Piezometer Construction Detail
0		TOPSOIL: Some silt, some clay. Light gray. Moist. Frozen.		IH94						
				IH95						
				IH96						
1		TILL, OXIDIZED: Clay, silty, trace to some fine sand, trace gravel. Very dark grayish brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky.								
2		@ 0.5 m, bottom of frost								
		@ 0.9 m, sand lens		IH97			14			Test Pit backfilled with excavated material
		@ 2.4 m, coal fragments and gypsum crystals								
3		@ 2.6 m, very dark grey (2.5Y 3/1)								
		@ 3.8 m, mottled light gray and dark brown		IH98						
				IH99			14			
4		@ 4.0 m, salt lens								
				IH100			14			
5		NOTES: End of hole at 4.9 m. Backfilled with excavated material.								
6										
7										
8										
9										
10										

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TEST PIT LOG

Test Pit: TP202
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	777.10 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x10^{-9}	Moisture Content percent: Plastic Limit ▲ / Natural Moisture ● / Liquid Limit ♦ (0 – 50 – 100)	Dry Density - kg/m3 (1600 – 2200); Shear Strength - kPa: Unconf. ■ / Pocket Pen. ◆ / Lab Vane ♦ (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Some silt, some clay, trace organics. Light gray. Moist. Frozen.								
		@ 0.5 m, bottom of frost		IH101						
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Very dark grayigh brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky.		IH102						
2										
		@ 2.4 m, hard		IH103						
3										
		@ 2.4 m, coal fragments and gypsum crystals		IH104						
4		@ 2.6 m, salt lens								
				IH105						
5		@ 5.2 m, wet, salt lens								
		NOTES: End of hole at 5.5 m. Backfilled with excavated material.								Test Pit backfilled with excavated material.
6										
7										
8										
9										
10										

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TEST PIT LOG

Test Pit: TP203
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	780.30 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x10^{-9}	Moisture Content percent: Plastic Limit ▲ / Natural Moisture ● / Liquid Limit ♦ (0 – 50 – 100)	Dry Density - kg/m3 ▲ (1800 – 2200); Shear Strength - kPa: Unconf. ■ / Pocket Pen. ◆ / Lab Vane ♦ (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Trace organics. Light gray. Moist. Soft. Loose. Frozen.								
		@ 0.5 m, frost								
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Very dark grayish brown (2.5Y 3/2). Oxidized iron staining. Moist. Firm. Blocky. Coal fragments and gypsum crystals.		IH106						
				IH107						
2		@ 2.4 m, wet, salt lens								Test Pit backfilled with excavated material
		@ 2.7 m, silt lens								
3				IH108			8.5			
4		@ 4.0 m, sand lens		IH109			8.5			
5				IH110			8.5			
		NOTES: End of hole at 5.5 m. Backfilled with excavated material.								
6										
7										
8										
9										
10										

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TEST PIT LOG

Test Pit: TP204
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	784.80 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x10^{-9}	Moisture Content (percent): Plastic Limit ▲ / Natural Moisture ● / Liquid Limit ◆ (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. ■ / Pocket Pen. ● / Lab Vane ◆ (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, trace silt, trace organics. Light gray. Moist. Soft. Loose. Frozen.								
		@ 0.5 m, frost								
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Dark brown. Oxidized iron staining. Moist. Soft to firm. Blocky. Coal fragments and gypsum crystals.		IH111						
2				IH112						Test Pit backfilled with excavated material
3				IH113						
4				IH114						
5				IH115						
6		NOTES: End of hole at 5.5 m. Backfilled with excavated material.								
7										
8										
9										
10										

Geotech TP Log m CAL V1.tif

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TEST PIT LOG

Test Pit: TP205
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	779.60 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x 10^{-9}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800 – 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100 – 200 – 300 – 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics. Light gray. Oxidized iron staining. Moist. Firm. Loose. Frozen.		IH116						
		@ 0.5 m, frost								
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Oxidized iron staining along fissures. Moist. Stiff to firm. Coal fragments and gypsum crystals.								
2				IH117						
		@ 2.0 m, more gravel in the till, hard		IH118						
3		@ 2.7 m, mottled light grey and dark brown								
4				IH119						
5				IH120						
6		NOTES: End of hole at 5.5 m. Backfilled with excavated material.								
7										
8										
9										
10										

Test Pit backfilled with excavated material

Geotech TP Log m CAL V1.tdf

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TEST PIT LOG

Test Pit: TP206
Page: 1 of 1

Client:	Canadian Crude Separators Inc.	Northing:	-	Date Drilled:	03 December 2001
Project:	Hydrogeological Investigation	Easting:	-	Drill:	225LC
Location:	Block A, Sec. 8-TWP88-RGE20-W6M	Ground Elev.:	781.90 m	Drilling Method:	Track Backhoe
Project No.:	C1548	Top Casing Elev.:	-	Logged by:	IHH

Depth (m)	Symbol	Soil Description	Sample Type	Sample No.	SPT 'N'	USC	K (cm/sec) x10^{-3}	Moisture Content percent: Plastic Limit / Natural Moisture / Liquid Limit (0 – 50 – 100)	Dry Density - kg/m3 (1800, 2200); Shear Strength - kPa: Unconf. / Pocket Pen. / Lab Vane (100, 200, 300, 400)	Piezometer Construction Detail
0		TOPSOIL: Clay, some organics, trace silt. Light gray. Oxidized. Moist. Loose. Frozen.								
		@ 0.5 m, frost		IH121						
1		TILL, OXIDIZED: Clay, silty, trace to some sand, trace gravel. Dark brown. Moist. Firm. Coal fragments and gypsum crystals.		IH122						
2		@ 2.0 m, stiff to hard								
		@ 2.4 m, more gravel in the till, mottled light gray and dark brown		IH123						
3										
4				IH124						
5		NOTES: End of hole at 4.6 m. Backfilled with excavated material.								Test Pit backfilled with excavated material.
6										
7										
8										
9										
10										

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Geotechnical Laboratory Test Data

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.76	IH1	Grab		25.1												190	
1.22	IH2	Grab		23.8												170	
1.52	IH3	Grab		17.9												215	
3.05	IH4	Grab		18.3												145	
4.57	IH5	Grab		18.2												145	
6.10	IH6	Grab		18.0												170	
7.31	IH7	Grab		16.0												190	

Clifton Associates Ltd.
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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH101

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.46	IH8	Shelby	100	20.8											44	145	
0.76	IH9	SPT		20.1												145	
1.52	IH10	Grab		21.2												145	
3.05	IH11	Grab		18.7												120	
4.27	IH12	Shelby	282	18.0									*5.7x10^{-9}		160	190	
4.42	IH13	SPT		17.8	18	33.4	15.4	CL	2.9	14.2	82.9					145	
4.57	IH14	Grab		19.4												120	
5.94	IH15	SPT		18.1												190	
6.10	IH16	Grab		17.9												145	
7.62	IH17	Grab		16.3												120	
8.84	IH18	Shelby	88	14.8									1.1x10^{-8}		324	215	
8.99	IH19	SPT		15.9	16.1	28.6	12.5	CL	3.0	15.6	45.9	35.5				145	
10.36	IH20	Grab		15.9												145	
11.89	IH21	SPT		16.8												120	
13.41	IH22	SPT		16.8												120	
14.94	IH23	SPT		17.1												120	
16.31	IH24	Grab		16.3												95	
17.98	IH25	SPT		14.0												120	
19.35	IH26	Grab		15.3	16.3	32.7	16.4	CL	11.6	18.4	75.6					215	

* EBA Engineering Constant Head Result = 4.41x10^{-8}

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8 - TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH102

Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clay, some sand, firm, Fe stains, silt lenses.

Sample Type	SY	Method of compaction	N/A
Load on Sample	12.4 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	33 (mm)	Ht. of Specimen	34 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	222.25 (g)	Mass of Sample	226.81 (g)
Volume of Sample	104.2 (cm^3)	Volume of Sample	106.1 (cm^3)
Water Content	17.1 %	Water Content	18.8 %
Estimated Dry Density	1,821 (kg/m^3)	Estimated Dry Density	1,799 (kg/m^3)

Range of Hydraulic Gradient From 4.2 To 6.8

	Time (min.)	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	2,953.0	6.8	8.8E-09
	3,886.0	6.5	8.2E-09
	4,569.0	6.5	4.3E-09
	5,307.0	6.3	5.4E-09
	5,780.0	6.3	4.3E-09
	7,278.0	6.0	6.2E-09
	8,513.0	5.8	6.1E-09
	9,866.0	5.6	4.5E-09
	12,730.5	5.3	4.7E-09
	13,106.0	5.2	6.4E-09
	15,613.0	4.9	5.0E-09
	17,262.0	4.7	5.6E-09
	19,835.5	4.4	5.1E-09
	21,678.0	4.2	5.2E-09
	AVERAGE	5.6	5.7E-09

Specific Gravity (Determined using ASTM D854-92) N/A

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Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548 Sample No. IH12

EBA Engineering Consultants Ltd.

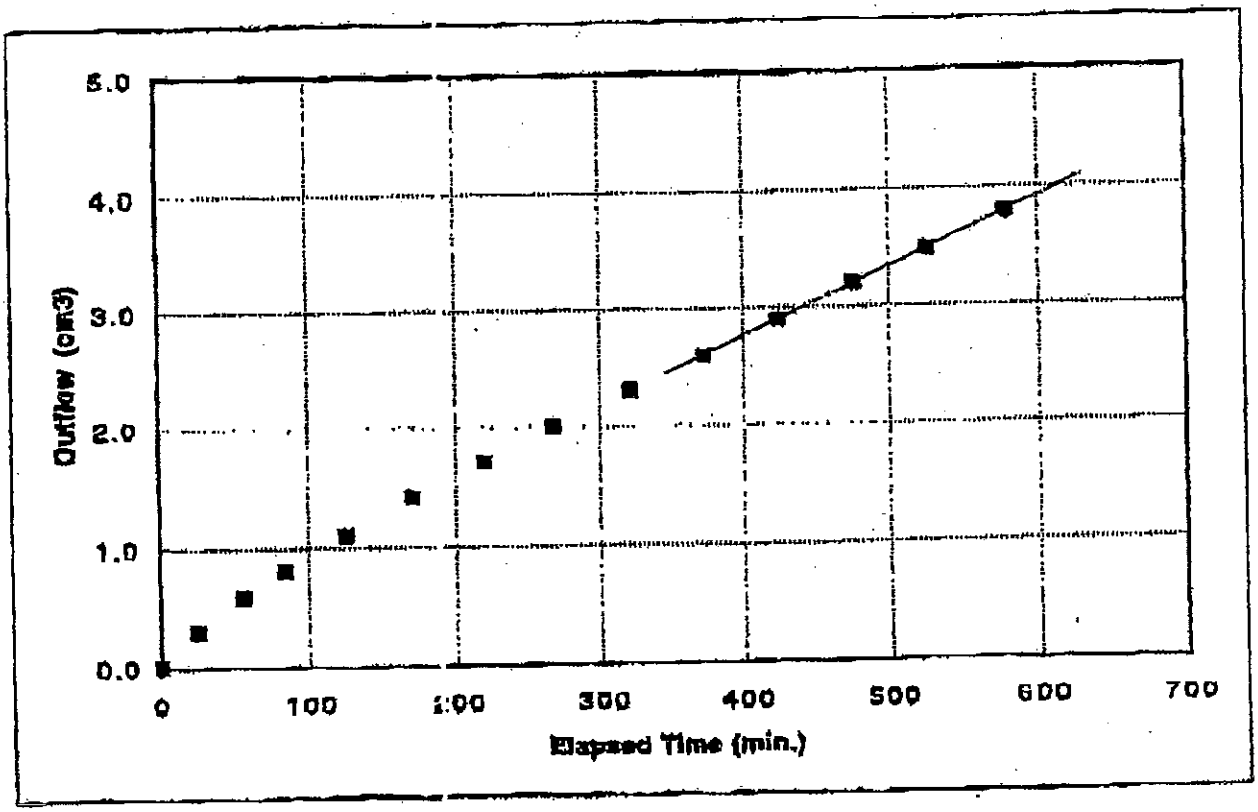
CONSTANT HEAD PERMEABILITY TEST

Job Number: 0304-99-31116
Test Hole: 102 Depth: 14 ft.

CAL JOB No. C1548
Sample No.: IH12
Date: 01-12-18
Test No: P-1

Time	Buret (cc)	Elap. (min)	Outflow (cc)
7:12	11.3	0	0.0
7:37	11.6	25	0.3
8:08	11.9	56	0.6
8:36	12.1	84	0.8
9:18	12.4	126	1.1
10:02	12.7	170	1.4
10:52	13.0	220	1.7
11:40	13.3	268	2.0
12:33	13.6	321	2.3
13:25	13.9	373	2.6
14:16	14.2	424	2.9
15:07	14.5	475	3.2
15:59	14.8	527	3.5
16:51	15.1	579	3.8

Diameter=	71.02	mm
Height=	25.32	mm
Volume=	100.30	cm3
Head Diff.=	2	psi
Q=	0.00010	cm3/sec
i=	55.56	
A=	39.61	cm2
K=	4.41E-08	cm/sec



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To Ram From Syl Kurash
Co./Dept. EBA Foothills Co. EBA Edm.

File C1548

Unified Sieve

Project No.	CG1548		
Laboratory ID No.	FSJ522	Sample No.	IH13
Original Dry Wt	144.33 g	Date	12/6/01
Wash Dry Wt.	24.74 g	Technician	NM
Minus 75 Material	119.59 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	24.7	144.3	100.00%	
25	24.7	144.3	100.00%	
19	24.7	144.3	100.00%	
12.5	24.7	144.3	100.00%	
9.5	21.9	141.5	98.00%	
4.75	20.6	140.2	97.15%	
2.36	20.1	139.7	96.76%	2.85% Gravel
1.18	14.3	133.9	92.79%	
0.6	14.3	133.9	92.79%	
0.3	13.3	132.9	92.05%	
0.075	0.1	119.7	82.90%	14.25% Sand
				82.90% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 16 Blows	Liquid Limit (LW) 15 Blows
Tare No.	1	3	4
Wt of Tare	1.36	1.37	1.42
Wt of Wet Soil + Tare	22.71	46.20	41.88
Wt of Dry Soil + Tare	19.46	34.53	31.27
Wt of Water (Ww)	3.25	11.67	10.61
Wt of Dry Soil	18.10	33.16	29.85
Water content %	17.96%	35.19%	35.54%
Correction factor		0.94785	0.94054
Corrected Limit	17.96%	33.36%	33.43%

Group Index: **12**

Pw 17.96%

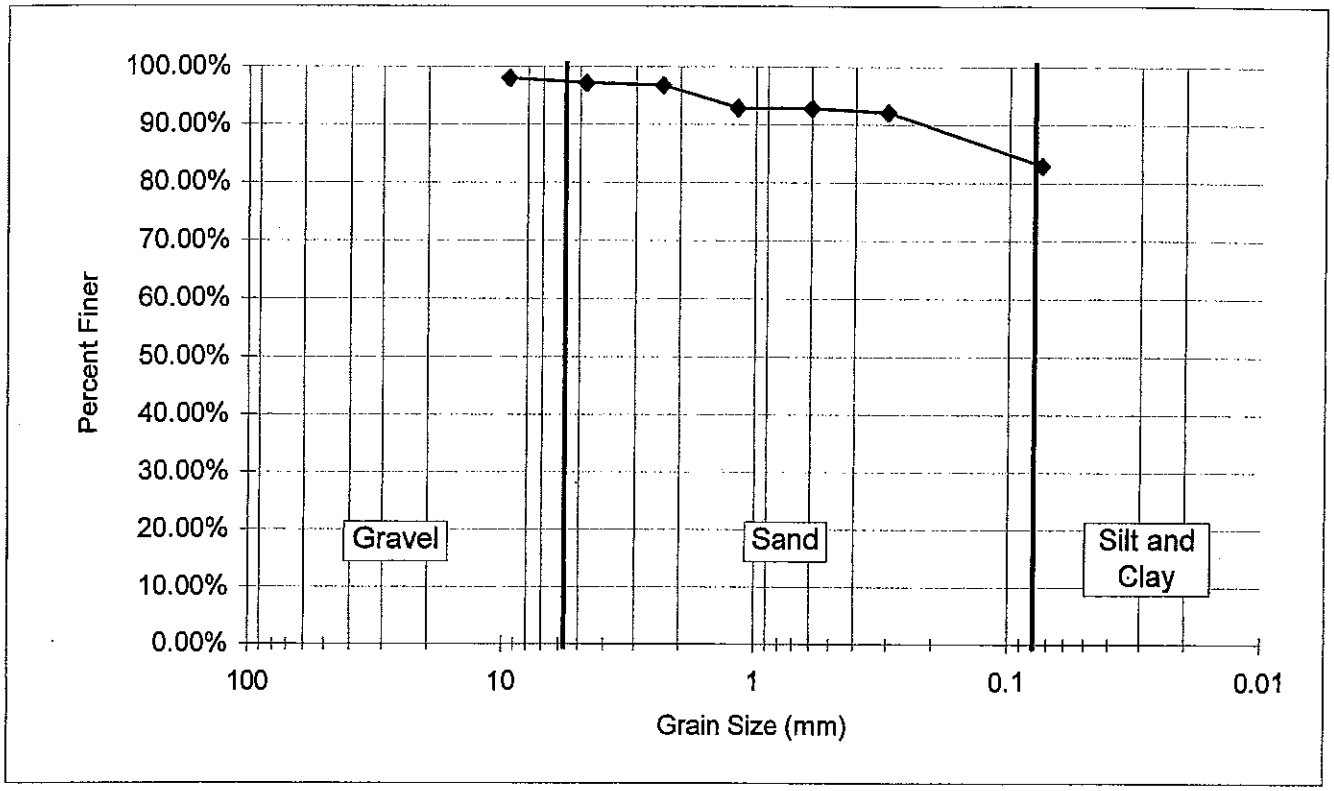
Lw 33.39%

PI 15.44%

Soil type: Inorganic

Fines type: CL

Classification: CL - Lean clay with sand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70.00%
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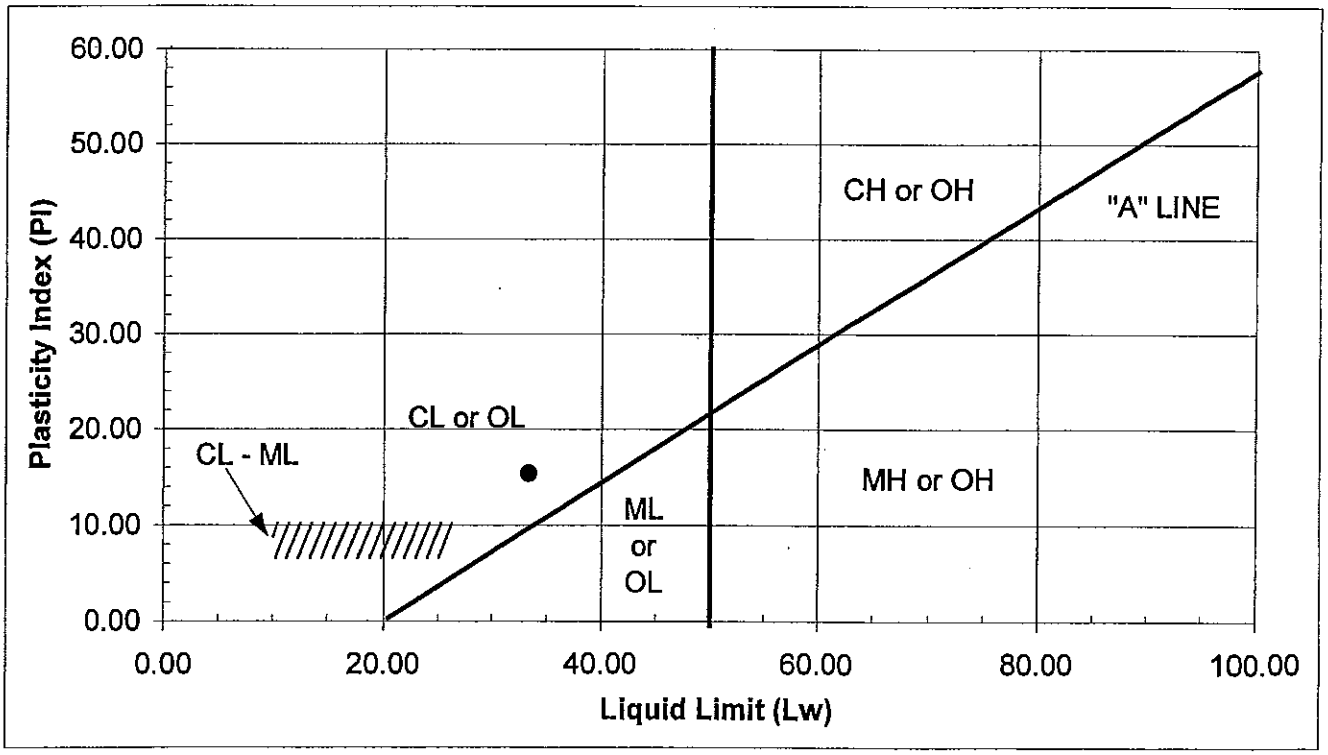
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clay, some silt and sand, stiff, Fe stains, silt pockets, black deposits, moist

Sample Type	SY	Method of compaction	N/A
Load on Sample	12.4 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	31 (mm)	Ht. of Specimen	32 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	207.02 (g)	Mass of Sample	210.41 (g)
Volume of Sample	97.6 (cm^3)	Volume of Sample	99.6 (cm^3)
Water Content	14.8 %	Water Content	18.5 %
Estimated Dry Density	1,848 (kg/m^3)	Estimated Dry Density	1,783 (kg/m^3)

Range of Hydraulic Gradient From 3.8 To 4.5

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	2,389.5	4.5	5.4E-08
	2,564.0	4.5	8.0E-09
	2,746.0	4.5	7.7E-09
	2,889.0	4.4	9.9E-09
	3,811.0	4.4	3.9E-09
	4,131.0	4.3	4.6E-09
	5,219.0	4.3	2.0E-09
	8,550.0	3.9	5.3E-09
	9,592.0	3.8	3.9E-09
	9,731.0	3.8	6.0E-09
	AVERAGE	4.3	1.1E-08

Specific Gravity (Determined using ASTM D854-92) N/A

Clifton Associates Ltd.
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Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548
Sample No.	IH18

File C1548

Unified Sieve

Project No.	CG1548		
Laboratory ID No.	FSJ523	Sample No.	IH19
Original Dry Wt	155.84 g	Date	12/6/01
Wash Dry Wt.	32.58 g	Technician	NM
Minus 75 Material	123.26 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	32.6	155.8	100.00%	
25	32.6	155.8	100.00%	
19	32.6	155.8	100.00%	
12.5	32.6	155.8	100.00%	
9.5	32.6	155.8	100.00%	
4.75	27.9	151.2	96.99%	
2.36	22.8	146.1	93.74%	3.01% Gravel
1.18	16.2	139.4	89.48%	
0.6	16.2	139.4	89.46%	
0.3	14.7	138.0	88.53%	
0.075	0.1	123.3	79.14%	17.85% Sand
				79.14% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 18 Blows	Liquid Limit (LW) 19 Blows
Tare No.	5	6	13
Wt of Tare	1.37	1.44	1.33
Wt of Wet Soil + Tare	23.75	49.32	51.49
Wt of Dry Soil + Tare	20.65	38.40	40.00
Wt of Water (Ww)	3.10	10.92	11.49
Wt of Dry Soil	19.28	36.96	38.67
Water content %	16.08%	29.55%	29.71%
Correction factor		0.96135	0.96760
Corrected Limit	16.08%	28.40%	28.75%

Group Index: **7.9**

Pw 16.08%

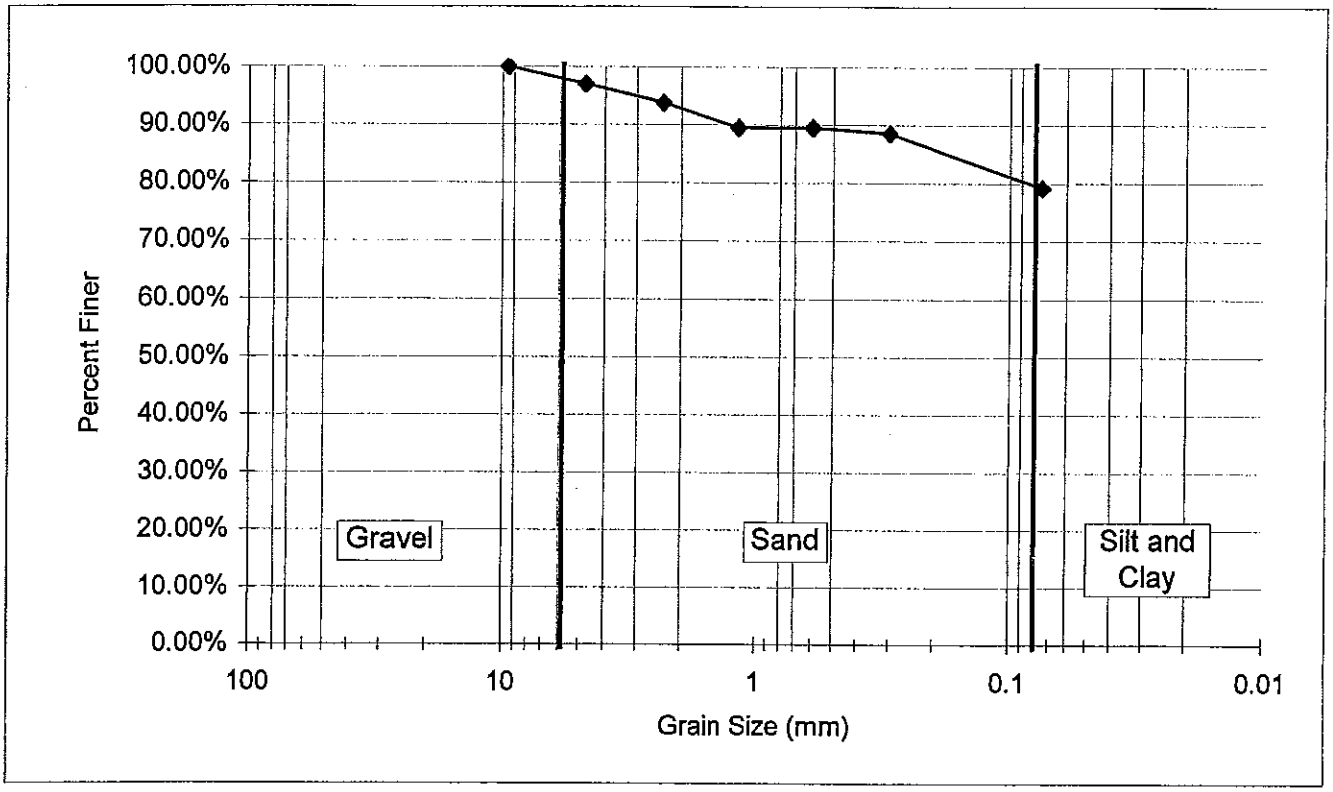
Lw 28.58%

PI 12.50%

Soil type: Inorganic

Fines type: CL

Classification: CL - Lean clay with sand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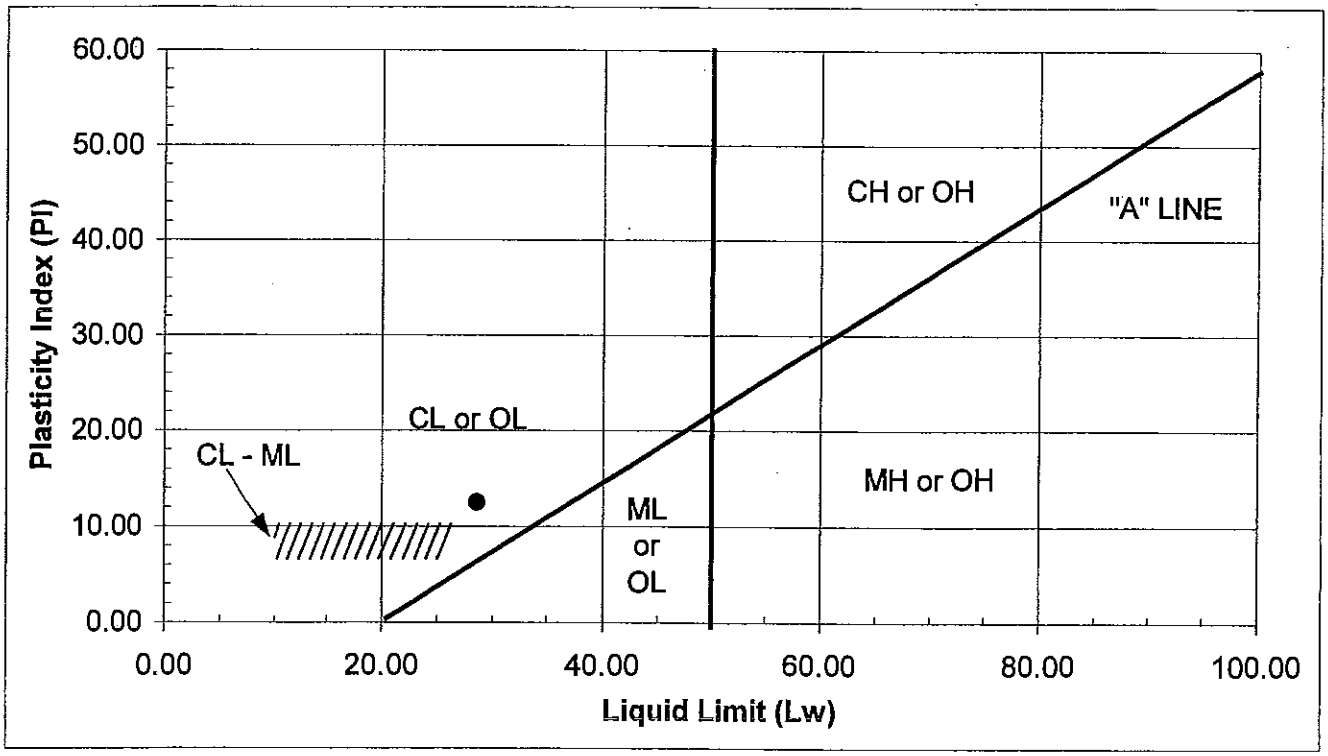
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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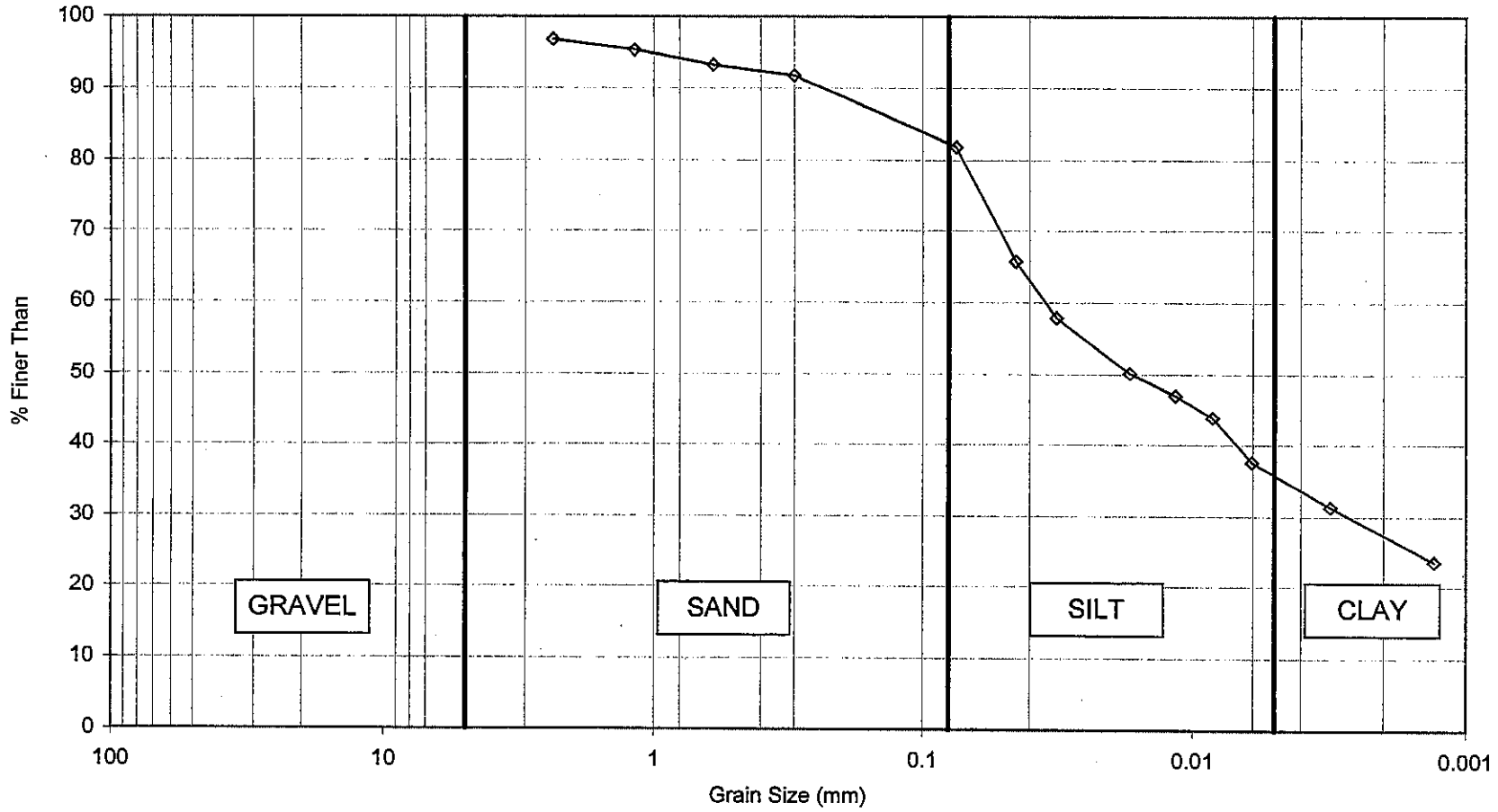
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH19 - BH102



Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSI524	Sample No.	IH26
Original Dry Wt	144.04 g	Date	12/6/01
Wash Dry Wt.	35.22 g	Technician	NM
Minus 75 Material	108.82 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	35.2	144.0	100.00%	
25	35.2	144.0	100.00%	
19	35.2	144.0	100.00%	
12.5	29.5	138.4	96.06%	
9.5	29.5	138.4	96.06%	
4.75	26.6	135.5	94.04%	
2.36	23.8	132.7	92.09%	5.96% Gravel
1.18	21.0	129.8	90.11%	
0.6	18.8	127.6	88.59%	
0.3	16.6	125.4	87.04%	
0.075	0.2	109.0	75.66%	18.38% Sand
				75.66% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 27 Blows	Liquid Limit (LW) 26 Blows
Tare No.	15	16	17
Wt of Tare	1.34	1.36	1.42
Wt of Wet Soil + Tare	23.44	45.61	42.02
Wt of Dry Soil + Tare	20.34	34.78	32.07
Wt of Water (Ww)	3.10	10.83	9.95
Wt of Dry Soil	19.00	33.42	30.65
Water content %	16.32%	32.41%	32.46%
Correction factor		1.00928	1.00470
Corrected Limit	16.32%	32.71%	32.62%

Group Index: **10**

Pw 16.32%

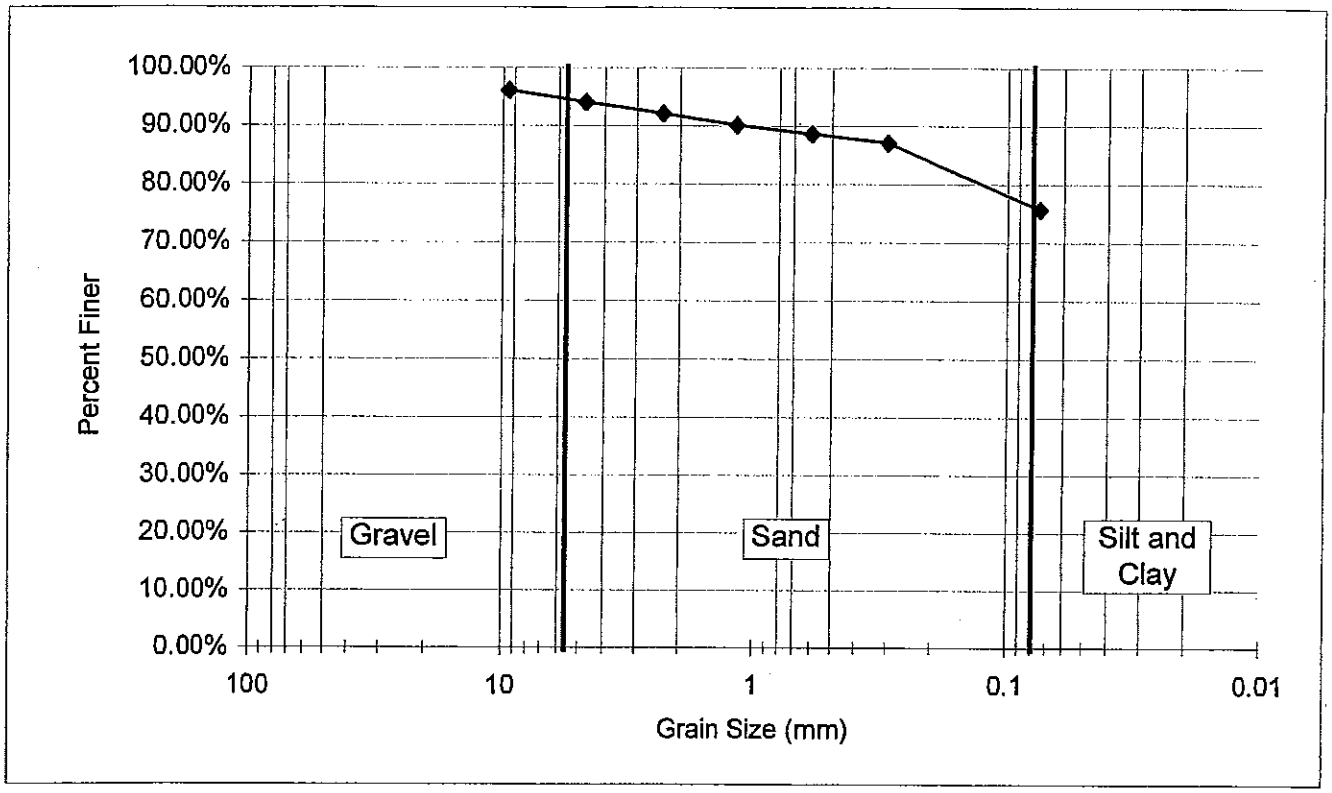
Lw 32.66%

PI 16.35%

Soil type: Inorganic

Fines type: CL

Classification: CL - Lean clay with sand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70.00%
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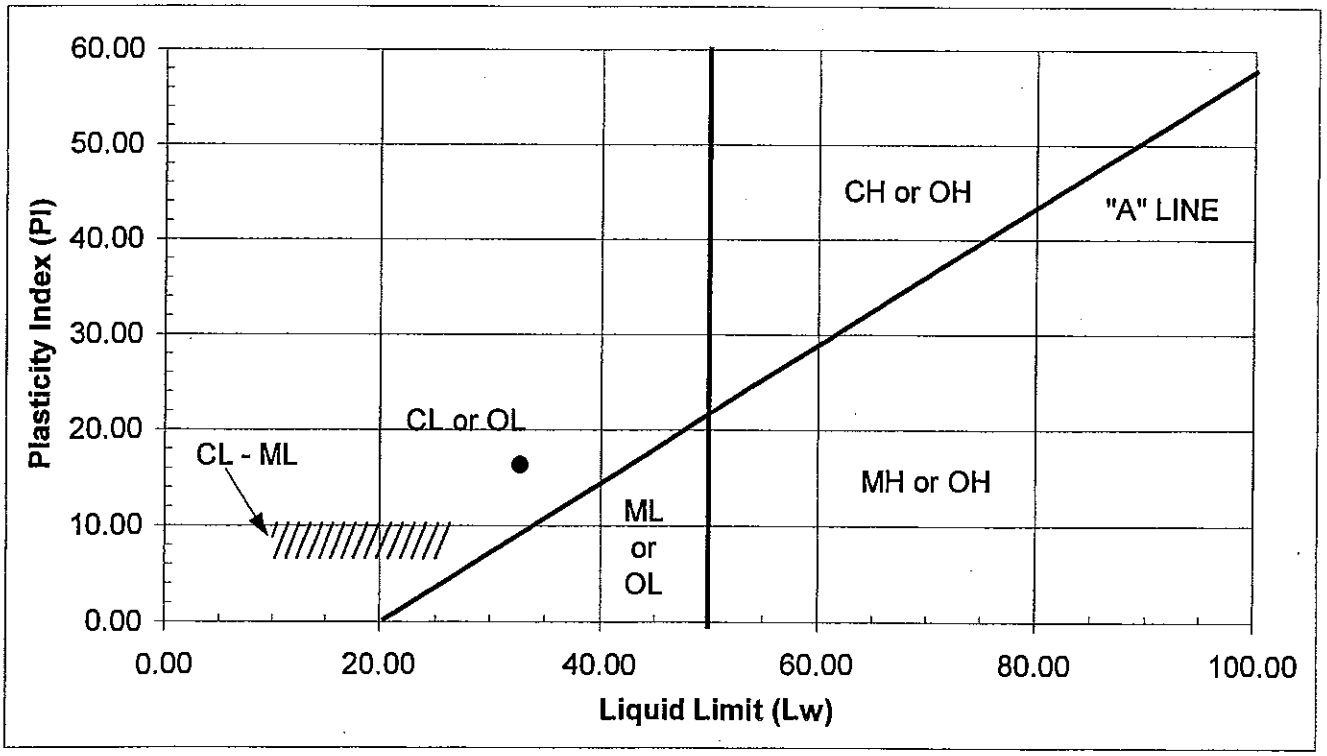
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
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0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.76	IH27	Grab		15.5												70	
1.22	IH28	Grab		15.3												190	
2.74	IH29	Grab		14.6	18.9	31.2	12.3	CL	3.1	16.8	80.1					190	
3.96	IH30	Grab		17.8	19.1	19.7	0.7	ML	0.1	29.1	70.8						
4.57	IH31	Grab		16.1	19.4	37.2	17.8	CL	0.6	9.7	89.7					215	
5.49	IH32	Grab		11.8													
6.10	IH33	Grab		13.4													
7.32	IH34	Grab		14.7	26.8	51.3	24.5	CH	0.0	1.1	21.4	77.5					

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH103

Unified Sieve

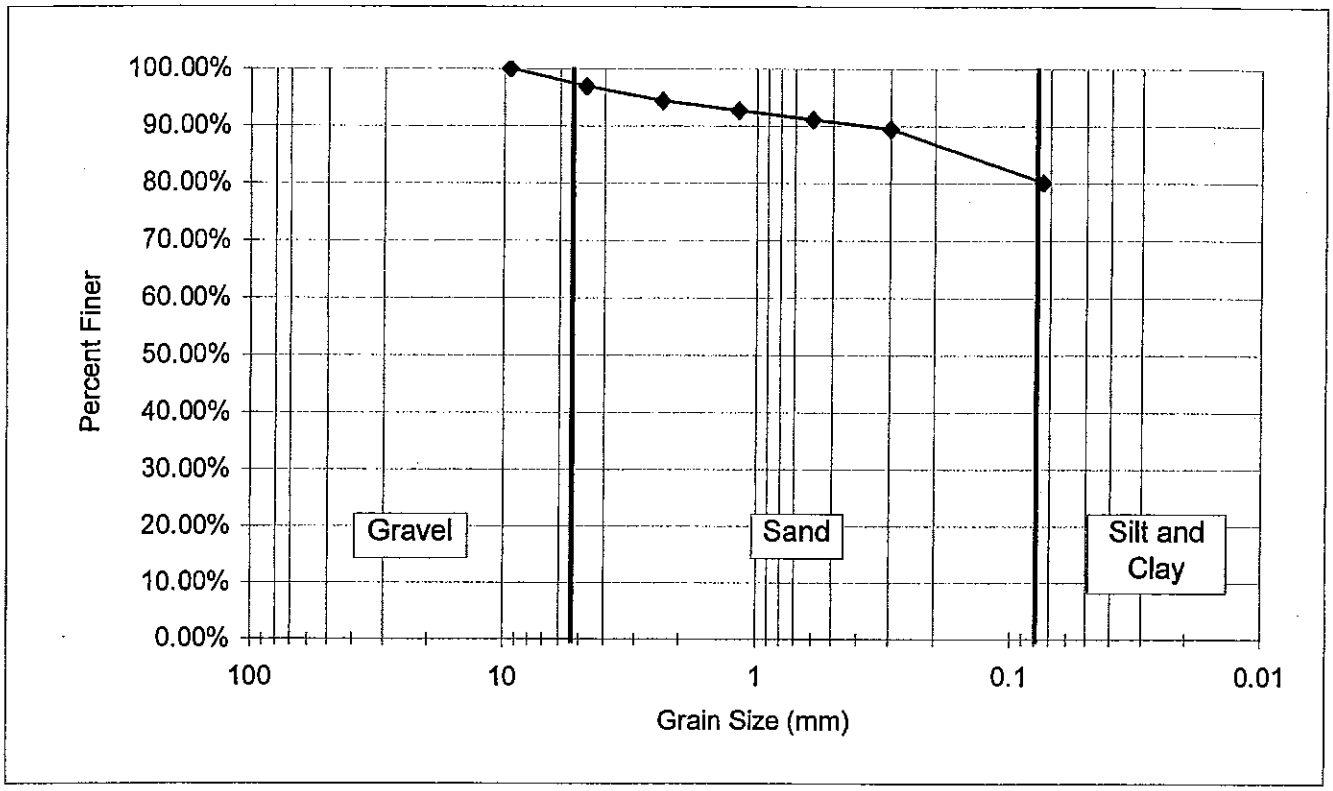
Laboratory ID No.	FSJ525	Project No.	C1548
Original Dry Wt	163.36 g	Sample No.	IH29
Wash Dry Wt.	32.72 g	Date	12/6/01
Minus 75 Material	130.64 g	Technician	NM

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	32.7	163.4	100.00%	
25	32.7	163.4	100.00%	
19	32.7	163.4	100.00%	
12.5	32.7	163.4	100.00%	
9.5	32.7	163.4	100.00%	
4.75	27.7	158.4	96.93%	
2.36	23.5	154.1	94.36%	3.07% Gravel
1.18	20.7	151.4	92.65%	
0.6	18.1	148.8	91.07%	
0.3	15.5	146.1	89.45%	
0.075	0.3	130.9	80.13%	16.80% Sand
				80.13% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 23 Blows	Liquid Limit (LW) 22 Blows
Tare No.	18	19	20
Wt of Tare	1.38	1.38	1.37
Wt of Wet Soil + Tare	24.11	44.73	38.22
Wt of Dry Soil + Tare	20.50	34.27	29.40
Wt of Water (Ww)	3.61	10.46	8.82
Wt of Dry Soil	19.12	32.89	28.03
Water content %	18.88%	31.80%	31.47%
Correction factor		0.99004	0.98478
Corrected Limit	18.88%	31.49%	30.99%

Group Index: **8.6**

Pw	18.88%	Soil type:	Inorganic
Lw	31.24%	Fines type:	CL
PI	12.36%	Classification:	CL - Lean clay with sand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70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
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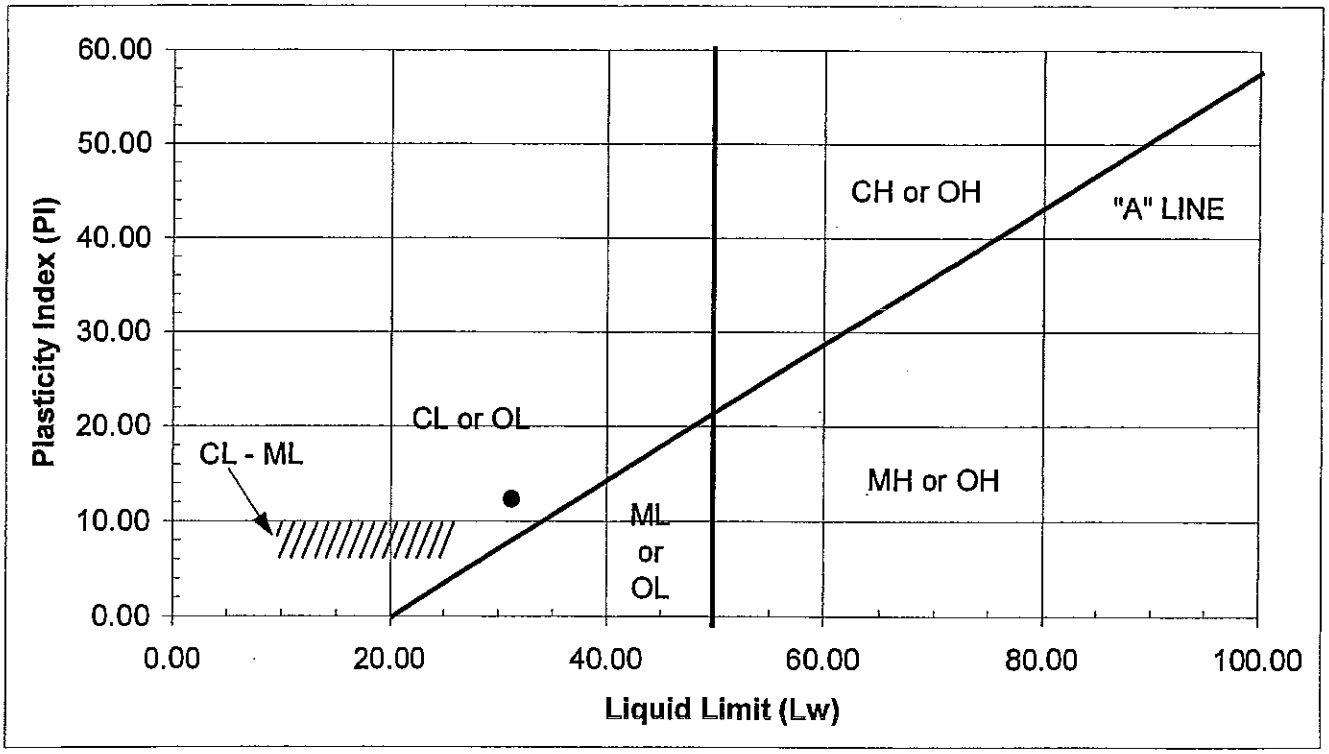
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

File C1548

Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSJ526	Sample No.	IH30
Original Dry Wt	150.33 g	Date	12/6/01
Wash Dry Wt.	44.90 g	Technician	NM
Minus 75 Material	105.43 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	44.9	150.3	100.00%	
25	44.9	150.3	100.00%	
19	44.9	150.3	100.00%	
12.5	44.9	150.3	100.00%	
9.5	44.9	150.3	100.00%	
4.75	44.7	150.2	99.89%	
2.36	43.8	149.2	99.25%	0.11% Gravel
1.18	43.1	148.5	98.80%	
0.6	42.5	147.9	98.38%	
0.3	41.5	147.0	97.76%	
0.075	1.0	106.4	70.79%	29.10% Sand
				70.79% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 18 Blows	Liquid Limit (LW) 20 Blows
Tare No.	23	22	21
Wt of Tare	1.37	1.45	1.36
Wt of Wet Soil + Tare	20.59	59.22	49.75
Wt of Dry Soil + Tare	17.51	49.45	41.54
Wt of Water (Ww)	3.08	9.77	8.21
Wt of Dry Soil	16.14	48.00	40.18
Water content %	19.08%	20.35%	20.43%
Correction factor		0.96135	0.97358
Corrected Limit	19.08%	19.57%	19.89%

Group Index: **0**

Pw 19.08%

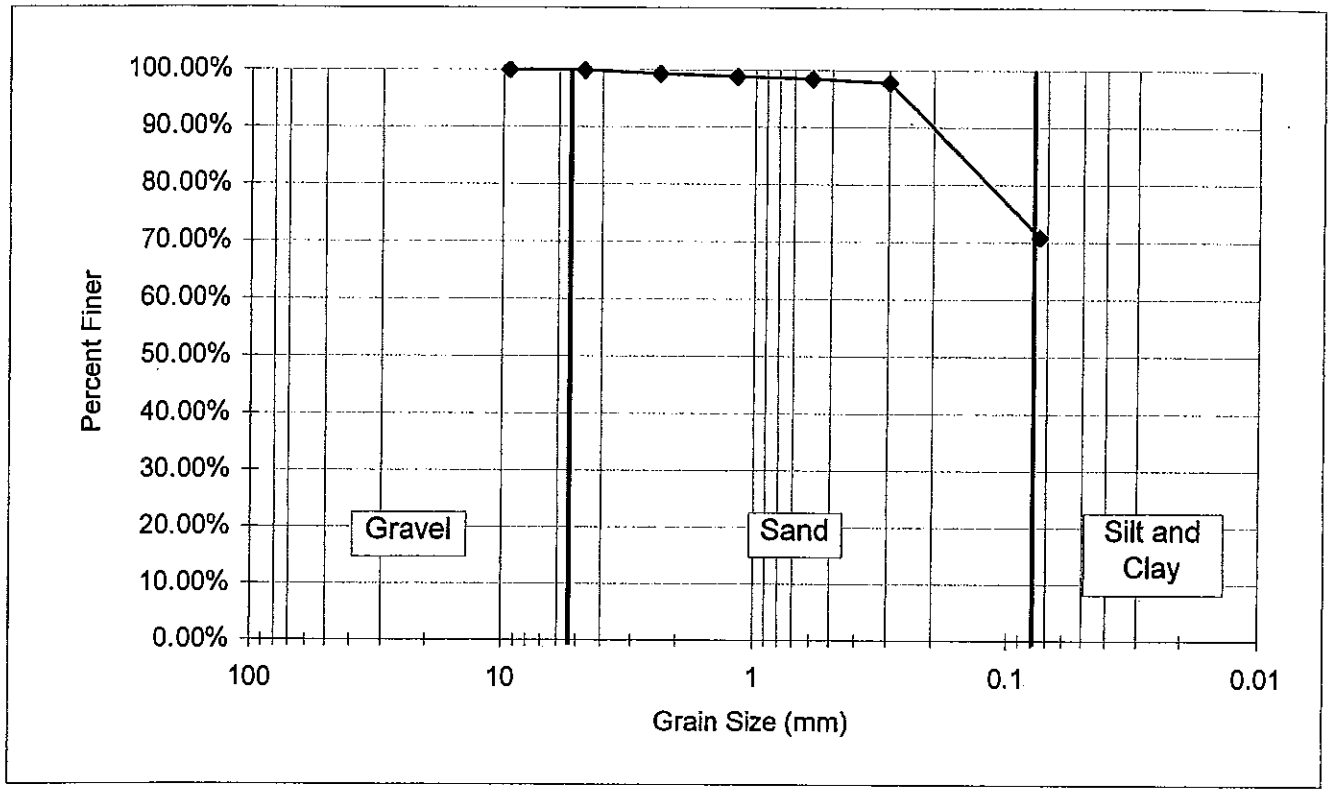
Lw 19.73%

PI 0.65%

Soil type: Inorganic

Fines type: ML

Classification: ML - Silt with sand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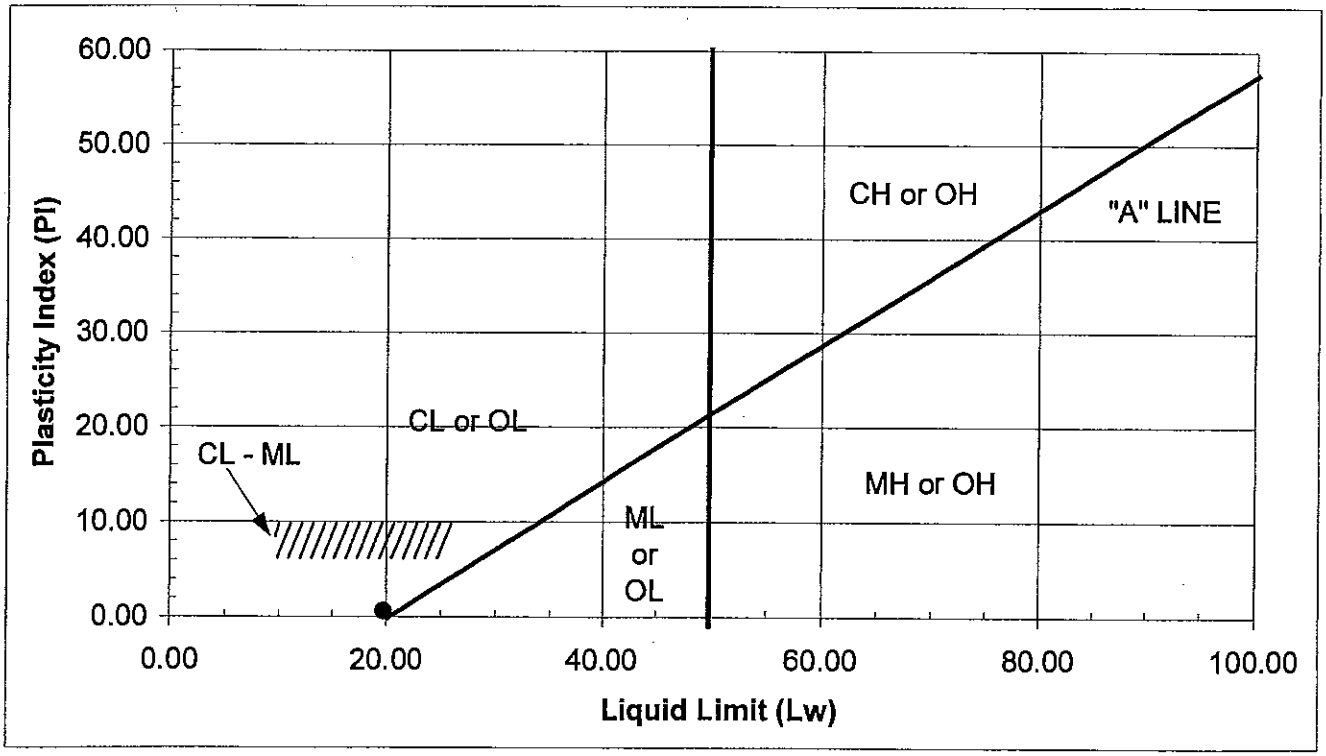
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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20.00
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0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Unified Sieve

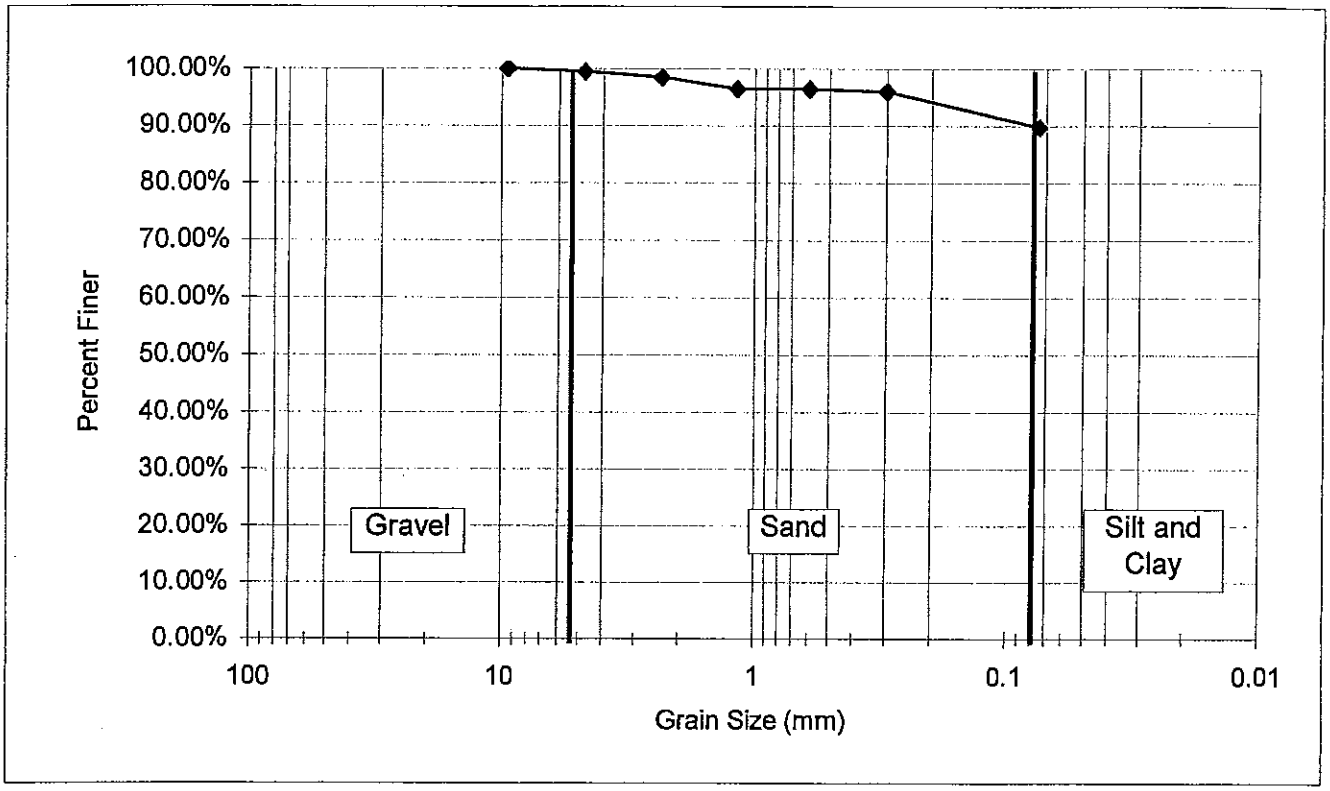
Project No.	C1548		
Laboratory ID No.	FSJ527	Sample No.	IH31
Original Dry Wt	126.11 g	Date	12/6/01
Wash Dry Wt.	12.97 g	Technician	NM
Minus 75 Material	113.14 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	13.0	126.1	100.00%	
25	13.0	126.1	100.00%	
19	13.0	126.1	100.00%	
12.5	13.0	126.1	100.00%	
9.5	13.0	126.1	100.00%	
4.75	12.3	125.4	99.44%	
2.36	11.1	124.2	98.48%	0.56% Gravel
1.18	8.5	121.6	96.42%	
0.6	8.4	121.6	96.41%	
0.3	7.9	121.0	95.95%	
0.075	0.0	113.2	89.74%	9.71% Sand
				89.74% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 30 Blows	Liquid Limit (LW) 28 Blows
Tare No.	24	25	26
Wt of Tare	1.33	1.34	1.33
Wt of Wet Soil + Tare	24.12	42.21	41.96
Wt of Dry Soil + Tare	20.41	31.27	31.07
Wt of Water (Ww)	3.71	10.94	10.89
Wt of Dry Soil	19.08	29.93	29.74
Water content %	19.44%	36.55%	36.62%
Correction factor		1.02212	1.01369
Corrected Limit	19.44%	37.36%	37.12%

Group Index: **16**

Pw	19.44%	Soil type:	Inorganic
Lw	37.24%	Fines type:	CL
PI	17.80%	Classification:	CL - Lean clay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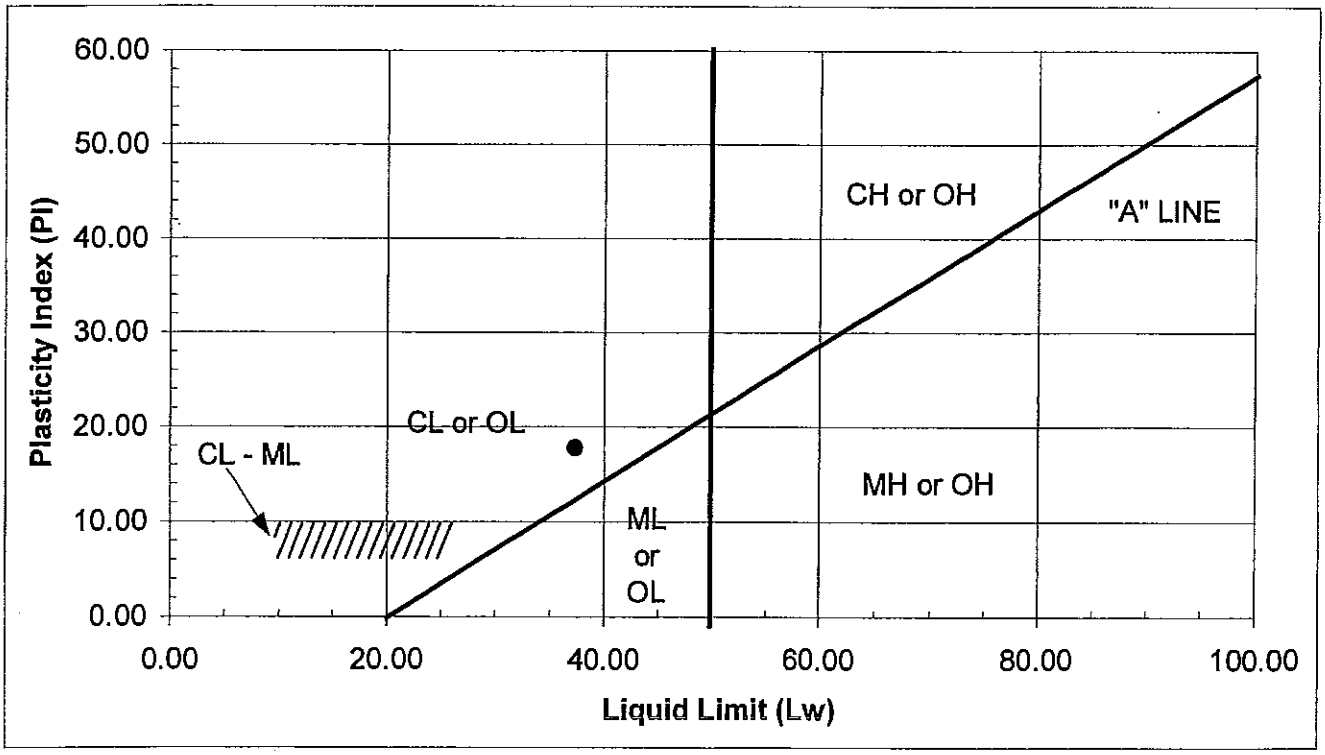
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
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20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSJ528	Sample No.	IH34
Original Dry Wt	165.31 g	Date	12/6/01
Wash Dry Wt.	10.89 g	Technician	NM
Minus 75 Material	154.42 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	10.9	165.3	100.00%	
25	10.9	165.3	100.00%	
19	10.9	165.3	100.00%	
12.5	10.9	165.3	100.00%	
9.5	10.9	165.3	100.00%	
4.75	10.9	165.3	100.00%	
2.36	10.7	165.2	99.91%	0.00% Gravel
1.18	10.3	164.8	99.67%	
0.6	8.5	162.9	98.54%	
0.3	5.9	160.3	96.98%	
0.075	0.2	154.6	93.51%	6.49% Sand
				93.51% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 28 Blows	Liquid Limit (LW) 27 Blows
Tare No.	27	28	29
Wt of Tare	1.33	1.32	1.34
Wt of Wet Soil + Tare	23.08	39.72	40.78
Wt of Dry Soil + Tare	18.49	26.87	27.42
Wt of Water (Ww)	4.59	12.85	13.36
Wt of Dry Soil	17.16	25.55	26.08
Water content %	26.75%	50.29%	51.23%
Correction factor		1.01369	1.00928
Corrected Limit	26.75%	50.98%	51.70%

Group Index: **26**

Pw 26.75%

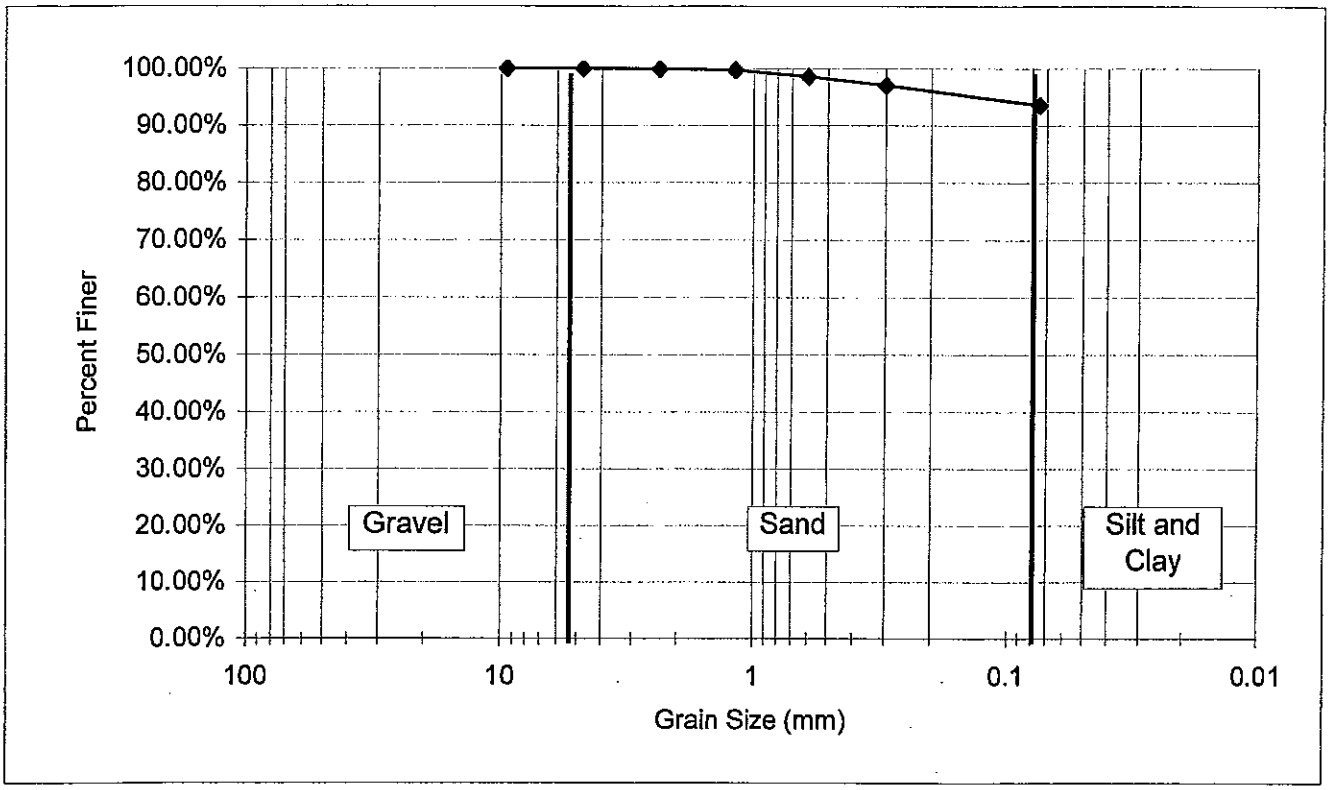
Lw 51.34%

PI 24.59%

Soil type: Inorganic

Fines type: CH

Classification: CH - Fat clay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60.00%
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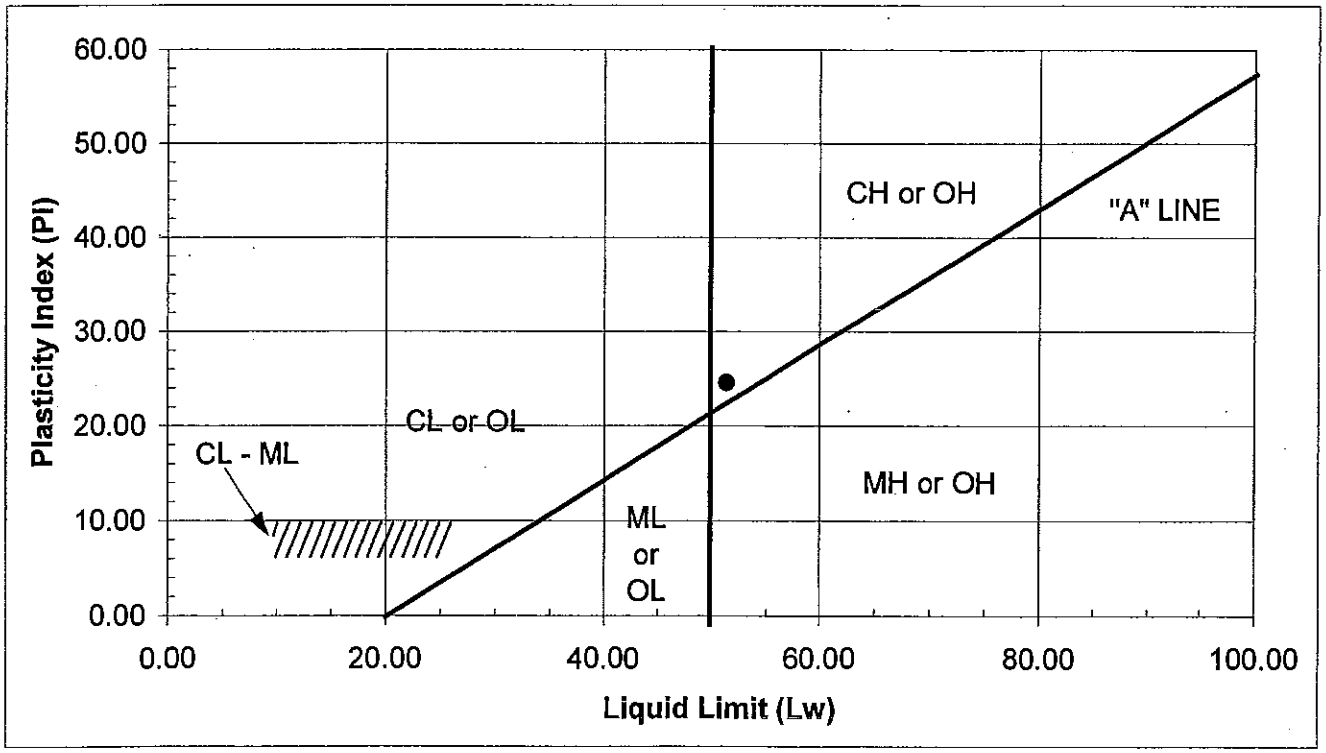
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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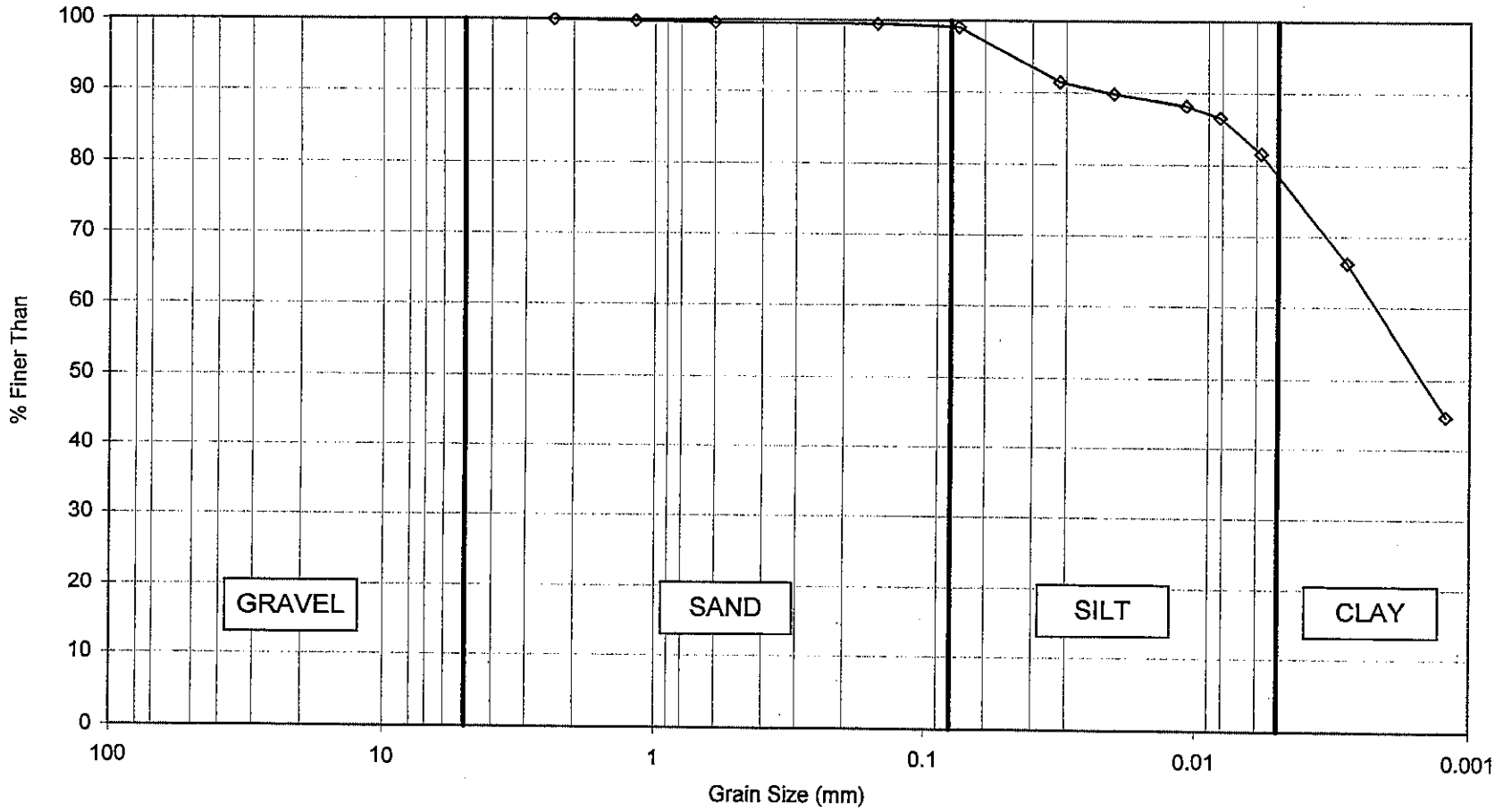
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH34 - BH103



SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.30	IH35	Grab		27.3												215	
1.22	IH36	Grab		19.5												120	
2.74	IH37	Grab		19.0												145	
4.27	IH38	Grab		17.4												145	
5.79	IH39	Grab		16.8												145	
7.32	IH40	Grab		15.8												145	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.

BH104

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE				WATER CONTENT	CONSISTENCY				GRADATION				FALLING HEAD PERMEABILITY TEST	SHEAR STRENGTH			DRY DENSITY
DEPTH	NUMBER	TYPE	RECOVERY		PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY		COMPRESSION TEST	LAB VANE	POCKET PEN	
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.30	IH41	Grab		18.0												215	
0.46	IH42	Shelby	12.5	20.5											106	120	
1.22	IH43	Grab		19.3												120	
1.37	IH44	SPT		18.9												170	
2.74	IH45	Grab		18.3												170	
3.81	IH46	Grab		17.6												170	
4.27	IH47	Shelby	198	17.2									$2.1x10^{-8}$		166	145	
4.42	IH48	SPT		16.0												145	
5.79	IH49	Grab		16.4												145	
7.32	IH50	Shelby	215	16.9											176	145	
7.47	IH51	SPT		16.2	17.1	32	14.9	CL	0.9	13.3	46.8	39.0				190	
8.84	IH52	Grab		15.8												145	
10.36	IH53	SPT		15.5												145	
11.89	IH54	Grab		15.2												170	
13.41	IH55	Grab		15.8												145	
13.56	IH56	SPT		15.6												170	
14.94	IH57	Grab		21.6												50	
15.24	IH58	Grab		20.4												70	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.

BH105

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
16.46	IH59	Grab		28.5												50	
16.61	IH60	SPT		23.0												120	
17.53	IH61	Grab		24.0												120	
17.98	IH62	Shelby	410	22.3									$3.1x10^{-7}$		78	215	
19.81	IH63	Grab		28.0	21.3	45.7	24.3	CL	0.0	1.6	41.4	57.0				120	
21.03	IH64	Grab		25.4												120	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH105

Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clay, some silt, trace gravel, firm, glauber salts, Fe stains, black deposits, moist

Sample Type	SY	Method of compaction	N/A
Load on Sample	12.1 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	35 (mm)	Ht. of Specimen	36 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	235.4 (g)	Mass of Sample	240.8 (g)
Volume of Sample	110.3 (cm^3)	Volume of Sample	114.4 (cm^3)
Water Content	17.2 %	Water Content	20.3 %
Estimated Dry Density	1,822 (kg/m^3)	Estimated Dry Density	1,749 (kg/m^3)

Range of Hydraulic Gradient From 2.2 To 3.0

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	1,287.0	3.0	8.3E-08
	1,445.0	2.9	4.1E-08
	2,533.0	2.7	1.5E-08
	5,864.0	2.4	8.6E-09
	6,904.0	2.3	6.5E-09
	7,335.0	2.3	3.2E-09
	8,312.0	2.2	1.0E-08
	8,733.5	2.2	3.4E-09
	AVERAGE	2.5	2.1E-08

Specific Gravity (Determined using ASTM D854-92) N/A

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Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548
Sample No.	IH47

Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSJ529	Sample No.	IH51
Original Dry Wt	149.31 g	Date	12/7/01
Wash Dry Wt.	24.88 g	Technician	NM
Minus 75 Material	124.43 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	24.9	149.3	100.00%	
25	24.9	149.3	100.00%	
19	24.9	149.3	100.00%	
12.5	24.9	149.3	100.00%	
9.5	24.9	149.3	100.00%	
4.75	23.6	148.0	99.14%	
2.36	21.5	145.9	97.71%	0.86% Gravel
1.18	19.2	143.6	96.16%	
0.6	17.2	141.6	94.85%	
0.3	14.9	139.4	93.34%	
0.075	0.2	124.7	83.50%	15.65% Sand
				83.50% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 24 Blows	Liquid Limit (LW) 22 Blows
Tare No.	30	31	32
Wt of Tare	1.34	1.42	1.47
Wt of Wet Soil + Tare	24.28	49.38	39.99
Wt of Dry Soil + Tare	20.93	37.69	30.57
Wt of Water (Ww)	3.35	11.69	9.42
Wt of Dry Soil	19.59	36.27	29.10
Water content %	17.10%	32.23%	32.37%
Correction factor		0.99511	0.98478
Corrected Limit	17.10%	32.07%	31.88%

Group Index: **11**

Pw 17.10%

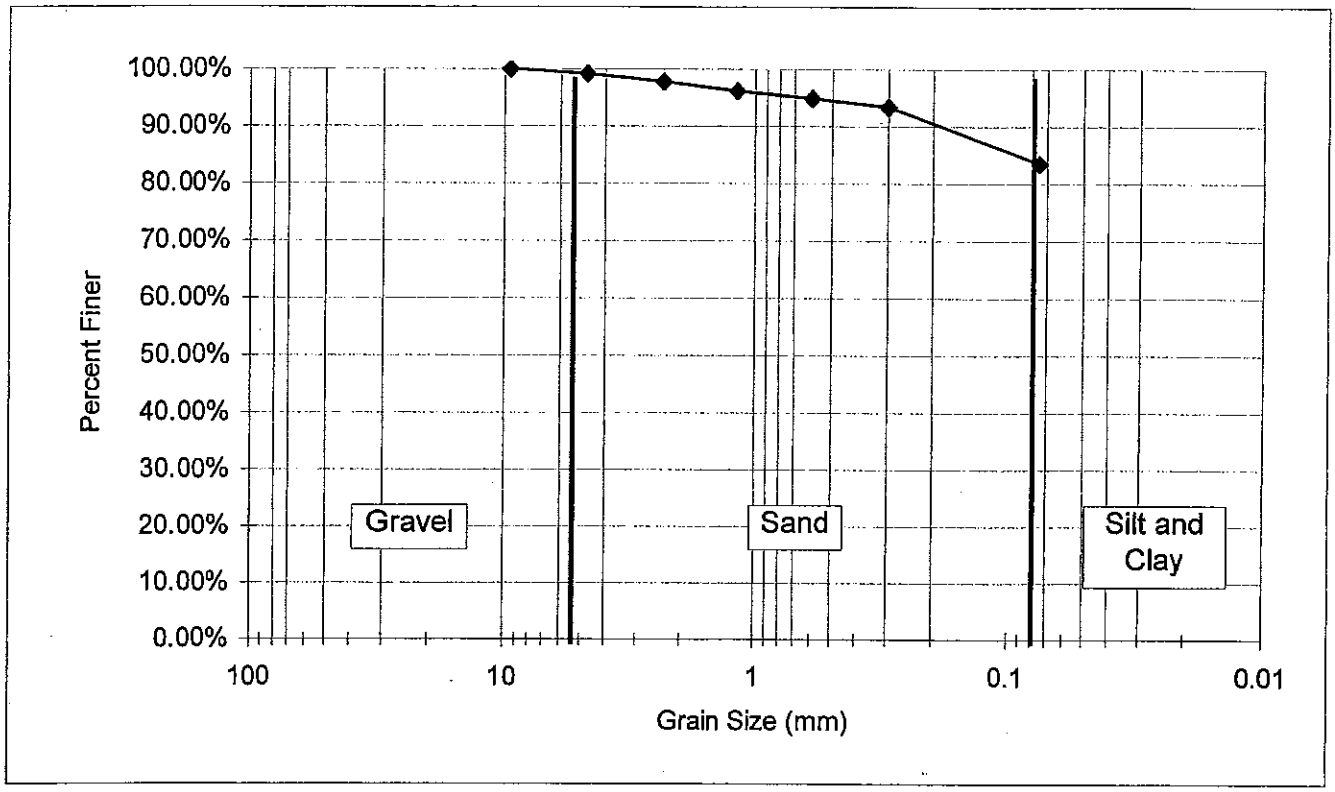
Lw 31.98%

PI 14.88%

Soil type: Inorganic

Fines type: CL

Classification: CL - Lean clay with sand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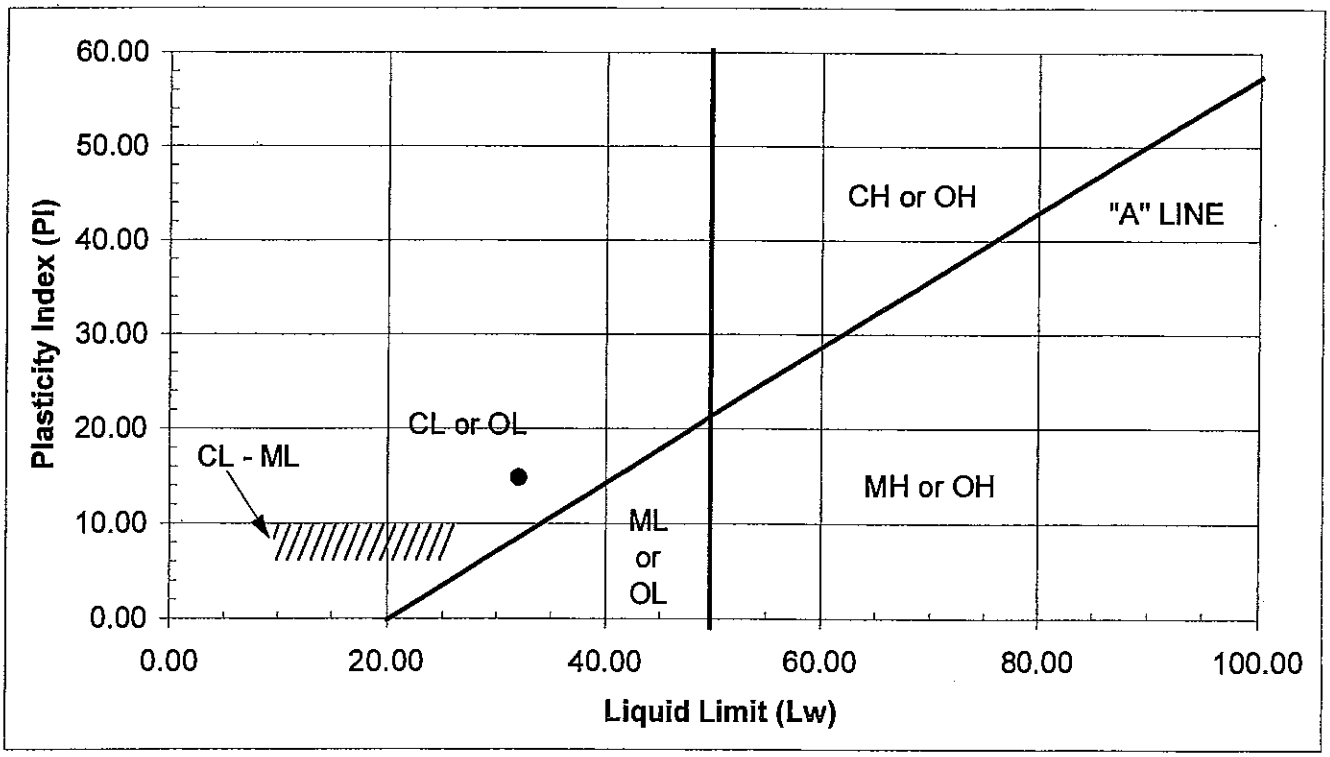
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
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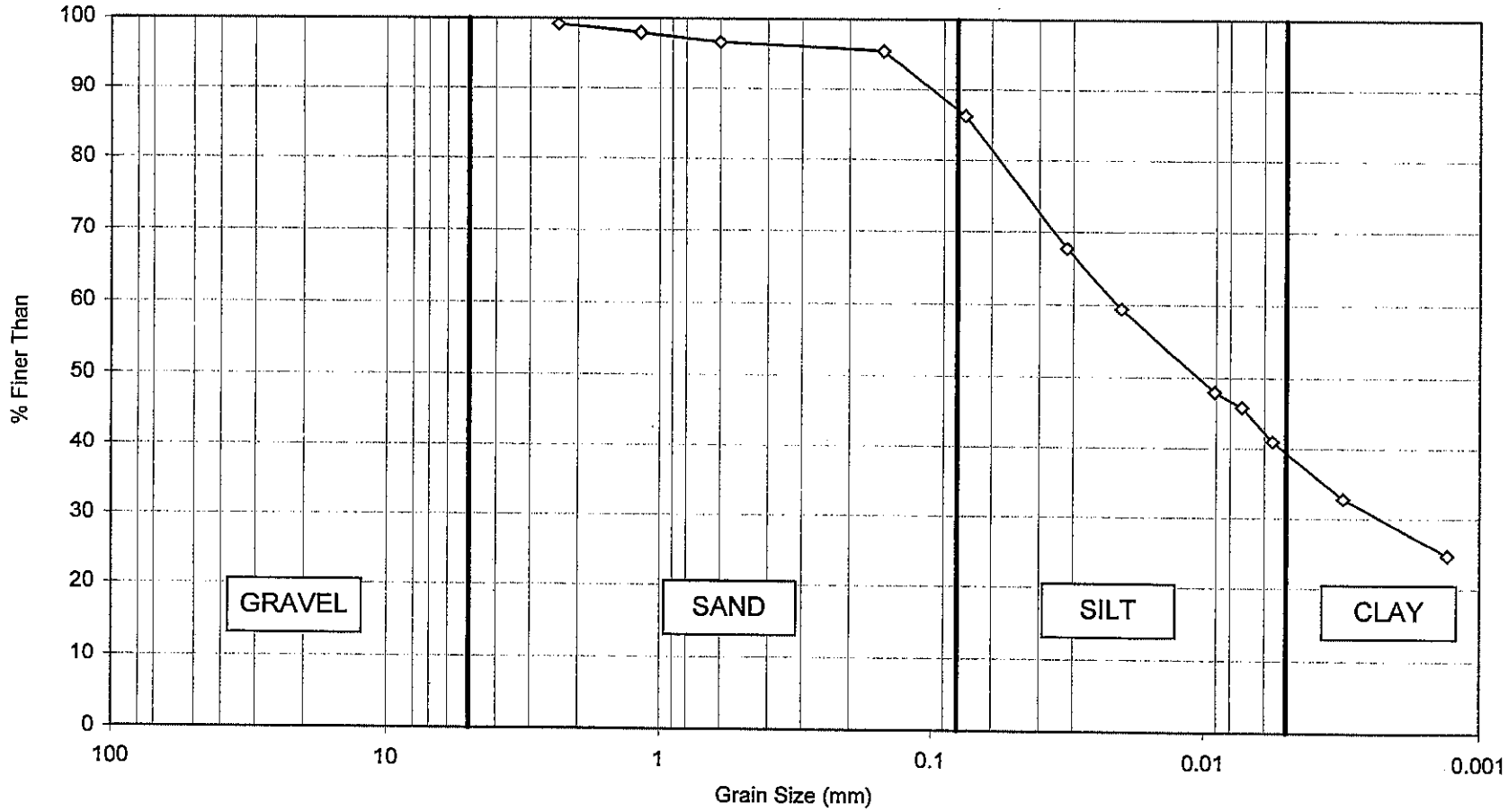
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution

C1548 - IH51 - BH105



Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clayey silt, trace fine sand, stiff, silt layers, laminated, moist-dry

Sample Type	SY	Method of compaction	N/A
Load on Sample	11.6 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	34 (mm)	Ht. of Specimen	34 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	221.85 (g)	Mass of Sample	226.5 (g)
Volume of Sample	107.8 (cm^3)	Volume of Sample	108.6 (cm^3)
Water Content	22.3 %	Water Content	18.8 %
Estimated Dry Density	1,683 (kg/m^3)	Estimated Dry Density	1,756 (kg/m^3)

Range of Hydraulic Gradient From 0.7 To 15.5

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	1,230.5	3.5	3.2E-07
	1,389.5	2.8	2.9E-07
	2,478.5	0.7	2.4E-07
Run 2	6,847.5	3.3	2.7E-07
	6,971.5	2.8	2.4E-07
	7,278.5	1.9	2.4E-07
Run 3	9,870.5	15.5	3.8E-07
	9,967.5	13.0	3.5E-07
	10,069.5	10.9	3.3E-07
	10,141.5	9.7	3.3E-07
	10,198.5	8.8	3.2E-07
	10,227.5	8.4	3.1E-07
	11,159.5	1.9	3.2E-07
	11,314.5	1.4	3.2E-07
	11,473.5	1.1	3.2E-07
	11,499.5	1.1	3.1E-07
	AVERAGE	5.4	3.1E-07

Specific Gravity (Determined using ASTM D854-92) N/A

Clifton Associates Ltd.
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Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548 Sample No. IH62

Unified Sieve

Laboratory ID No.	FSJ530	Project No.	C1548
Original Dry Wt	144.90 g	Sample No.	IH63
Wash Dry Wt.	2.69 g	Date	12/7/01
Minus 75 Material	142.21 g	Technician	NM

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	2.7	144.9	100.00%	
25	2.7	144.9	100.00%	
19	2.7	144.9	100.00%	
12.5	2.7	144.9	100.00%	
9.5	2.7	144.9	100.00%	
4.75	2.7	144.9	100.00%	
2.36	2.4	144.6	99.77%	0.00% Gravel
1.18	2.0	144.2	99.52%	
0.6	1.9	144.1	99.42%	
0.3	1.6	143.8	99.23%	
0.075	0.0	142.2	98.15%	1.85% Sand
				98.15% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 25 Blows	Liquid Limit (LW) 24 Blows
Tare No.	33	34	35
Wt of Tare	1.44	1.38	1.33
Wt of Wet Soil + Tare	20.95	40.26	41.07
Wt of Dry Soil + Tare	17.52	28.03	28.61
Wt of Water (Ww)	3.43	12.23	12.46
Wt of Dry Soil	16.08	26.65	27.28
Water content %	21.33%	45.89%	45.67%
Correction factor		1.00000	0.99511
Corrected Limit	21.33%	45.89%	45.45%

Group Index: **26**

Pw 21.33%

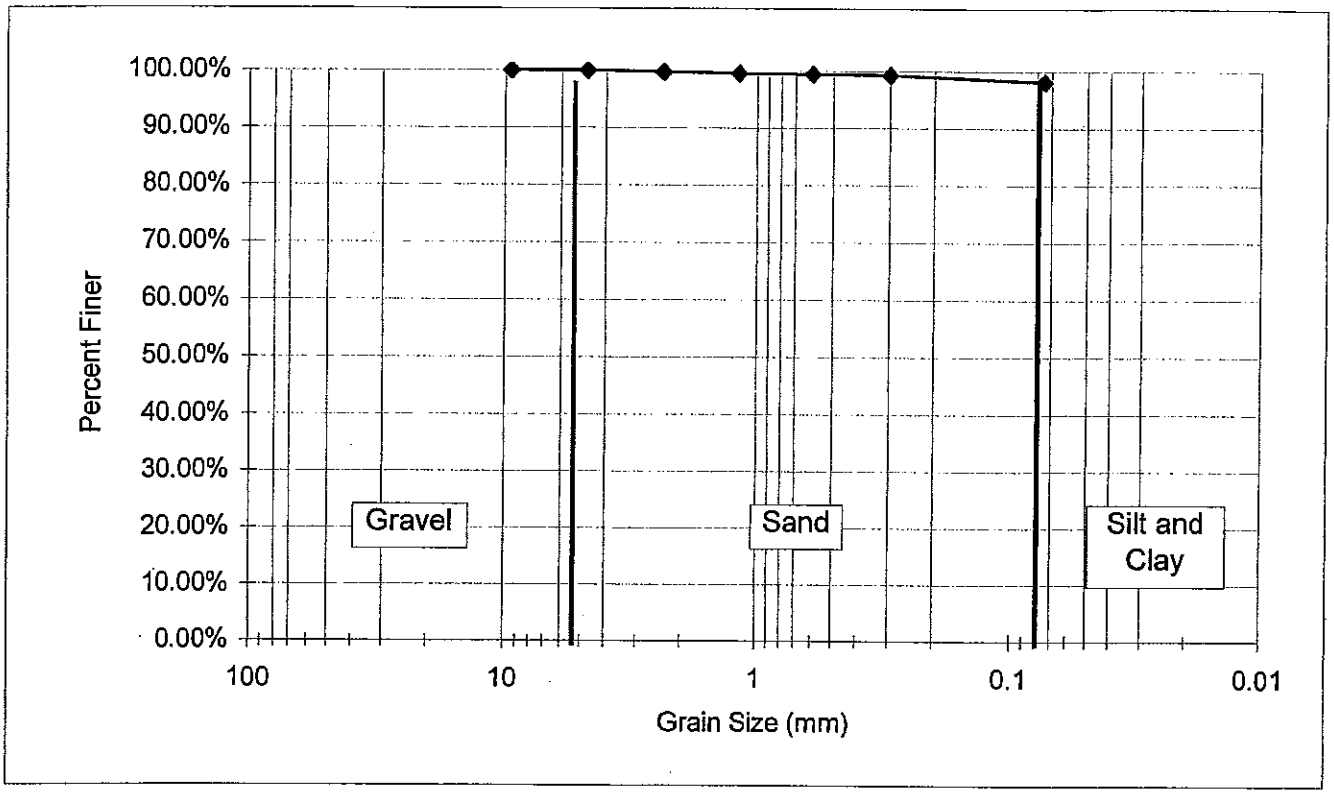
Lw 45.67%

PI 24.34%

Soil type: Inorganic

Fines type: CL

Classification: CL - Lean clay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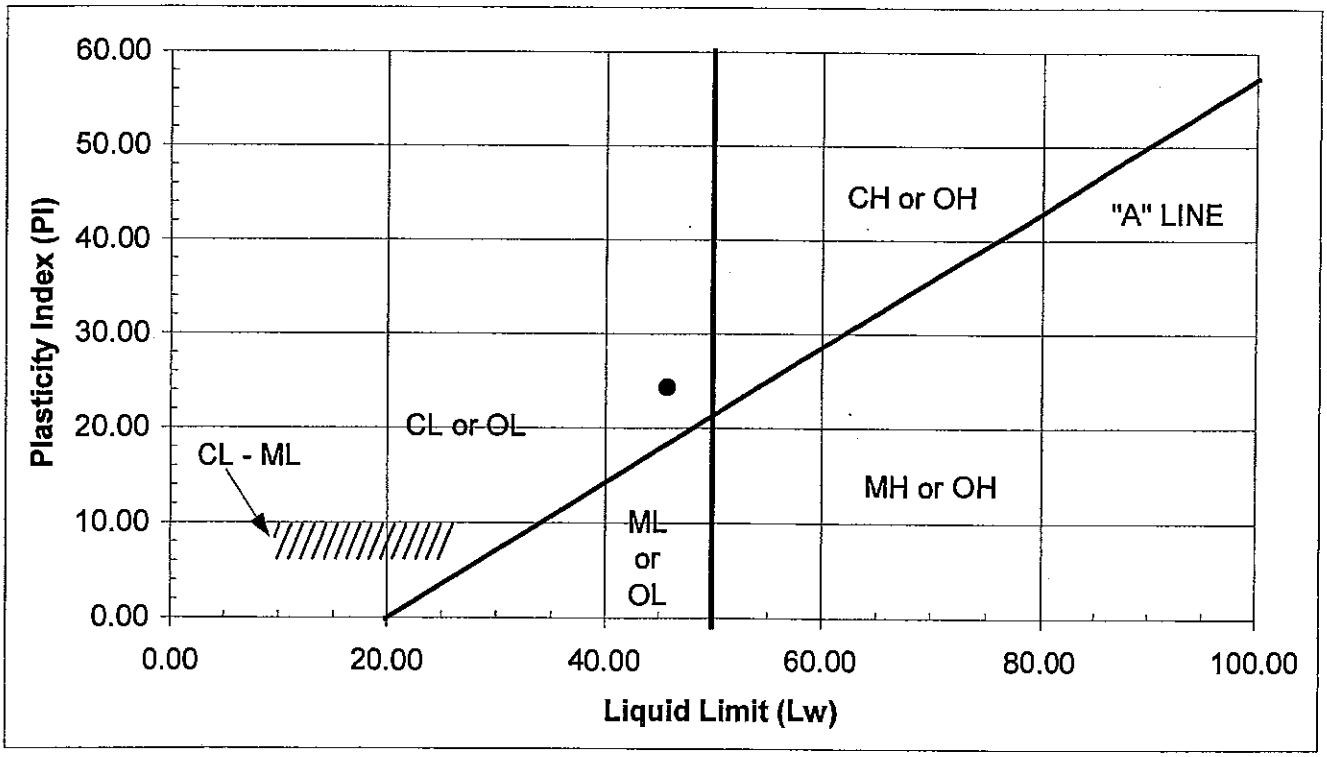
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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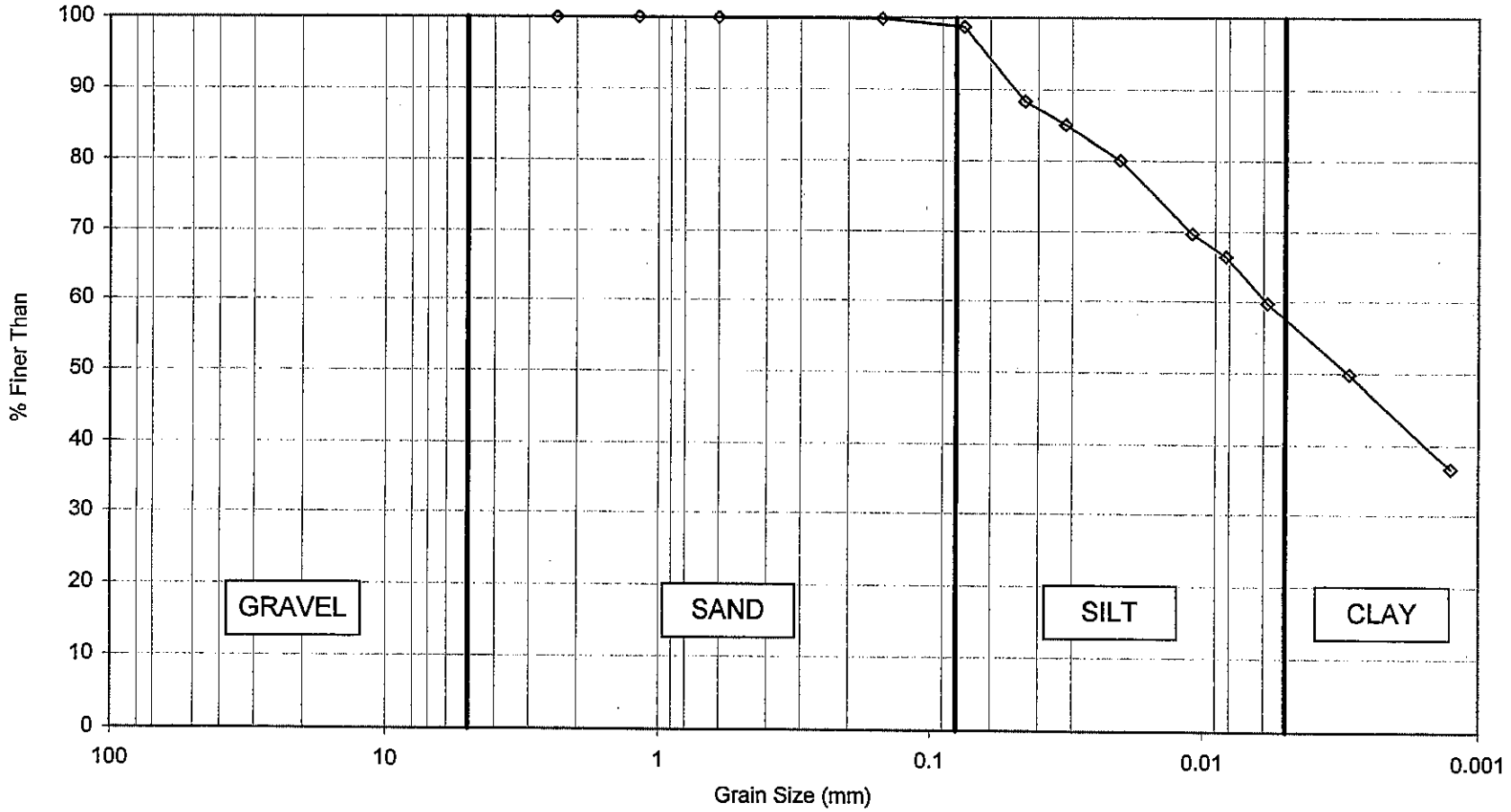
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH63 - BH105



SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.30	IH65	Grab		20.2	22.6	40.9	18.3	CL	0.6	14.4	41.6	43.7				145	
1.52	IH66	Grab		17.5												145	
2.29	IH67	Grab		15.5												50	
2.74	IH68	Shelby	272	16.5											162	190	
2.90	IH69	SPT		18.6												145	
4.27	IH70	Grab		19.3												145	
5.33	IH71	Grab		18.9												145	
5.79	IH72	SPT		18.5												145	
6.25	IH73	Grab		17.3												190	
7.32	IH74	Shelby	237	17.4									$5.7x10^{-4}$		166	190	
8.53	IH75	Grab		16.8	17.2	26.8	9.6	CL	4.4	18.5	46.5	30.6				120	
10.36	IH76	Grab		15.1												190	
10.52	IH77	SPT		14.3												215	
11.89	IH78	Grab		15.4												215	
13.41	IH79	Grab		14.0												120	
14.48	IH80	Grab		13.2												120	
14.94	IH81	Shelby	205	15.8	13.6	22.8	9.2	CL	0.8	35.2	37.1	26.9			200	215	
15.09	IH82	SPT		15.6												215	
16.46	IH83	Grab		11.1												215	
17.98	IH84	Grab		9.0												215	
19.20	IH85	Grab		10.3												215	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH106

Unified Sieve

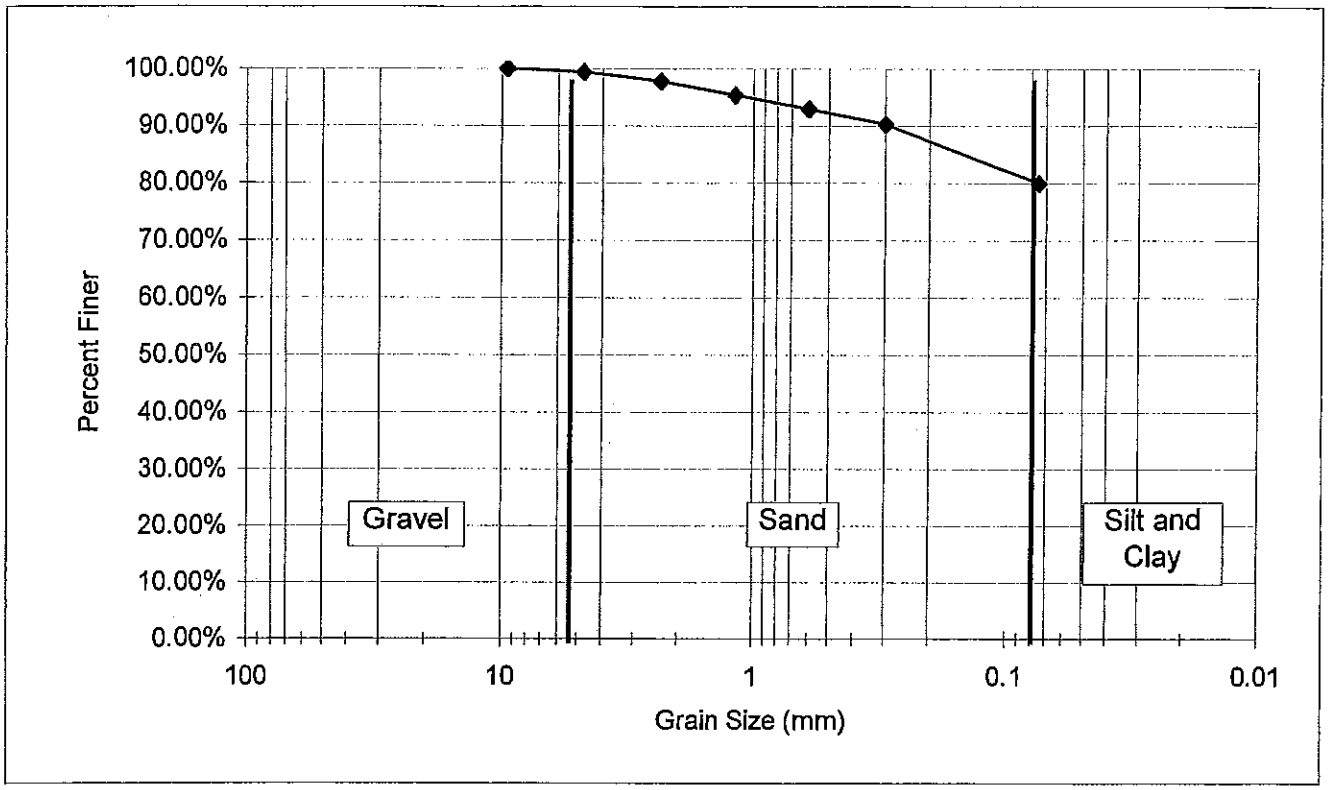
Laboratory ID No.	FSJ531	Project No.	C1548
Original Dry Wt	145.06 g	Sample No.	IH65
Wash Dry Wt.	29.30 g	Date	12/7/01
Minus 75 Material	115.76 g	Technician	NM

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	29.3	145.1	100.00%	
25	29.3	145.1	100.00%	
19	29.3	145.1	100.00%	
12.5	29.3	145.1	100.00%	
9.5	29.3	145.1	100.00%	
4.75	28.4	144.2	99.39%	
2.36	26.1	141.8	97.77%	0.61% Gravel
1.18	22.6	138.3	95.36%	
0.6	19.0	134.7	92.89%	
0.3	15.1	130.9	90.22%	
0.075	0.2	116.0	79.95%	19.43% Sand
				79.95% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 19 Blows	Liquid Limit (LW) 18 Blows
Tare No.	36	40	41
Wt of Tare	1.35	1.34	1.36
Wt of Wet Soil + Tare	24.08	36.43	40.42
Wt of Dry Soil + Tare	19.89	25.98	28.80
Wt of Water (Ww)	4.19	10.45	11.62
Wt of Dry Soil	18.54	24.64	27.44
Water content %	22.60%	42.41%	42.35%
Correction factor		0.96760	0.96135
Corrected Limit	22.60%	41.04%	40.71%

Group Index: **15**

Pw	22.60%	Soil type:	Inorganic
Lw	40.87%	Fines type:	CL
PI	18.27%	Classification:	CL - Lean clay with sand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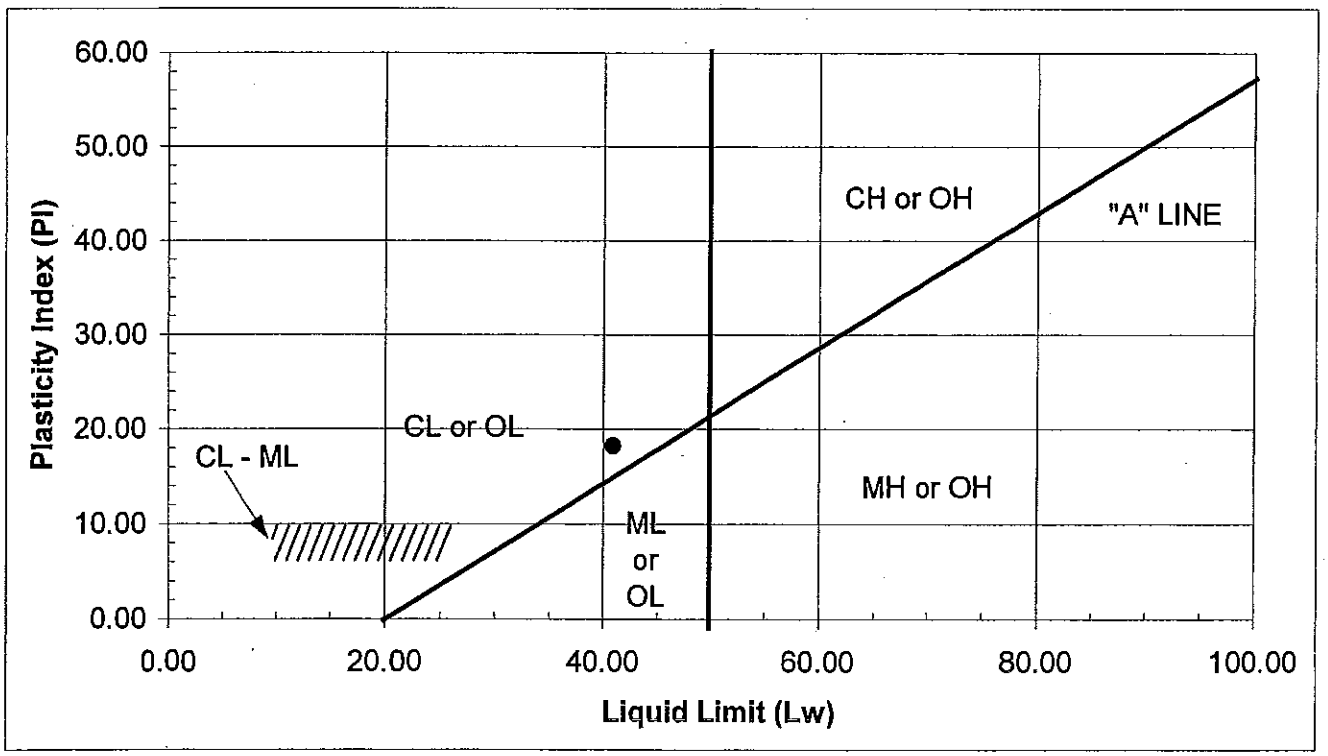
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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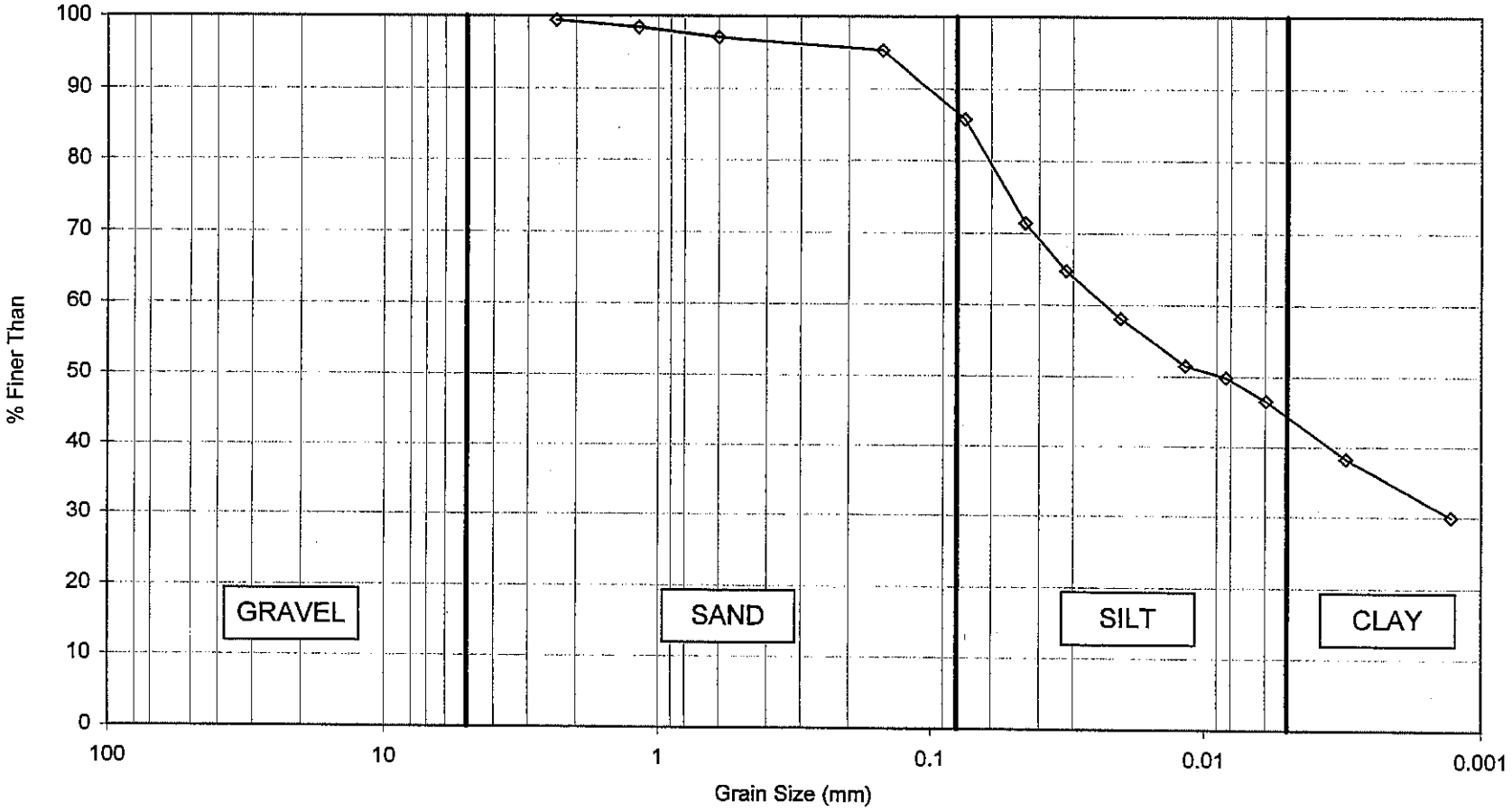
40.00
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH65 - BH106



Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Till, clay, some silt and sand, stiff, silt pockets, glauber salts, black deposits, Fe stains, mottled brown

Sample Type	SY	Method of compaction	N/A
Load on Sample	13.5 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	31 (mm)	Ht. of Specimen	32 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	207.74 (g)	Mass of Sample	213.9 (g)
Volume of Sample	97.5 (cm^3)	Volume of Sample	101.8 (cm^3)
Water Content	17.3 %	Water Content	19.3 %
Estimated Dry Density	1,817 (kg/m^3)	Estimated Dry Density	1,761 (kg/m^3)

Range of Hydraulic Gradient From 5.2 To 9.0

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	3,199.5	9.0	8.0E-09
	4,133.0	8.7	5.8E-09
	4,817.0	8.6	5.4E-09
	5,555.0	8.4	5.1E-09
	6,026.0	8.3	4.8E-09
	7,526.0	8.0	5.5E-09
	8,759.0	7.7	5.6E-09
	10,112.7	7.4	5.0E-09
	12,977.2	6.9	5.0E-09
	13,352.0	6.8	7.4E-09
	15,861.0	6.4	5.0E-09
	17,508.0	6.1	6.2E-09
	20,081.0	5.6	5.7E-09
	21,924.0	5.3	5.7E-09
	22,881.0	5.2	5.7E-09
	AVERAGE	7.2	5.7E-09

Specific Gravity (Determined using ASTM D854-92) N/A

Clifton Associates Ltd.
engineering science technology

Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548 Sample No. IH74

Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSJ532	Sample No.	IH75
Original Dry Wt	159.23 g	Date	12/7/01
Wash Dry Wt.	35.28 g	Technician	NM
Minus 75 Material	123.95 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	35.3	159.2	100.00%	
25	35.3	159.2	100.00%	
19	35.3	159.2	100.00%	
12.5	35.3	159.2	100.00%	
9.5	35.3	159.2	100.00%	
4.75	28.3	152.3	95.63%	
2.36	25.8	149.8	94.07%	4.37% Gravel
1.18	23.9	147.9	92.85%	
0.6	21.9	145.9	91.62%	
0.3	19.3	143.3	89.98%	
0.075	0.0	124.0	77.85%	17.78% Sand
				77.85% Silt &Clay

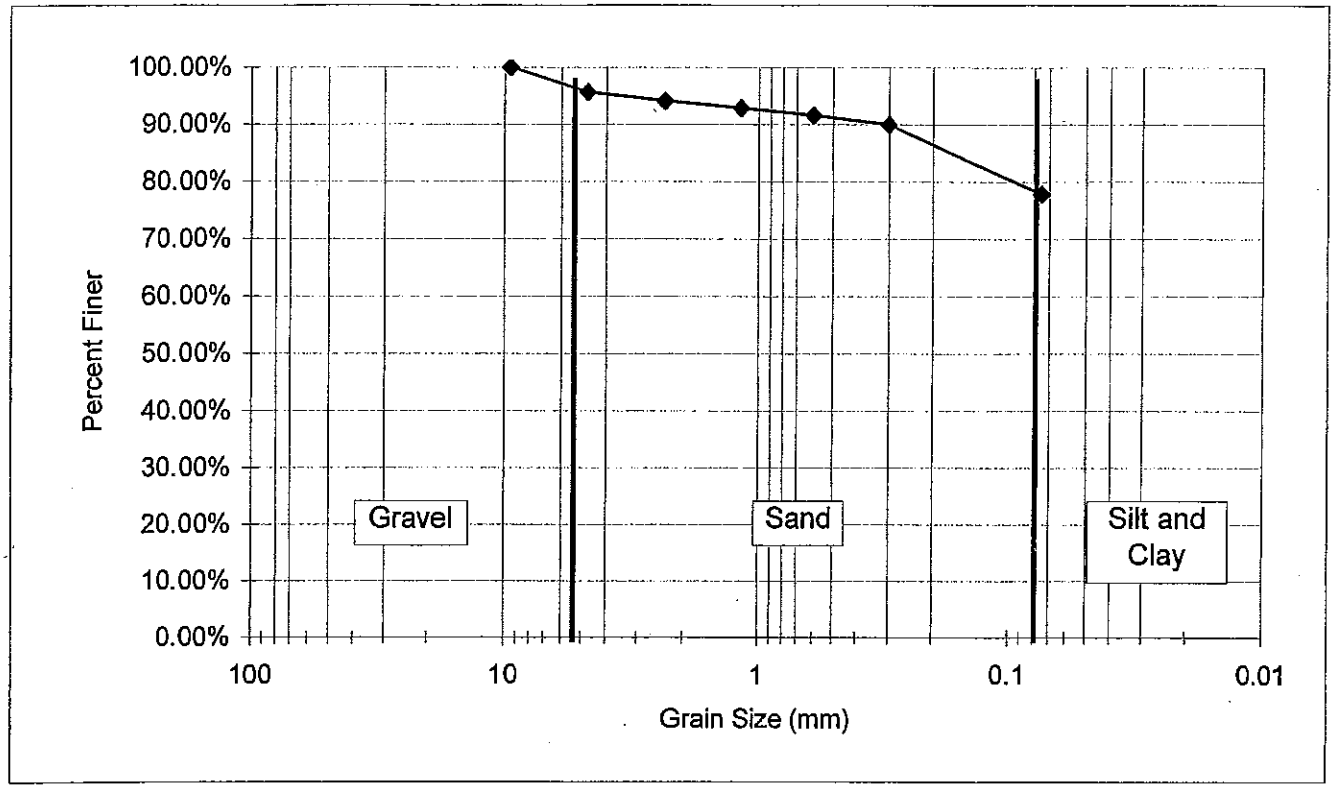
PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 20 Blows	Liquid Limit (LW) 18 Blows
Tare No.	42	43	44
Wt of Tare	1.35	1.37	1.39
Wt of Wet Soil + Tare	20.15	44.15	38.76
Wt of Dry Soil + Tare	17.39	34.85	30.66
Wt of Water (Ww)	2.76	9.30	8.10
Wt of Dry Soil	16.04	33.48	29.27
Water content %	17.21%	27.78%	27.67%
Correction factor		0.97358	0.96135
Corrected Limit	17.21%	27.04%	26.60%

Group Index: **5.5**

Pw 17.21% Soil type: Inorganic

Lw 26.82% Fines type: CL

PI 9.62% Classification: CL - Lean clay with sand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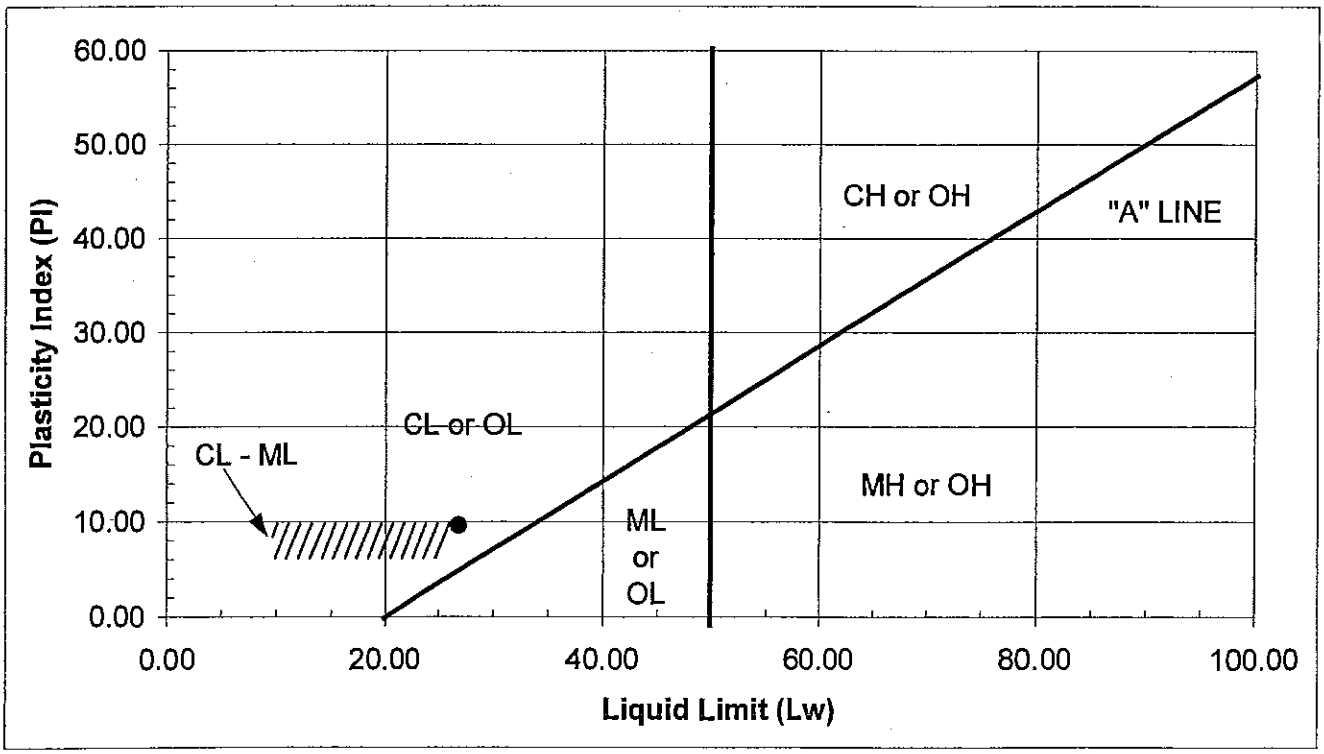
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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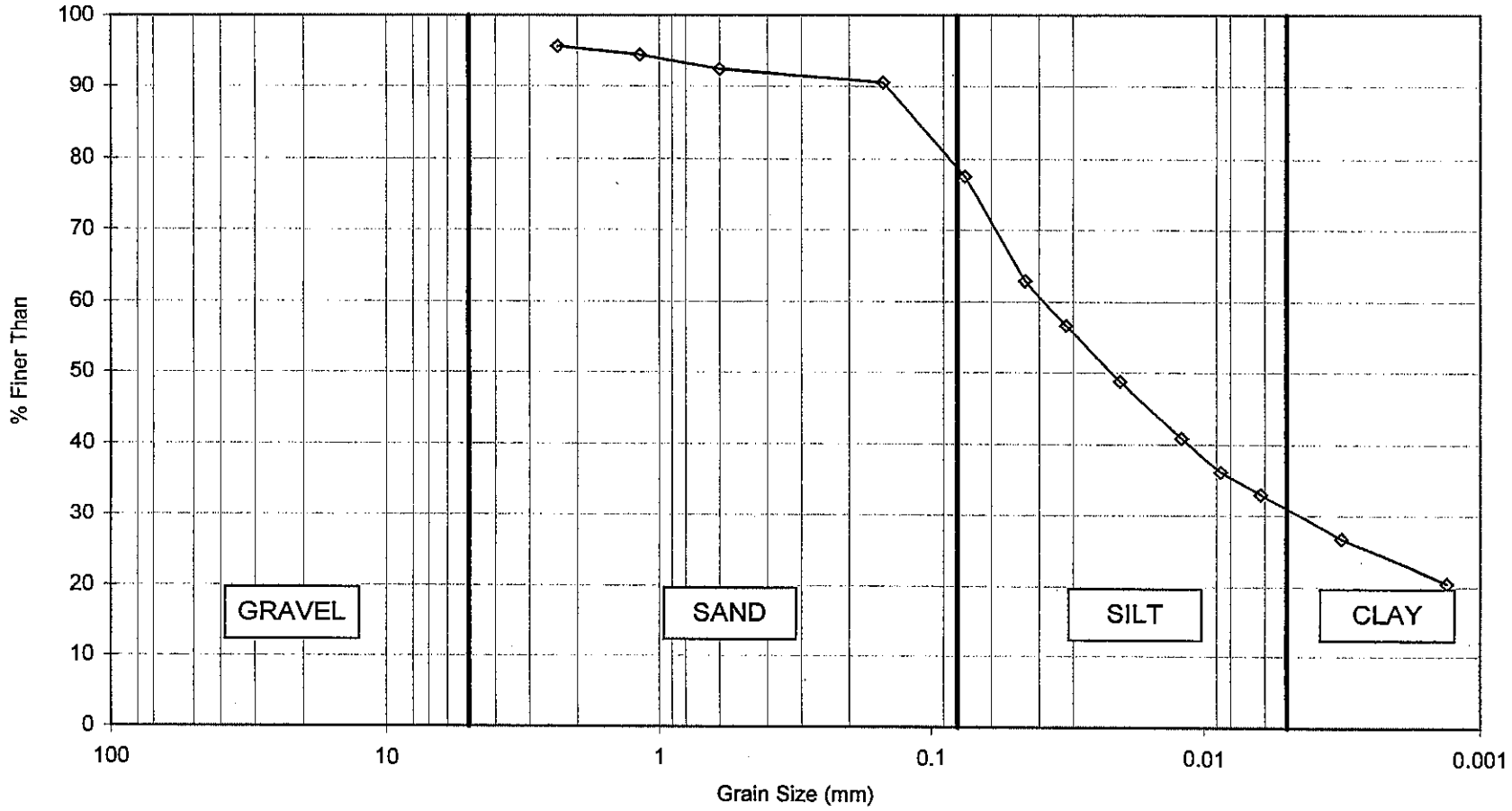
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution

C1548 - IH75 - BH106



File C1548

Unified Sieve

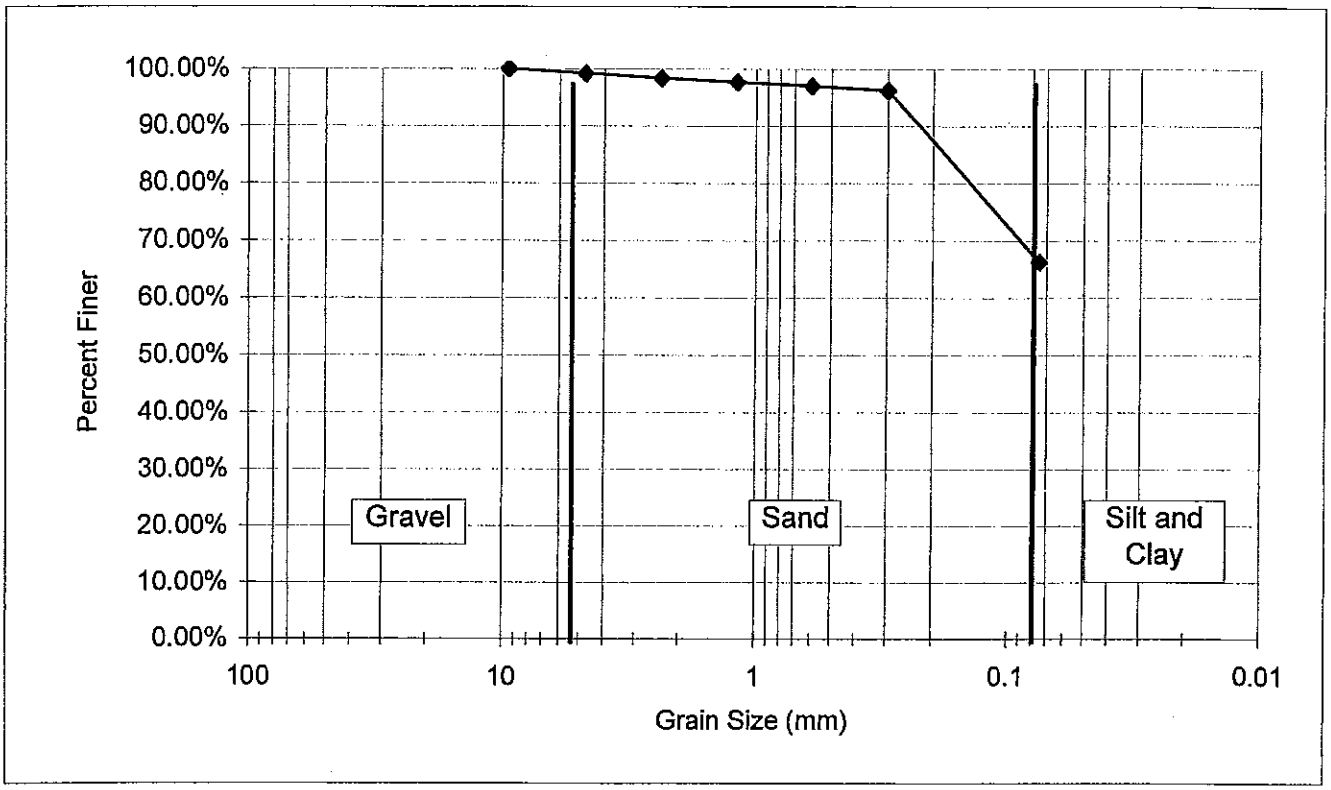
		Project No.	C1548
Laboratory ID No.	FSJ533	Sample No.	IH81
Original Dry Wt	173.13 g	Date	12/7/01
Wash Dry Wt.	58.44 g	Technician	NM
Minus 75 Material	114.69 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	58.4	173.1	100.00%	
25	58.4	173.1	100.00%	
19	58.4	173.1	100.00%	
12.5	58.4	173.1	100.00%	
9.5	58.4	173.1	100.00%	
4.75	57.1	171.8	99.22%	
2.36	55.6	170.3	98.37%	0.78% Gravel
1.18	54.4	169.1	97.65%	
0.6	53.3	168.0	97.01%	
0.3	51.9	166.6	96.21%	
0.075	0.1	114.8	66.29%	32.93% Sand
				66.29% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 25 Blows	Liquid Limit (LW) 23 Blows
Tare No.	65	64	63
Wt of Tare	1.42	1.32	1.33
Wt of Wet Soil + Tare	29.66	45.10	39.55
Wt of Dry Soil + Tare	26.27	36.93	32.42
Wt of Water (Ww)	3.39	8.17	7.13
Wt of Dry Soil	24.85	35.61	31.09
Water content %	13.64%	22.94%	22.93%
Correction factor		1.00000	0.99004
Corrected Limit	13.64%	22.94%	22.71%

Group Index: **3.2**

Pw	13.64%	Soil type:	Inorganic
Lw	22.82%	Fines type:	CL
PI	9.18%	Classification:	CL - Sandy lean clay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80.00%
70.00%
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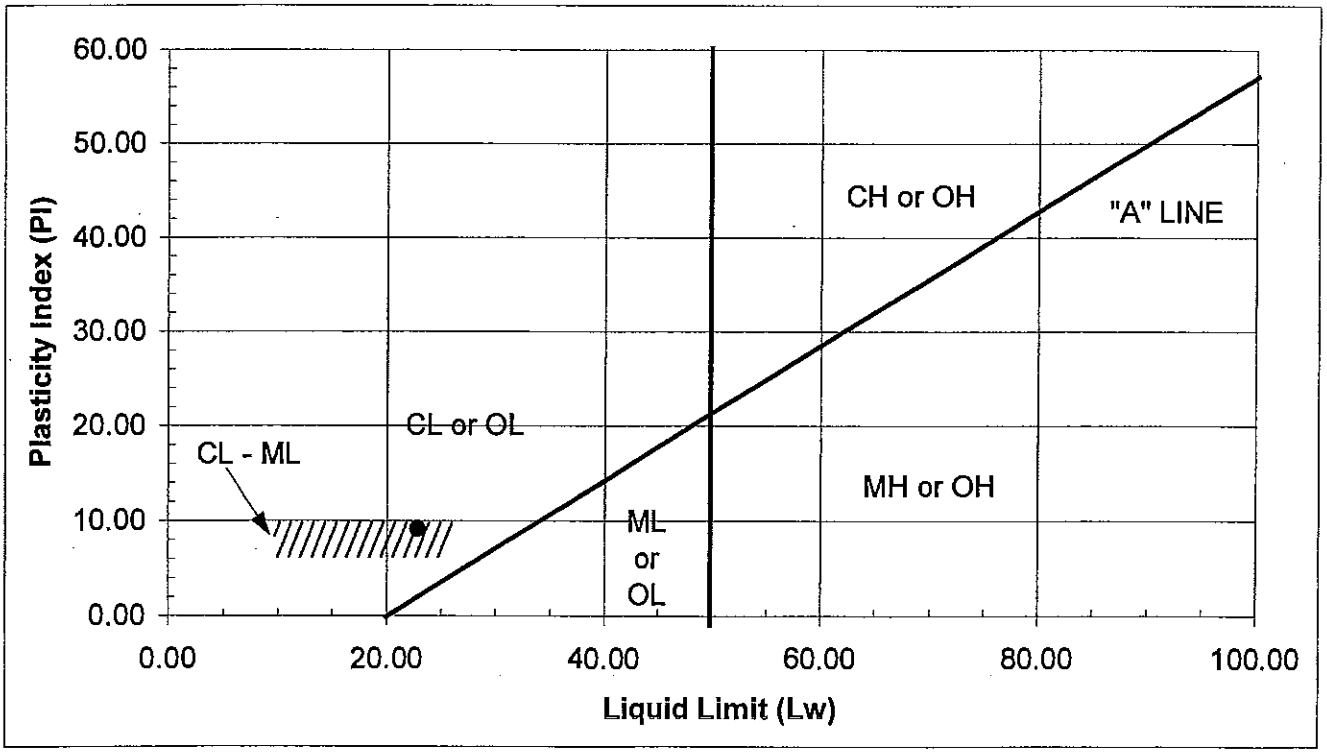
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)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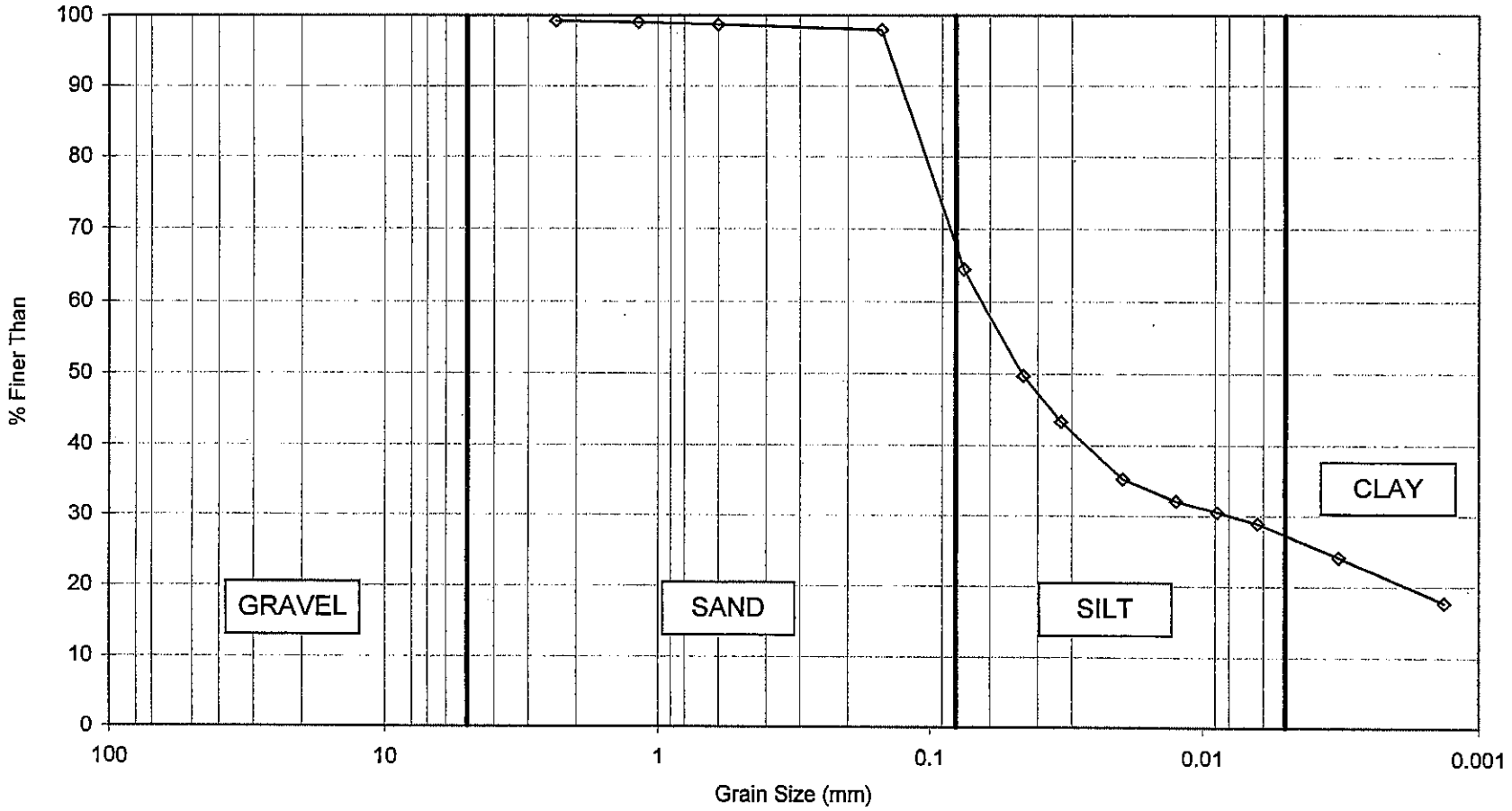
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH81 - BH106



SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.30	IH86	Grab		20.2												N/A	
0.46	IH87	Shelby	156	13.1											200+	215	
1.22	IH88	Grab		17.5	19.6	36.1	16.5	CL	3.7	18.5	77.8					215	
2.74	IH89	Grab		15.5												N/A	
3.66	IH90	Grab		18.6												215	
4.27	IH91	Shelby	140	12.1												215	
5.79	IH92	Grab		19.3	20.7	38.1	17.4	CL	0.0	3.3	44.1	52.6			200+	215	
7.32	IH93	Grab		18.9													

Clifton Associates Ltd.
engineering science technology

CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
BH107

Unified Sieve

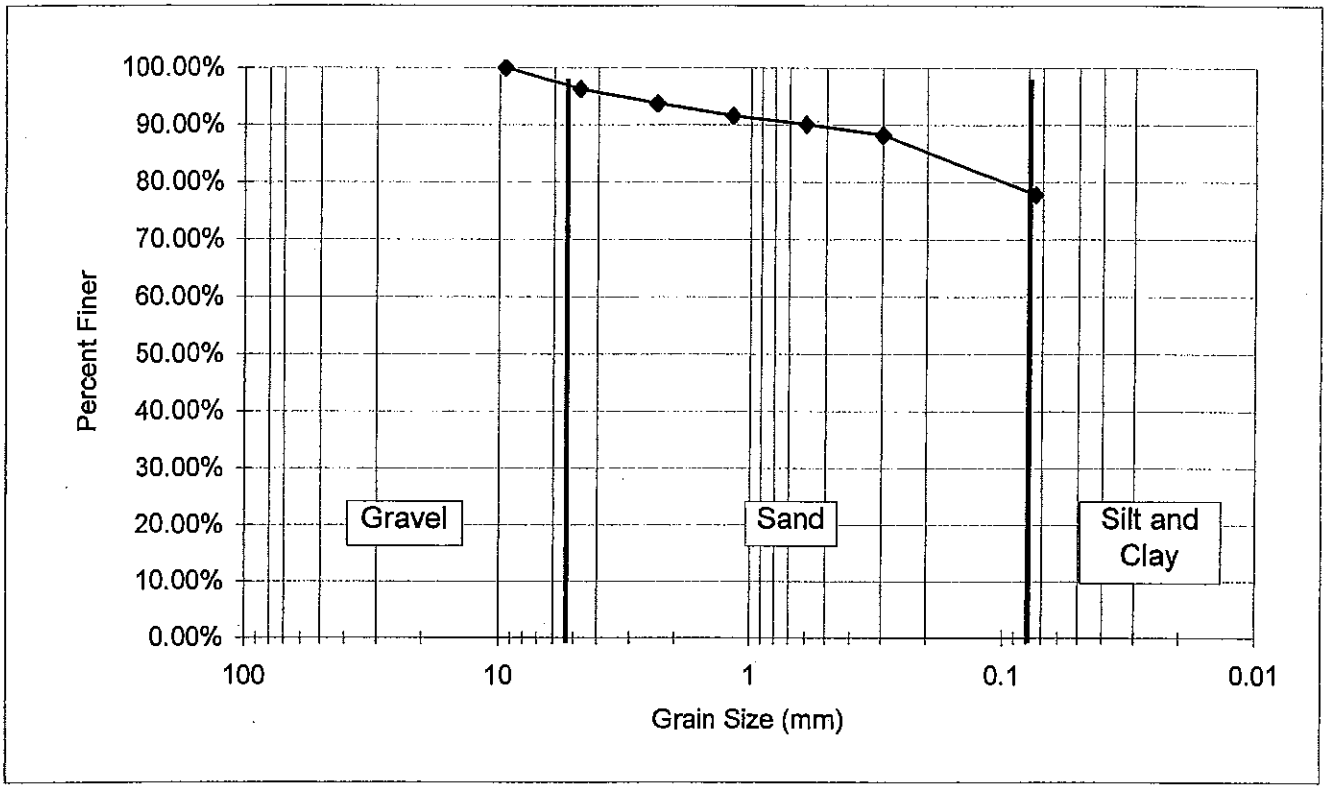
Laboratory ID No.	FSJ534	Project No.	C1548
Original Dry Wt	136.31 g	Sample No.	IH88
Wash Dry Wt.	30.62 g	Date	12/7/01
Minus 75 Material	105.69 g	Technician	NM

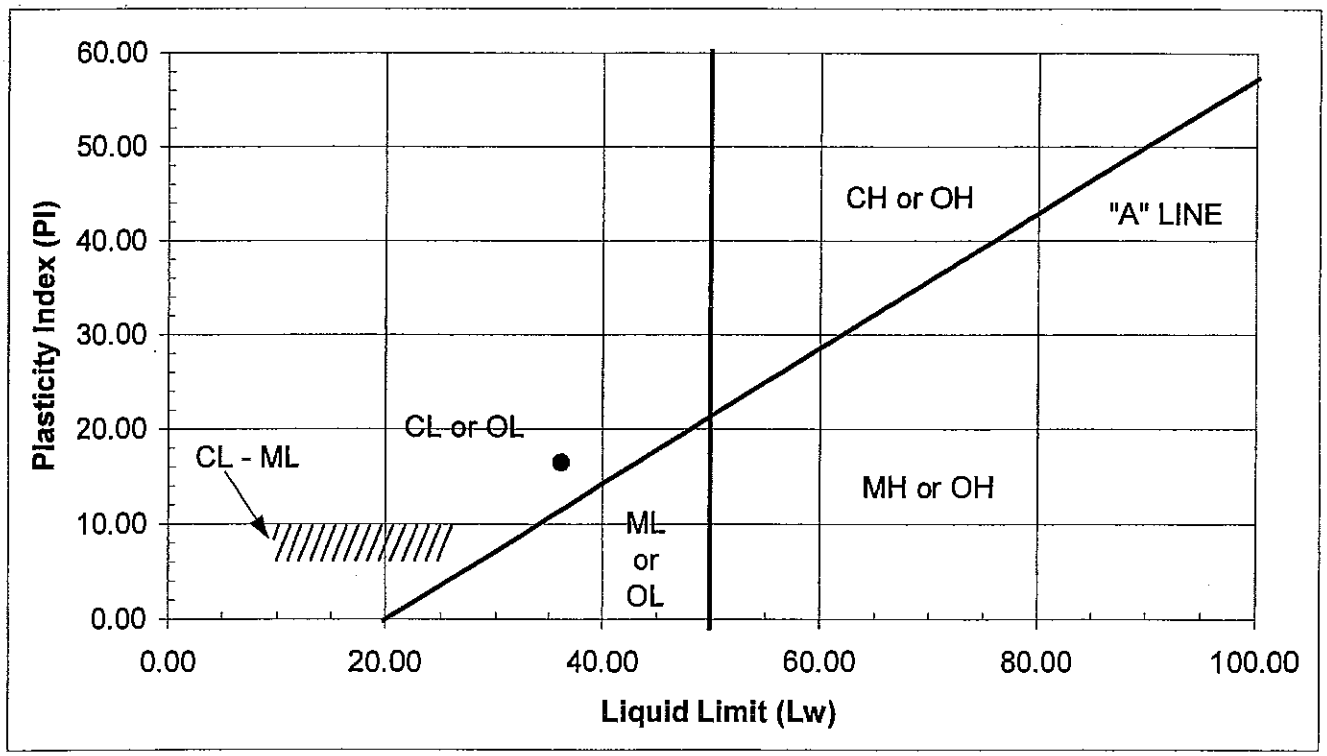
Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	30.6	136.3	100.00%	
25	30.6	136.3	100.00%	
19	30.6	136.3	100.00%	
12.5	30.6	136.3	100.00%	
9.5	30.6	136.3	100.00%	
4.75	25.5	131.2	96.25%	
2.36	22.0	127.7	93.70%	3.75% Gravel
1.18	19.1	124.8	91.56%	
0.6	17.0	122.7	90.04%	
0.3	14.6	120.2	88.21%	
0.075	0.3	106.0	77.79%	18.47% Sand
				77.79% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 26 Blows	Liquid Limit (LW) 24 Blows
Tare No.	66	67	68
Wt of Tare	1.36	1.36	1.34
Wt of Wet Soil + Tare	23.77	41.78	39.73
Wt of Dry Soil + Tare	20.10	31.05	29.56
Wt of Water (Ww)	3.67	10.73	10.17
Wt of Dry Soil	18.74	29.69	28.22
Water content %	19.58%	36.14%	36.04%
Correction factor		1.00470	0.99511
Corrected Limit	19.58%	36.31%	35.86%

Group Index: **12**

Pw	19.58%	Soil type:	Inorganic
Lw	36.09%	Fines type:	CL
PI	16.50%	Classification:	CL - Lean clay with sand


100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
50.00
40.00
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Unified Sieve

Project No.	C1548		
Laboratory ID No.	FSJ535	Sample No.	IH92
Original Dry Wt	147.06 g	Date	12/7/01
Wash Dry Wt.	9.84 g	Technician	NM
Minus 75 Material	137.22 g		

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
75	9.8	147.1	100.00%	
25	9.8	147.1	100.00%	
19	9.8	147.1	100.00%	
12.5	9.8	147.1	100.00%	
9.5	9.8	147.1	100.00%	
4.75	9.8	147.1	100.00%	
2.36	9.7	147.0	99.93%	0.00% Gravel
1.18	8.9	146.1	99.35%	
0.6	7.3	144.6	98.30%	
0.3	5.6	142.8	97.08%	
0.075	0.2	137.4	93.41%	6.59% Sand
				93.41% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 30 Blows	Liquid Limit (LW) 30 Blows
Tare No.	69	70	80
Wt of Tare	1.35	1.32	1.33
Wt of Wet Soil + Tare	19.05	54.45	37.91
Wt of Dry Soil + Tare	16.01	40.02	28.00
Wt of Water (Ww)	3.04	14.43	9.91
Wt of Dry Soil	14.66	38.70	26.67
Water content %	20.74%	37.29%	37.16%
Correction factor		1.02212	1.02212
Corrected Limit	20.74%	38.11%	37.98%

Group Index: **17**

Pw 20.74%

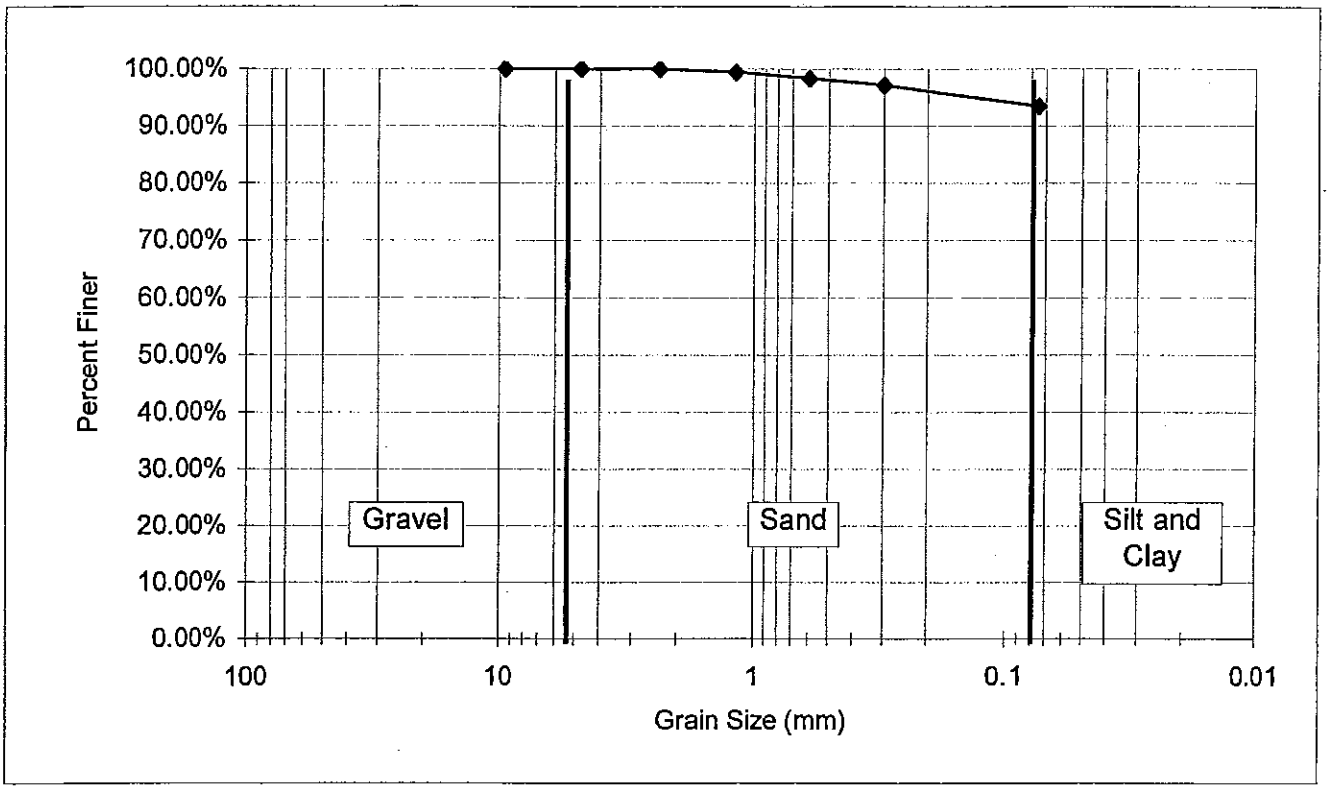
Lw 38.05%

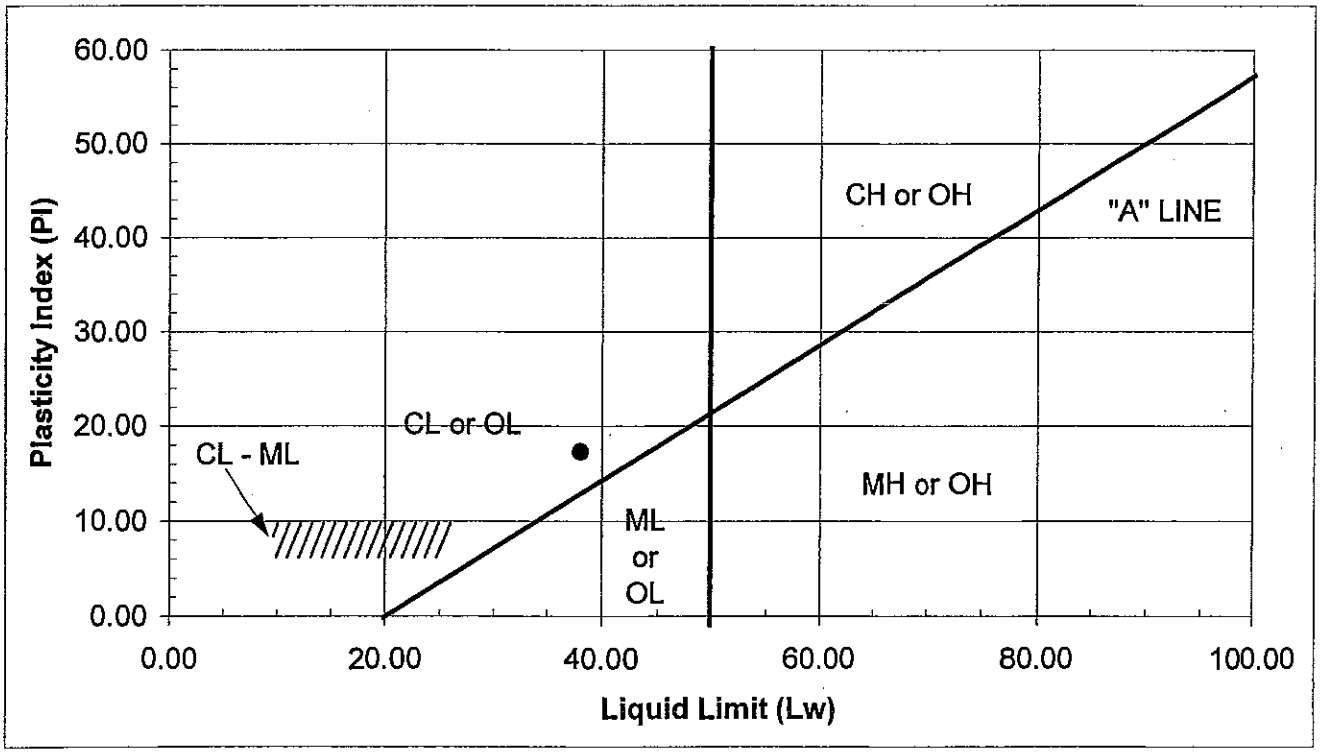
PI 17.31%

Soil type: Inorganic

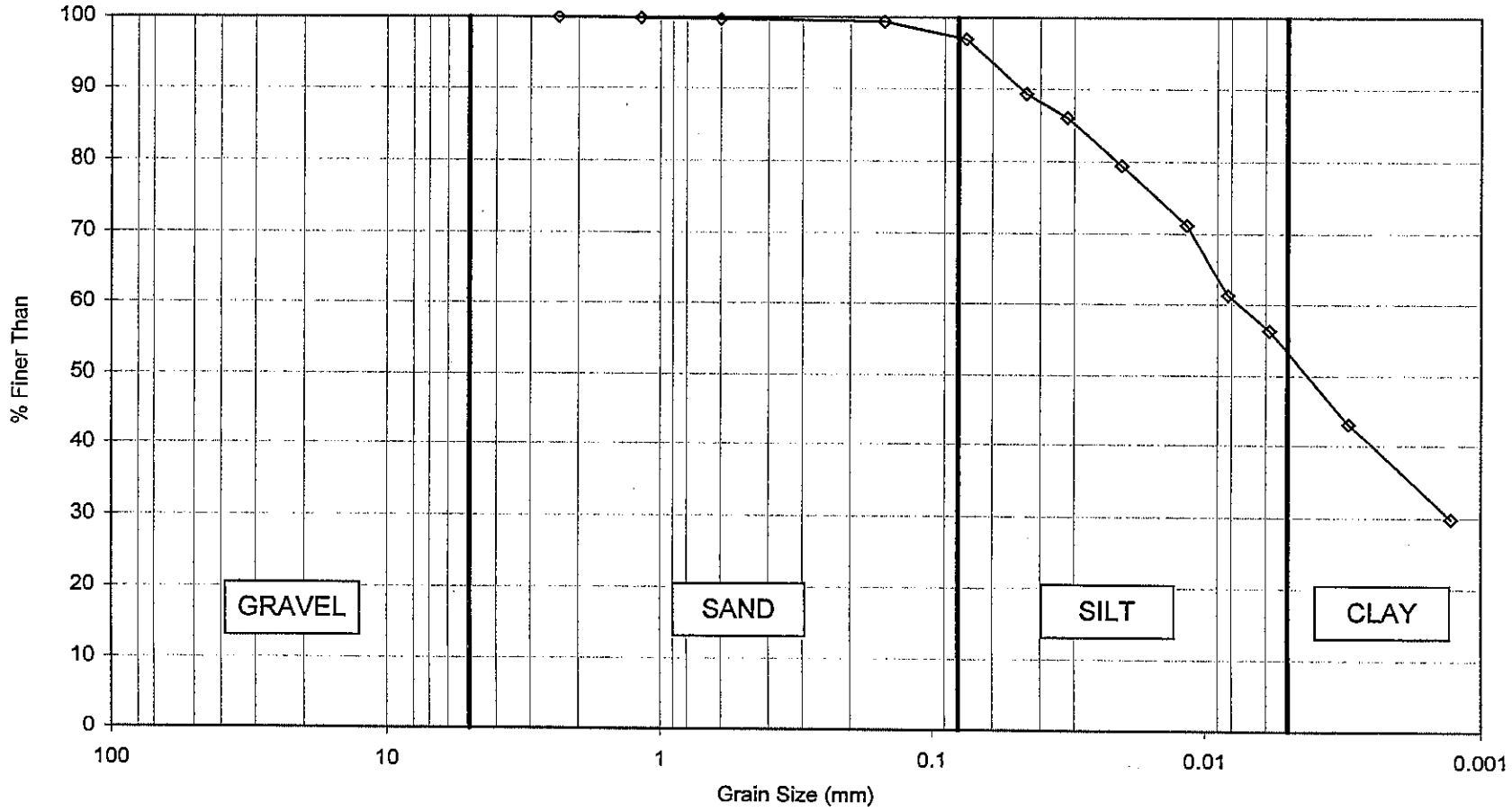
Fines type: CL

Classification: CL - Lean clay


100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
50.00
40.00
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

Hydrometer Particle Size Distribution
C1548 - IH92 - BH107



SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE				WATER CONTENT	CONSISTENCY				GRADATION				FALLING HEAD PERMEABILITY TEST	SHEAR STRENGTH			DRY DENSITY
DEPTH	NUMBER	TYPE	RECOVERY		PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY		COMPRESSION TEST	LAB VANE	POCKET PEN	
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.03	IH94	Grab		32.8													
0.20	IH95	Grab		21.0													
0.46	IH96	Shelby	180	23.7											100	145	
2.44	IH97	Grab		22.0									*1.4x10^{-8}				
3.81	IH98	Grab		19.3												170	
3.96	IH99	Grab		21.1									*1.4x10^{-8}			145	
4.88	IH100	Grab		19.9									*1.4x10^{-8}			145	

* Composite sample.

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
TP201

Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clay, some silt, trace sand, moist.
Composite sample (IH 97, 99 & 100) at 95% proctor at 2% over optimum.

Sample Type	Bag	Method of compaction	Proctor
Load on Sample	12.1 kPa		

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	30 (mm)	Ht. of Specimen	30 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	186.04 (g)	Mass of Sample	189.3 (g)
Volume of Sample	94.7 (cm^3)	Volume of Sample	95.4 (cm^3)
Water Content	23.3 %	Water Content	24.8 %
Estimated Dry Density	1,594 (kg/m^3)	Estimated Dry Density	1,591 (kg/m^3)

Range of Hydraulic Gradient From 6.7 To 10.7

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	1,380.0	10.7	2.4E-08
	1,511.0	10.6	1.4E-08
	1,649.0	10.5	1.3E-08
	1,731.0	10.4	1.5E-08
	2,661.0	9.8	1.4E-08
	2,806.5	9.6	1.8E-08
	2,954.0	9.6	9.0E-09
	3,056.0	9.5	1.3E-08
	3,156.0	9.4	1.3E-08
	5,971.5	7.7	1.3E-08
	6,972.5	7.3	1.1E-08
	7,106.0	7.2	1.3E-08
	7,486.5	7.1	1.2E-08
	8,417.0	6.7	1.1E-08
	AVERAGE	9.0	1.4E-08

Specific Gravity (Determined using ASTM D854-92) N/A

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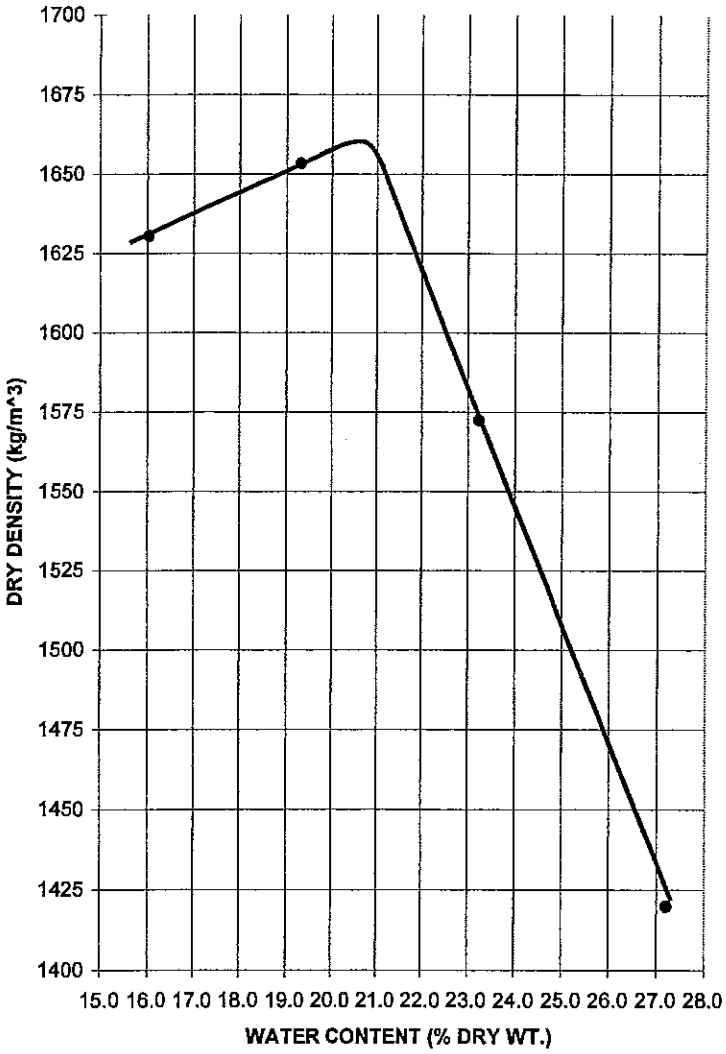
Client	**Canadian Crude Separators Inc.**
Location	**Fort St. John, British Columbia**
Project	**Hydrogeological Investigation**
Job No.	**C1548** Sample No. **IH97,99 & 100**

COMPACTION TEST

	TRIAL NUMBER		1	2	3	4	5	6
Density Determination	MOLD NO							
	WT. SAMPLE WET + MOLD	(g)	5919.7	5996.2	5963.2	5838.6		
	WT. OF MOLD	(g)	4128.1	4128.1	4128.1	4128.1		
	WT. SAMPLE WET	(g)	1791.6	1868.1	1835.1	1710.5		
	VOLUME OF MOLD	(m^3)	947	947	947	947		
	WET DENSITY	(Kg/m^3)	1891.8	1972.6	1937.8	1806.2		
	DRY DENSITY	(Kg/m^3)	1630	1653	1572	1420		

	TARE NO.		P5	P1	P3	P5		
Water Content Determination	WT. SAMPLE WET + TARE	(g)	451.0	416.5	422.6	413.0		
	WT. SAMPLE DRY + TARE	(g)	426.4	393.3	396.9	385.9		
	WT. OF TARE	(g)	273.0	273.2	286.3	286.3		
	WT. DRY SOIL	(g)	153.4	120.1	110.6	99.6		
	WT. OF WATER	(g)	24.6	23.2	25.7	27.1		
	WATER CONTENT W%		16.0	19.3	23.2	27.2		



AT OPTIMUM:

W% = 21.0

DENSITY = 1660 Kg/m^3

ROCK CORRECTED DENSITY _____ Kg/m^3

METHOD OF COMPACTION ASTM-D698

DESCRIPTION OF SAMPLE:
Composite sample. Clay

BOREHOLE NO. TP203

DEPTH 3.0 m to 5.5 m

REMARKS:

NATURAL WATER CONTENT:

Tare#:
Sample+Tare WT.:
Sample+Tare Dry.:
Wt.of Tare:
Wt.Dry soil:
Wt. Of Water:
Water Content:

DRY DENSITY = $\frac{100 \times \text{WET DENSITY}}{100 + W\ \%}$

WET DENSITY = $\frac{\text{WT. OF COMPACTED SOIL}}{\text{VOLUME OF COMPACTED SOIL}}$

DISTRIBUTION:

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PROJECT	Hydrogeological Site Investigation	**DATE**	20-Dec-01
CLIENT	Canadian Crude Separators	**TECH.**	HC
LOCATION	Block A, 8-88-20-W6M	**PROJ. NO.**	C1548
SAMPLE	IH97, IH99 and IH100		

Unified Sieve

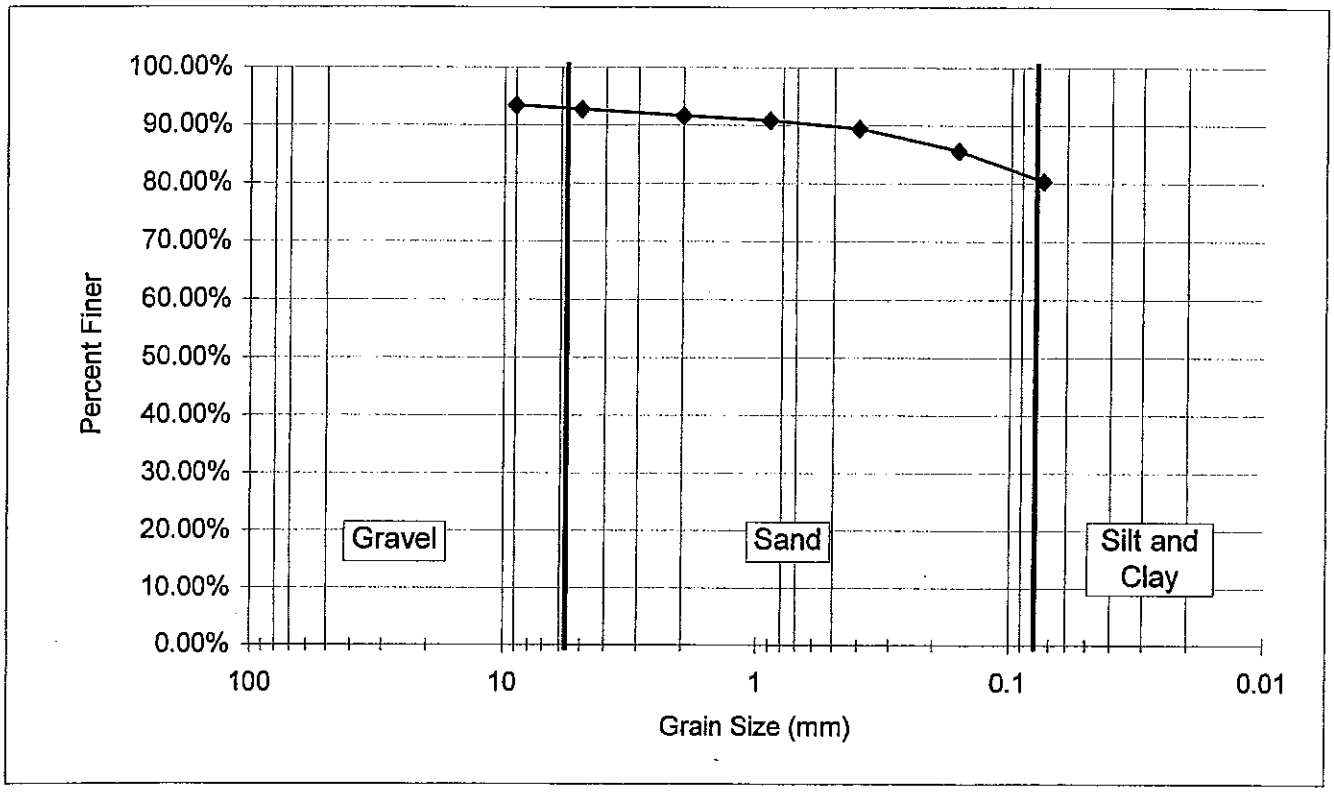
Laboratory ID No.	0	Project No.	C1548
Original Dry Wt	100.00 g	Sample No.	IH108, IH109, IH110
Wash Dry Wt.	19.80 g	Date	12/18/01
Minus 75 Material	80.20 g	Technician	HC

Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
25	19.8	100.0	100.00%	
20	19.8	100.0	100.00%	
16	19.8	100.0	100.00%	
12.5	19.8	100.0	100.00%	
9	13.2	93.4	93.40%	
5	12.5	92.7	92.70%	
2	11.4	91.6	91.60%	7.30% Gravel
0.9	10.6	90.8	90.80%	
0.4	9.2	89.4	89.40%	
0.16	5.4	85.6	85.60%	
0.075	0.1	80.3	80.30%	12.40% Sand
				80.30% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 24 Blows	Liquid Limit (LW) 23 Blows
Tare No.	F4	D3	A10
Wt of Tare	1.92	11.09	10.75
Wt of Wet Soil + Tare	7.08	40.79	34.88
Wt of Dry Soil + Tare	6.18	32.70	28.30
Wt of Water (Ww)	0.90	8.09	6.58
Wt of Dry Soil	4.26	21.61	17.55
Water content %	21.13%	37.44%	37.49%
Correction factor		0.99511	0.99004
Corrected Limit	21.13%	37.25%	37.12%

Group Index: **12**

Pw	21.13%	Soil type:	Inorganic
Lw	37.19%	Fines type:	CL
PI	16.06%	Classification:	CL - Lean clay with sand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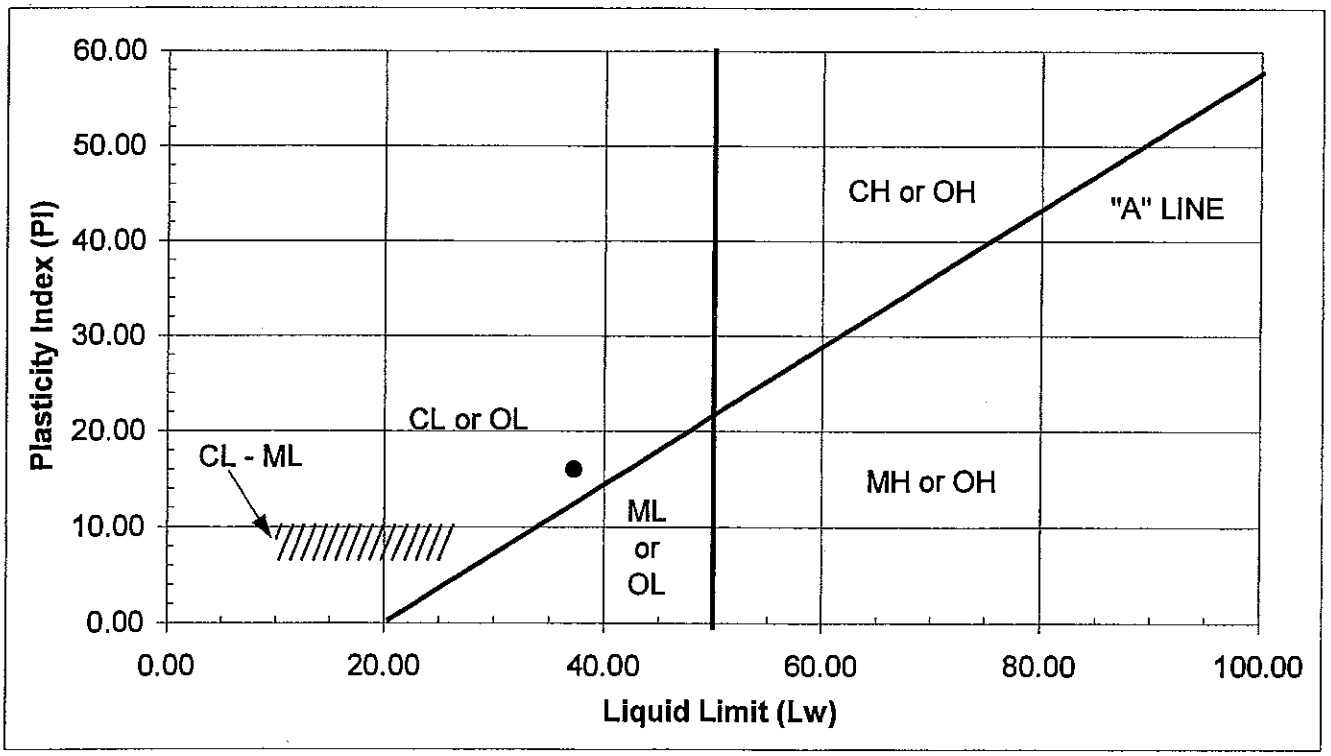
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
50.00
40.00
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE				WATER CONTENT	CONSISTENCY				GRADATION				FALLING HEAD PERMEABILITY TEST	SHEAR STRENGTH			DRY DENSITY
DEPTH	NUMBER	TYPE	RECOVERY		PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY		COMPRESSION TEST	LAB VANE	POCKET PEN	
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.61	IH101	Shelby	158	23.7											118	145	
1.83	IH102	Grab		22.4													
2.59	IH103	Grab		20.5													
3.96	IH104	Grab		19.6													
4.72	IH105	Grab		19.6													

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.

TP202

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.76	IH106	Shelby	202	22.7											102	120	
1.83	IH107	Grab		21.4												120	
3.35	IH108	Grab		20.5									*8.5x10^{-9}			170	
4.27	IH109	Grab		21.0									*8.5x10^{-9}			170	
5.33	IH110	Grab		17.1									*8.5x10^{-9}			145	
* Composite sample.																	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
TP203

Falling Head Permeability Test Report

Sample Description, Preparation Remarks (i.e. removal of stones, type, structure, consistency, pebbles)

Clay, some silt, trace fine sand, moist, Fe stains
Composite sample at 93% proctor, 1.9% over optimum

Sample Type: Bag — Method of compaction: Proctor

Load on Sample: 11.6 kPa

Dimensions of Specimen

Initial		Final	
Ht. of Specimen	30 (mm)	Ht. of Specimen	31 (mm)
Dia. of Specimen	63 (mm)	Dia. of Specimen	63 (mm)
Mass of Sample	193.25 (g)	Mass of Sample	196.2 (g)
Volume of Sample	96.5 (cm^3)	Volume of Sample	97.8 (cm^3)
Water Content	22.9 %	Water Content	24.1 %
Estimated Dry Density	1,629 (kg/m^3)	Estimated Dry Density	1,617 (kg/m^3)

Range of Hydraulic Gradient: From 6.7 To 9.6

	Time	Hydraulic Gradient	Hydraulic Conductivity (cm/s)
Run 1	18,323.0	9.6	1.4E-08
	18,728.0	9.4	9.1E-09
	19,697.0	9.0	7.8E-09
	19,760.0	9.0	1.0E-08
	20,001.0	8.9	8.1E-09
	20,139.0	8.8	4.8E-09
	20,220.0	8.8	8.1E-09
	21,151.0	8.3	1.0E-08
	21,296.0	8.3	9.7E-09
	21,443.0	8.2	4.8E-09
	21,545.0	8.2	6.9E-09
	21,646.0	8.2	7.0E-09
	24,461.5	7.0	9.5E-09
	25,462.5	6.7	7.6E-09
	AVERAGE	8.5	8.5E-09

Specific Gravity (Determined using ASTM D854-92): N/A

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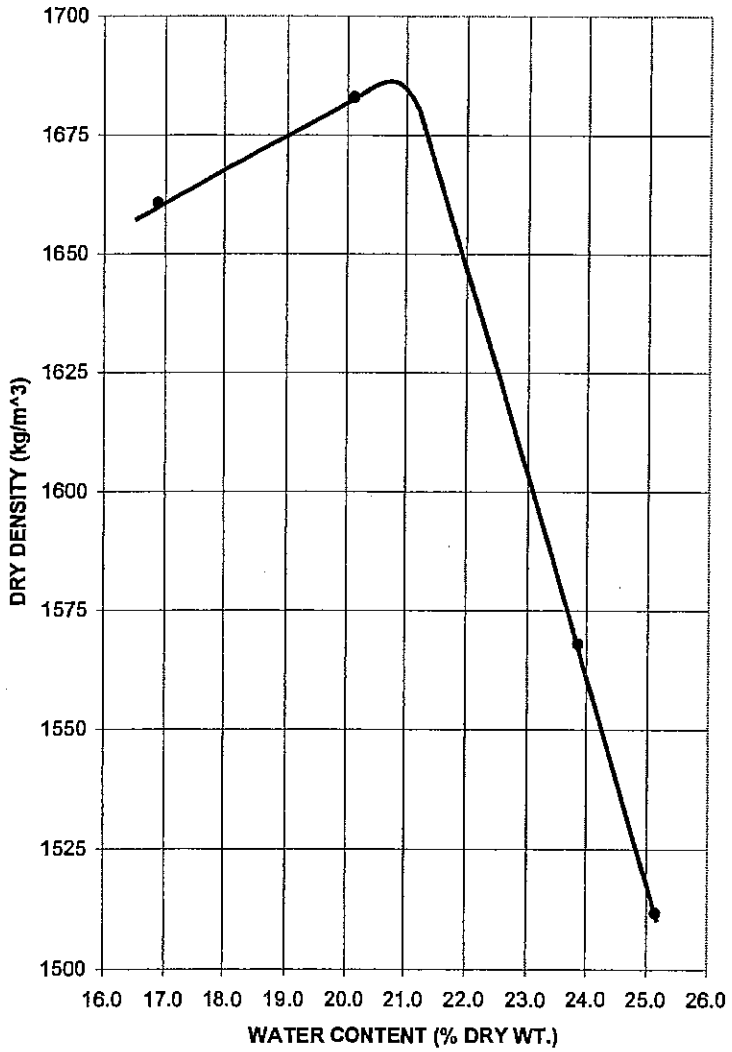
Client	Canadian Crude Separators Inc.
Location	Fort St. John, British Columbia
Project	Hydrogeological Investigation
Job No.	C1548
Sample No.	IH108-IH110

COMPACTION TEST

	TRIAL NUMBER		1	2	3	4	5	6
Density Determination	MOLD NO							
	WT. SAMPLE WET + MOLD	(g)	5966.0	6042.2	5966.9	5919.6		
	WT. OF MOLD	(g)	4127.8	4127.8	4127.8	4127.8		
	WT. SAMPLE WET	(g)	1838.2	1914.4	1839.1	1791.8		
	VOLUME OF MOLD	(m^3)	947	947	947	947		
	WET DENSITY	(Kg/m^3)	1941.1	2021.5	1942.0	1892.1		
	DRY DENSITY	(Kg/m^3)	1661	1683	1568	1512		

Water Content Determination	TARE NO.		P1	P3	P4	P5		
	WT. SAMPLE WET + TARE	(g)	411.8	412.4	408.7	409.2		
	WT. SAMPLE DRY + TARE	(g)	391.8	391.3	382.6	384.5		
	WT. OF TARE	(g)	273.3	286.4	273.2	286.3		
	WT. DRY SOIL	(g)	118.5	104.9	109.4	98.2		
	WT. OF WATER	(g)	20.0	21.1	26.1	24.7		
	WATER CONTENT W%		16.9	20.1	23.9	25.2		



AT OPTIMUM:

W% = 21.0

DENSITY = 1687 Kg/m^3

ROCK CORRECTED DENSITY _____ Kg/m^3

METHOD OF COMPACTION ASTM-D698

DESCRIPTION OF SAMPLE:
Composite sample. Clay

BOREHOLE NO. TP201

DEPTH 2.0 m to 4.9 m

REMARKS:

NATURAL WATER CONTENT:

Tare#:
Sample+Tare WT.:
Sample+Tare Dry.:
Wt.of Tare:
Wt.Dry soil:
Wt. Of Water:
Water Content:

DRY DENSITY = $\frac{100 \text{ X WET DENSITY}}{100 + W\%}$

WET DENSITY = $\frac{\text{WT. OF COMPACTED SOIL}}{\text{VOLUME OF COMPACTED SOIL}}$

DISTRIBUTION:

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PROJECT	Hydrogeological Site Investigation	DATE	20-Dec-01
CLIENT	Canadian Crude Separators	TECH.	HC
LOCATION	Block A, 8-88-20-W6M	PROJ. NO.	C1548
SAMPLE	IH97, IH99 and IH100		

Unified Sieve

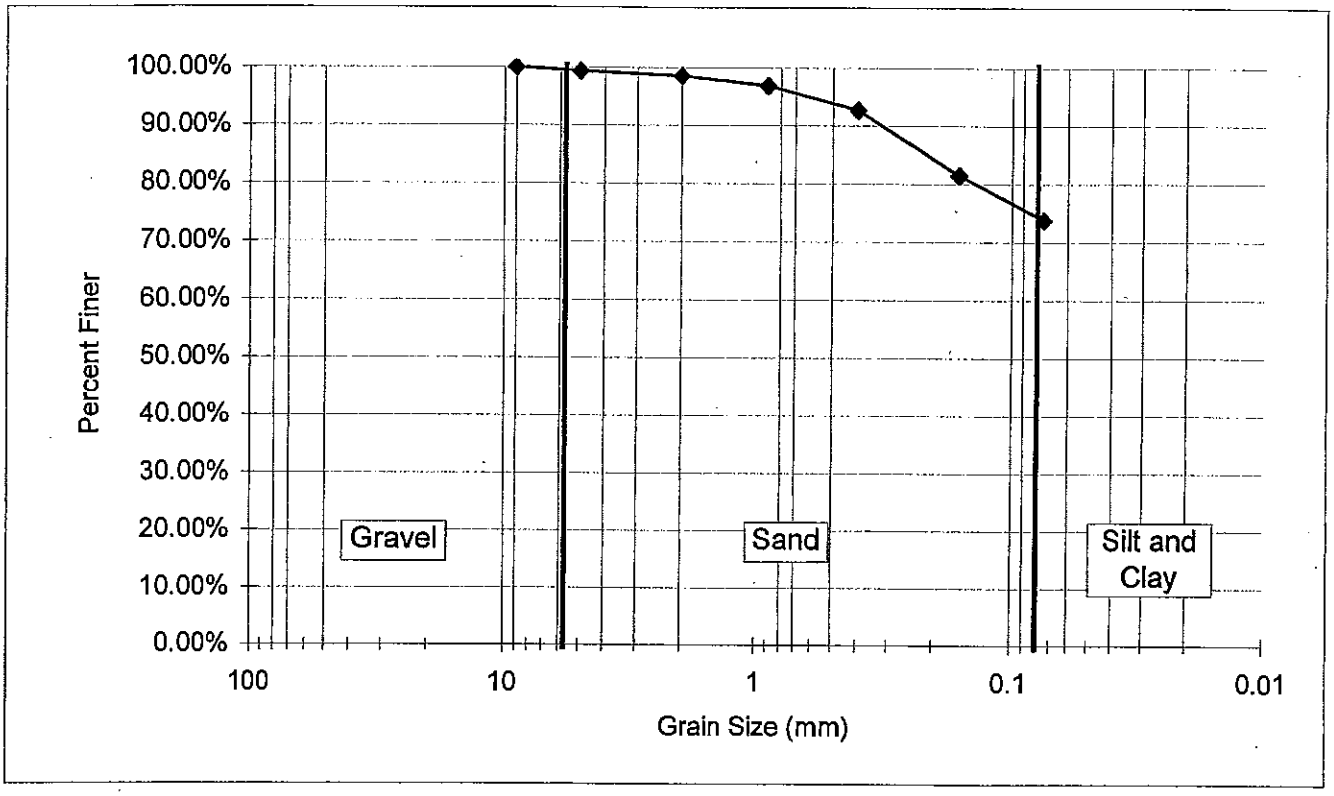
Laboratory ID No.	0	Project No.	C1548
Original Dry Wt	100.00 g	Sample No.	IH97, IH99, IH100
Wash Dry Wt.	26.46 g	Date	12/18/01
Minus 75 Material	73.54 g	Technician	HC

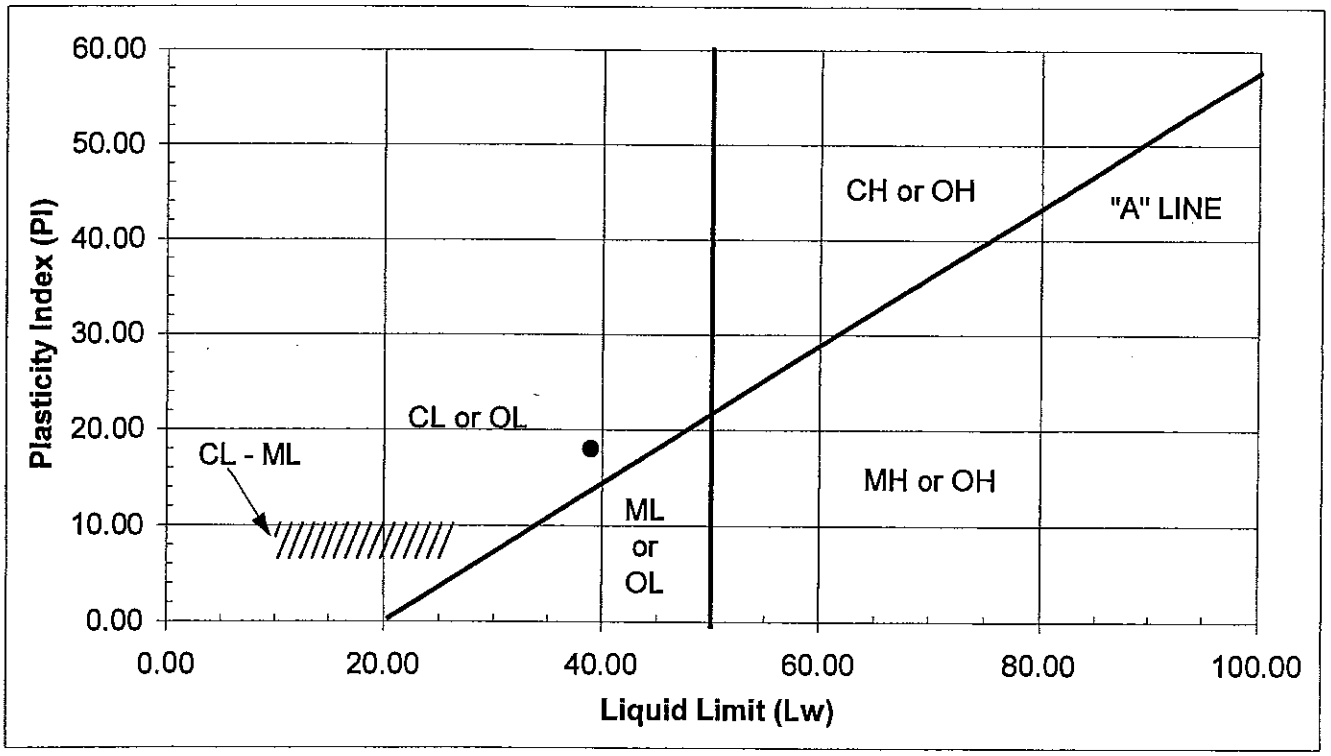
Sieve Size (mm)	Cumulative Weight Passing	Adjusted Weight Passing	Percent (%) Passing	
25	26.5	100.0	100.00%	
20	26.5	100.0	100.00%	
16	26.5	100.0	100.00%	
12.5	26.5	100.0	100.00%	
9	26.5	100.0	100.00%	
5	25.8	99.3	99.34%	
2	25.0	98.5	98.54%	0.66% Gravel
0.9	23.3	96.8	96.84%	
0.4	19.1	92.6	92.64%	
0.16	7.9	81.4	81.44%	
0.075	0.2	73.7	73.74%	25.60% Sand
				73.74% Silt &Clay

PLASTIC INDEX	Plastic Limit (PW)	Liquid Limit (LW) 24 Blows	Liquid Limit (LW) 26 Blows
Tare No.	G7	A3	A9
Wt of Tare	1.79	10.53	10.95
Wt of Wet Soil + Tare	6.36	39.69	36.22
Wt of Dry Soil + Tare	5.57	31.52	29.13
Wt of Water (Ww)	0.79	8.17	7.09
Wt of Dry Soil	3.78	20.99	18.18
Water content %	20.90%	38.92%	39.00%
Correction factor		0.99511	1.00470
Corrected Limit	20.90%	38.73%	39.18%

Group Index: **12**

Pw	20.90%	Soil type:	Inorganic
Lw	38.96%	Fines type:	CL
PI	18.06%	Classification:	CL - Lean clay with sand


100.00%
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
Percent Finer
Gravel
Sand
Silt and Clay
100
10
1
0.1
0.01
Grain Size (mm)


60.00
50.00
40.00
30.00
20.00
10.00
0.00
Plasticity Index (PI)
CH or OH
"A" LINE
CL or OL
CL - ML
MH or OH
ML
or
OL
0.00
20.00
40.00
60.00
80.00
100.00
Liquid Limit (Lw)

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMEABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.91	IH111	Grab		21.9												120	
2.44	IH112	Grab		18.2												145	
3.35	IH113	Grab		19.2												170	
4.57	IH114	Grab		20.5												145	
5.49	IH115	Grab		18.1												145	

Clifton Associates Ltd.
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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.

TP204

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	SULPHATE CONTENT	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	%	kPa	kPa	kPa	kg/m^3
0.61	IH116	Grab		26.4												70	
2.13	IH117	Grab		23.1												120	
2.74	IH118	Grab		21.6												155	
3.96	IH119	Grab		19.4												145	
5.33	IH120	Grab		19.0												145	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.

TP205

SUMMARY OF SAMPLING AND LABORATORY TEST DATA

SAMPLE					CONSISTENCY				GRADATION					SHEAR STRENGTH			
DEPTH	NUMBER	TYPE	RECOVERY	WATER CONTENT	PLASTIC LIMIT	LIQUID LIMIT	PLASTICITY INDEX	USC	GRAVEL	SAND	SILT	CLAY	FALLING HEAD PERMABILITY TEST	COMPRESSION TEST	LAB VANE	POCKET PEN	DRY DENSITY
meters			mm	%	%	%	%		%	%	%	%	cm/s	kPa	kPa	kPa	kg/m^3
0.91	IH121	Grab		23.1												95	
1.83	IH122	Grab		22.4												120	
3.05	IH123	Grab		21.9												145	
4.57	IH124	Grab		18.2												170	

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CLIENT Canadian Crude Separators Inc.
PROJECT Hydrogeological Siting Suitability Investigation
LOCATION Block A, Section 8-TWP88-RGE20-W6M
PROJECT NO. CG1548

BOREHOLE NO.
TP206

Clifton Associates Ltd.
engineering science technology

Analytical Laboratory Test Data

ETL Enviro-Test LABORATORIES

A DIVISION OF ETL CHEMSPEC ANALYTICAL LIMITED

CHEMICAL ANALYSIS REPORT

CLIFTON ASSOCIATES LTD

ATTN: IAN HARDER

9908 107 AVENUE

FORT ST JOHN BC V1J 2P6

DATE: February 04, 2002

Lab Work Order #: L56178 **Sampled By:** RT **Date Received:** 24-JAN-02

Project P.O. #: NOT SUBMITTED

Project Reference: CG 1548

Comments: UND - Unreliable: Sample Not Preserved Properly.

APPROVED BY:

TAMMI HOGAN

Project Manager

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-1	KM 10, MILE 73 ALASKA HWY~BH 101						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	BTEX, VPH, LEPH & HEPH; PAH corrected						
	PAHs						
	Naphthalene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acridine	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acenaphthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluorene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Phenanthrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluoranthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	LEPHs and HEPHs						
	LEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	HEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	BTEX and VPH (C6-C10)						
	Benzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Toluene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Ethylbenzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Xylenes	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Petroleum Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Total As, Se, Sb and Hg						
	Antimony (Sb)-Total	0.0007	0.0004	mg/L		28-JAN-02	ZG
	Arsenic (As)-Total	<0.0004	0.0004	mg/L		28-JAN-02	ZG
	Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
	Selenium (Se)-Total	<0.0004	0.0004	mg/L		28-JAN-02	ZG
	Major Ions & Total Metals						
	Chloride (Cl)	<1	1	mg/L		28-JAN-02	CNP
	Fluoride (F)	0.14	0.05	mg/L		28-JAN-02	PTT
	Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
	pH, Conductivity and Total Alkalinity						
	pH	6.9	0.1	pH			PTT
	Conductivity (EC)	3690	0.2	uS/cm			PTT
	Bicarbonate (HCO3)	484	5	mg/L			PTT
	Carbonate (CO3)	<5	5	mg/L			PTT
	Hydroxide (OH)	<5	5	mg/L			PTT
	Alkalinity, Total (as CaCO3)	397	5	mg/L			PTT
	Total Trace Metals						
	Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Aluminum (Al)	0.05	0.01	mg/L		28-JAN-02	ZG
	Boron (B)	0.29	0.05	mg/L		28-JAN-02	ZG
	Barium (Ba)	0.033	0.003	mg/L		28-JAN-02	ZG
	Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
	Cadmium (Cd)	0.001	0.001	mg/L		28-JAN-02	ZG
	Cobalt (Co)	0.005	0.002	mg/L		28-JAN-02	ZG
	Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Copper (Cu)	0.002	0.001	mg/L		28-JAN-02	ZG

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-1	KM 10, MILE 73 ALASKA HWY~BH 101						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	Major Ions & Total Metals						
	Total Trace Metals						
	Molybdenum (Mo)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Nickel (Ni)	0.016	0.002	mg/L		28-JAN-02	ZG
	Lead (Pb)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Strontium (Sr)	2.13	0.002	mg/L		28-JAN-02	ZG
	Titanium (Ti)	0.002	0.001	mg/L		28-JAN-02	ZG
	Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Vanadium (V)	<0.001	0.001	mg/L		28-JAN-02	ZG
	Zinc (Zn)	0.024	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals						
	Calcium (Ca)	435	0.5	mg/L		30-JAN-02	EC
	Potassium (K)	7.3	0.1	mg/L		30-JAN-02	EC
	Magnesium (Mg)	282	0.1	mg/L		30-JAN-02	EC
	Sodium (Na)	159	1	mg/L		30-JAN-02	EC
	Iron (Fe)	0.071	0.005	mg/L		30-JAN-02	EC
	Manganese (Mn)	1.01	0.001	mg/L		30-JAN-02	EC
	Ion Balance Calculation						
	Ion Balance	93.0		%		29-JAN-02	
	TDS (Calculated)	3650		mg/L		29-JAN-02	
	Hardness (as CaCO3)	2430		mg/L		29-JAN-02	
	ICP metals and SO4 for routine water						
	Calcium (Ca)	469	0.5	mg/L		29-JAN-02	MOR
	Potassium (K)	8.3	0.1	mg/L		29-JAN-02	MOR
	Magnesium (Mg)	306	0.1	mg/L		29-JAN-02	MOR
	Sodium (Na)	152	1	mg/L		29-JAN-02	MOR
	Sulfate (SO4)	2480	0.5	mg/L		29-JAN-02	MOR
	Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
	Uranium (U)-Total	<0.05	0.05	mg/L		28-JAN-02	ZG
	Ammonia-N	0.07	0.05	mg/L		25-JAN-02	TL
	Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
	Phenols (4AAP)	<0.001	0.001	mg/L		29-JAN-02	DDN
	Sulphide	0.040	0.003	mg/L		28-JAN-02	TL/WN
	Total Organic Carbon	6	1	mg/L		24-JAN-02	JTV
L56178-2	KM 10, MILE 73 ALASKA HWY~BH 102						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	Total As, Se, Sb and Hg						
	Antimony (Sb)-Total	0.0019	0.0004	mg/L		28-JAN-02	ZG
	Arsenic (As)-Total	0.0028	0.0004	mg/L		28-JAN-02	ZG
	Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
	Selenium (Se)-Total	0.0311	0.0004	mg/L		28-JAN-02	ZG
	Major Ions & Total Metals						
	Chloride (Cl)	5	1	mg/L		28-JAN-02	CNP
	Fluoride (F)	0.11	0.05	mg/L		28-JAN-02	PTT
	Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-2	KM 10, MILE 73 ALASKA HWY~BH 102						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	Major Ions & Total Metals						
	Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
	pH, Conductivity and Total Alkalinity						
	pH	7.5	0.1	pH		25-JAN-02	PTT
	Conductivity (EC)	3890	0.2	uS/cm		25-JAN-02	PTT
	Bicarbonate (HCO3)	486	5	mg/L		25-JAN-02	PTT
	Carbonate (CO3)	<5	5	mg/L		25-JAN-02	PTT
	Hydroxide (OH)	<5	5	mg/L		25-JAN-02	PTT
	Alkalinity, Total (as CaCO3)	398	5	mg/L		25-JAN-02	PTT
	Total Trace Metals						
	Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Aluminum (Al)	1.40	0.01	mg/L		28-JAN-02	ZG
	Boron (B)	0.26	0.05	mg/L		28-JAN-02	ZG
	Barium (Ba)	0.057	0.003	mg/L		28-JAN-02	ZG
	Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
	Cadmium (Cd)	0.003	0.001	mg/L		28-JAN-02	ZG
	Cobalt (Co)	0.014	0.002	mg/L		28-JAN-02	ZG
	Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Copper (Cu)	0.029	0.001	mg/L		28-JAN-02	ZG
	Molybdenum (Mo)	0.016	0.005	mg/L		28-JAN-02	ZG
	Nickel (Ni)	0.046	0.002	mg/L		28-JAN-02	ZG
	Lead (Pb)	0.006	0.005	mg/L		28-JAN-02	ZG
	Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Strontium (Sr)	2.71	0.002	mg/L		28-JAN-02	ZG
	Titanium (Ti)	0.017	0.001	mg/L		28-JAN-02	ZG
	Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Vanadium (V)	0.006	0.001	mg/L		28-JAN-02	ZG
	Zinc (Zn)	0.082	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals						
	Calcium (Ca)	365	0.5	mg/L		30-JAN-02	EC
	Potassium (K)	12.3	0.1	mg/L		30-JAN-02	EC
	Magnesium (Mg)	195	0.1	mg/L		30-JAN-02	EC
	Sodium (Na)	417	1	mg/L		30-JAN-02	EC
	Iron (Fe)	4.11	0.005	mg/L		30-JAN-02	EC
	Manganese (Mn)	1.55	0.001	mg/L		30-JAN-02	EC
	Ion Balance Calculation						
	Ion Balance	93.2		%		29-JAN-02	
	TDS (Calculated)	3670		mg/L		29-JAN-02	
	Hardness (as CaCO3)	1870		mg/L		29-JAN-02	
	ICP metals and SO4 for routine water						
	Calcium (Ca)	386	0.5	mg/L		29-JAN-02	MOR
	Potassium (K)	12.3	0.1	mg/L		29-JAN-02	MOR
	Magnesium (Mg)	220	0.1	mg/L		29-JAN-02	MOR
	Sodium (Na)	386	1	mg/L		29-JAN-02	MOR
	Sulfate (SO4)	2420	0.5	mg/L		29-JAN-02	MOR
	Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
	Uranium (U)-Total	<0.05	0.05	mg/L		28-JAN-02	ZG
	Ammonia-N	0.60	0.05	mg/L		25-JAN-02	TL

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-2	KM 10, MILE 73 ALASKA HWY~BH 102						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
	Sulphide	0.006	0.003	mg/L		28-JAN-02	TL/WN
L56178-3	KM 10, MILE 73 ALASKA HWY~BH 103						
Sample Date:	22-JAN-02						
Matrix:	WATER						
	BTEX, VPH, LEPH & HEPH; PAH corrected						
	PAHs						
	Naphthalene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acridine	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acenaphthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluorene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Phenanthrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluoranthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	LEPHs and HEPHs						
	LEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	HEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	BTEX and VPH (C6-C10)						
	Benzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Toluene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Ethylbenzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Xylenes	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Petroleum Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Total As, Se, Sb and Hg						
	Antimony (Sb)-Total	0.0008	0.0004	mg/L		28-JAN-02	ZG
	Arsenic (As)-Total	0.0004	0.0004	mg/L		28-JAN-02	ZG
	Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
	Selenium (Se)-Total	0.0006	0.0004	mg/L		28-JAN-02	ZG
	Major Ions & Total Metals						
	Chloride (Cl)	<1	1	mg/L		28-JAN-02	CNP
	Fluoride (F)	0.14	0.05	mg/L		28-JAN-02	PTT
	Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
	pH, Conductivity and Total Alkalinity						
	pH	6.3	0.1	pH		25-JAN-02	PTT
	Conductivity (EC)	4780	0.2	uS/cm		25-JAN-02	PTT
	Bicarbonate (HCO3)	200	5	mg/L		25-JAN-02	PTT
	Carbonate (CO3)	<5	5	mg/L		25-JAN-02	PTT
	Hydroxide (OH)	<5	5	mg/L		25-JAN-02	PTT
	Alkalinity, Total (as CaCO3)	164	5	mg/L		25-JAN-02	PTT
	Total Trace Metals						
	Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Aluminum (Al)	0.10	0.01	mg/L		28-JAN-02	ZG

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-3	KM 10, MILE 73 ALASKA HWY~BH 103							
Sample Date:	22-JAN-02							
Matrix:	WATER							
	Major Ions & Total Metals							
	Total Trace Metals							
		Boron (B)	0.73	0.05	mg/L		28-JAN-02	ZG
		Barium (Ba)	0.033	0.003	mg/L		28-JAN-02	ZG
		Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
		Cadmium (Cd)	0.002	0.001	mg/L		28-JAN-02	ZG
		Cobalt (Co)	0.012	0.002	mg/L		28-JAN-02	ZG
		Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Copper (Cu)	0.004	0.001	mg/L		28-JAN-02	ZG
		Molybdenum (Mo)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Nickel (Ni)	0.065	0.002	mg/L		28-JAN-02	ZG
		Lead (Pb)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
		Strontium (Sr)	1.54	0.002	mg/L		28-JAN-02	ZG
		Titanium (Ti)	0.005	0.001	mg/L		28-JAN-02	ZG
		Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
		Vanadium (V)	<0.001	0.001	mg/L		28-JAN-02	ZG
		Zinc (Zn)	0.044	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals							
		Calcium (Ca)	387	0.5	mg/L		30-JAN-02	EC
		Potassium (K)	10.1	0.1	mg/L		30-JAN-02	EC
		Magnesium (Mg)	351	0.1	mg/L		30-JAN-02	EC
		Sodium (Na)	411	1	mg/L		30-JAN-02	EC
		Iron (Fe)	0.090	0.005	mg/L		30-JAN-02	EC
		Manganese (Mn)	1.11	0.001	mg/L		30-JAN-02	EC
	Ion Balance Calculation							
		Ion Balance	94.6		%		29-JAN-02	
		TDS (Calculated)	4900		mg/L		29-JAN-02	
		Hardness (as CaCO3)	2730		mg/L		29-JAN-02	
	ICP metals and SO4 for routine water							
		Calcium (Ca)	437	0.5	mg/L		29-JAN-02	MOR
		Potassium (K)	10.8	0.1	mg/L		29-JAN-02	MOR
		Magnesium (Mg)	398	0.1	mg/L		29-JAN-02	MOR
		Sodium (Na)	413	1	mg/L		29-JAN-02	MOR
		Sulfate (SO4)	3540	0.5	mg/L		29-JAN-02	MOR
		Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
		Uranium (U)-Total	<0.05	0.05	mg/L		28-JAN-02	ZG
		Ammonia-N	0.37	0.05	mg/L		25-JAN-02	TL
		Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
		Phenols (4AAP)	<0.001	0.001	mg/L		29-JAN-02	DDN
		Sulphide	0.006	0.003	mg/L		28-JAN-02	TL/WN
		Total Organic Carbon	8	1	mg/L		24-JAN-02	JTV
L56178-4	KM 10, MILE 73 ALASKA HWY~BH 105							
Sample Date:	22-JAN-02							
Matrix:	WATER							
	BTEX, VPH, LEPH & HEPH; PAH corrected							
	PAHs							
		Naphthalene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Acridine	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-4	KM 10, MILE 73 ALASKA HWY~BH 105							
Sample Date:	22-JAN-02							
Matrix:	WATER							
		BTEX, VPH, LEPH & HEPH; PAH corrected						
		PAHs						
		Acenaphthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Fluorene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Phenanthrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Fluoranthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Benzo(a)anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		Benzo(a)pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
		LEPHs and HEPHs						
		LEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
		HEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
		BTEX and VPH (C6-C10)						
		Benzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Toluene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Ethylbenzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Xylenes	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Volatile Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
		Volatile Petroleum Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
		Total As, Se, Sb and Hg						
		Antimony (Sb)-Total	0.0009	0.0004	mg/L		28-JAN-02	ZG
		Arsenic (As)-Total	0.0008	0.0004	mg/L		28-JAN-02	ZG
		Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
		Selenium (Se)-Total	0.0012	0.0004	mg/L		28-JAN-02	ZG
		Major Ions & Total Metals						
		Chloride (Cl)	2	1	mg/L		28-JAN-02	CNP
		Fluoride (F)	0.07	0.05	mg/L		28-JAN-02	PTT
		Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP
		Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
		Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
		pH, Conductivity and Total Alkalinity						
		pH	7.0	0.1	pH		25-JAN-02	PTT
		Conductivity (EC)	4120	0.2	uS/cm		25-JAN-02	PTT
		Bicarbonate (HCO3)	853	5	mg/L		25-JAN-02	PTT
		Carbonate (CO3)	<5	5	mg/L		25-JAN-02	PTT
		Hydroxide (OH)	<5	5	mg/L		25-JAN-02	PTT
		Alkalinity, Total (as CaCO3)	699	5	mg/L		25-JAN-02	PTT
		Total Trace Metals						
		Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Aluminum (Al)	0.03	0.01	mg/L		28-JAN-02	ZG
		Boron (B)	0.25	0.05	mg/L		28-JAN-02	ZG
		Barium (Ba)	0.054	0.003	mg/L		28-JAN-02	ZG
		Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
		Cadmium (Cd)	<0.001	0.001	mg/L		28-JAN-02	ZG
		Cobalt (Co)	0.009	0.002	mg/L		28-JAN-02	ZG
		Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Copper (Cu)	0.003	0.001	mg/L		28-JAN-02	ZG
		Molybdenum (Mo)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Nickel (Ni)	0.029	0.002	mg/L		28-JAN-02	ZG

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-4	KM 10, MILE 73 ALASKA HWY~BH 105						
Sample Date:	22-JAN-02						
Matrix:	WATER						
	Major Ions & Total Metals						
	Total Trace Metals						
	Lead (Pb)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Strontium (Sr)	4.12	0.002	mg/L		28-JAN-02	ZG
	Titanium (Ti)	0.001	0.001	mg/L		28-JAN-02	ZG
	Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Vanadium (V)	<0.001	0.001	mg/L		28-JAN-02	ZG
	Zinc (Zn)	0.023	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals						
	Calcium (Ca)	484	0.5	mg/L		30-JAN-02	EC
	Potassium (K)	8.9	0.1	mg/L		30-JAN-02	EC
	Magnesium (Mg)	219	0.1	mg/L		30-JAN-02	EC
	Sodium (Na)	335	1	mg/L		30-JAN-02	EC
	Iron (Fe)	0.040	0.005	mg/L		30-JAN-02	EC
	Manganese (Mn)	0.804	0.001	mg/L		30-JAN-02	EC
	Ion Balance Calculation						
	Ion Balance	94.3		%		29-JAN-02	
	TDS (Calculated)	3880		mg/L		29-JAN-02	
	Hardness (as CaCO3)	2310		mg/L		29-JAN-02	
	Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
	Uranium (U)-Total	0.06	0.05	mg/L		28-JAN-02	ZG
	Ammonia-N	0.70	0.05	mg/L		25-JAN-02	TL
	Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
	Phenols (4AAP)	<0.001	0.001	mg/L		29-JAN-02	DDN
	Sulphide	<0.003	0.003	mg/L		28-JAN-02	TL/WN
	Total Organic Carbon	4	1	mg/L		24-JAN-02	JTV
L56178-5	KM 10, MILE 73 ALASKA HWY~BH 106						
Sample Date:	22-JAN-02						
Matrix:	WATER						
	BTEX, VPH, LEPH & HEPH; PAH corrected						
	PAHs						
	Naphthalene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acridine	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acenaphthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluorene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Phenanthrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluoranthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	LEPHs and HEPHs						
	LEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	HEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	BTEX and VPH (C6-C10)						
	Benzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Toluene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-5	KM 10, MILE 73 ALASKA HWY~BH 106							
Sample Date:	22-JAN-02							
Matrix:	WATER							
	BTEX, VPH, LEPH & HEPH; PAH corrected							
	BTEX and VPH (C6-C10)							
		Ethylbenzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Xylenes	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
		Volatile Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
		Volatile Petroleum Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Total As, Se, Sb and Hg							
		Antimony (Sb)-Total	0.0022	0.0004	mg/L		28-JAN-02	ZG
		Arsenic (As)-Total	0.0012	0.0004	mg/L		28-JAN-02	ZG
		Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
		Selenium (Se)-Total	0.0025	0.0004	mg/L		28-JAN-02	ZG
	Major Ions & Total Metals							
		Chloride (Cl)	2	1	mg/L		28-JAN-02	CNP
		Fluoride (F)	0.08	0.05	mg/L		28-JAN-02	PTT
		Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP
		Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
		Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
	pH, Conductivity and Total Alkalinity							
		pH	6.9	0.1	pH		25-JAN-02	PTT
		Conductivity (EC)	7140	0.2	uS/cm		25-JAN-02	PTT
		Bicarbonate (HCO3)	853	5	mg/L		25-JAN-02	PTT
		Carbonate (CO3)	<5	5	mg/L		25-JAN-02	PTT
		Hydroxide (OH)	<5	5	mg/L		25-JAN-02	PTT
		Alkalinity, Total (as CaCO3)	699	5	mg/L		25-JAN-02	PTT
	Total Trace Metals							
		Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Aluminum (Al)	0.05	0.01	mg/L		28-JAN-02	ZG
		Boron (B)	0.52	0.05	mg/L		28-JAN-02	ZG
		Barium (Ba)	0.043	0.003	mg/L		28-JAN-02	ZG
		Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
		Cadmium (Cd)	0.001	0.001	mg/L		28-JAN-02	ZG
		Cobalt (Co)	0.040	0.002	mg/L		28-JAN-02	ZG
		Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Copper (Cu)	0.008	0.001	mg/L		28-JAN-02	ZG
		Molybdenum (Mo)	0.007	0.005	mg/L		28-JAN-02	ZG
		Nickel (Ni)	0.093	0.002	mg/L		28-JAN-02	ZG
		Lead (Pb)	<0.005	0.005	mg/L		28-JAN-02	ZG
		Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
		Strontium (Sr)	4.21	0.002	mg/L		28-JAN-02	ZG
		Titanium (Ti)	0.003	0.001	mg/L		28-JAN-02	ZG
		Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
		Vanadium (V)	<0.001	0.001	mg/L		28-JAN-02	ZG
		Zinc (Zn)	0.052	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals							
		Calcium (Ca)	373	0.5	mg/L		30-JAN-02	EC
		Potassium (K)	22.9	0.1	mg/L		30-JAN-02	EC
		Magnesium (Mg)	534	0.1	mg/L		30-JAN-02	EC
		Sodium (Na)	1040	1	mg/L		30-JAN-02	EC
		Iron (Fe)	0.040	0.005	mg/L		30-JAN-02	EC
		Manganese (Mn)	4.60	0.001	mg/L		30-JAN-02	EC

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-5	KM 10, MILE 73 ALASKA HWY~BH 106						
Sample Date:	22-JAN-02						
Matrix:	WATER						
	Major Ions & Total Metals						
	Ion Balance Calculation						
	Ion Balance	93.6		%		29-JAN-02	
	TDS (Calculated)	7060		mg/L		29-JAN-02	
	Hardness (as CaCO3)	3320		mg/L		29-JAN-02	
	ICP metals and SO4 for routine water						
	Calcium (Ca)	381	0.5	mg/L		29-JAN-02	MOR
	Potassium (K)	21.3	0.1	mg/L		29-JAN-02	MOR
	Magnesium (Mg)	575	0.1	mg/L		29-JAN-02	MOR
	Sodium (Na)	891	1	mg/L		29-JAN-02	MOR
	Sulfate (SO4)	4770	0.5	mg/L		29-JAN-02	MOR
	Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
	Uranium (U)-Total	<0.05	0.05	mg/L		28-JAN-02	ZG
	Ammonia-N	5.81	0.05	mg/L		25-JAN-02	TL
	Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
	Phenols (4AAP)	<0.001	0.001	mg/L		29-JAN-02	DDN
	Sulphide	<0.003	0.003	mg/L		28-JAN-02	TL/WN
	Total Organic Carbon	14	1	mg/L		24-JAN-02	JTV
L56178-6	KM 10, MILE 73 ALASKA HWY~BH 107						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	BTEX, VPH, LEPH & HEPH; PAH corrected						
	PAHs						
	Naphthalene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acridine	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Acenaphthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluorene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Phenanthrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Fluoranthene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)anthracene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	Benzo(a)pyrene	<5	5	ug/L	25-JAN-02	25-JAN-02	ESG
	LEPHs and HEPHs						
	LEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	HEPH	<50	50	ug/L	25-JAN-02	25-JAN-02	SCM
	BTEX and VPH (C6-C10)						
	Benzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Toluene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Ethylbenzene	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Xylenes	<0.5	0.5	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Volatile Petroleum Hydrocarbons	<100	100	ug/L	25-JAN-02	26-JAN-02	CVL
	Total As, Se, Sb and Hg						
	Antimony (Sb)-Total	0.0009	0.0004	mg/L		28-JAN-02	ZG
	Arsenic (As)-Total	0.0005	0.0004	mg/L		28-JAN-02	ZG
	Mercury (Hg)-Total	<0.0002	0.0002	mg/L		28-JAN-02	ZG
	Selenium (Se)-Total	<0.0004	0.0004	mg/L		28-JAN-02	ZG

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID / Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-6	KM 10, MILE 73 ALASKA HWY~BH 107						
Sample Date:	18-JAN-02						
Matrix:	WATER						
	Major Ions & Total Metals						
	Chloride (Cl)	<1	1	mg/L		28-JAN-02	CNP
	Fluoride (F)	0.21	0.05	mg/L		28-JAN-02	PTT
	Nitrate+Nitrite-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrate-N	<0.1	0.1	mg/L		25-JAN-02	CNP
	Nitrite-N	<0.05	0.05	mg/L		25-JAN-02	CNP
	pH, Conductivity and Total Alkalinity						
	pH	6.6	0.1	pH		25-JAN-02	PTT
	Conductivity (EC)	1480	0.2	uS/cm		25-JAN-02	PTT
	Bicarbonate (HCO3)	217	5	mg/L		25-JAN-02	PTT
	Carbonate (CO3)	<5	5	mg/L		25-JAN-02	PTT
	Hydroxide (OH)	<5	5	mg/L		25-JAN-02	PTT
	Alkalinity, Total (as CaCO3)	178	5	mg/L		25-JAN-02	PTT
	Total Trace Metals						
	Silver (Ag)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Aluminum (Al)	0.66	0.01	mg/L		28-JAN-02	ZG
	Boron (B)	0.29	0.05	mg/L		28-JAN-02	ZG
	Barium (Ba)	0.063	0.003	mg/L		28-JAN-02	ZG
	Beryllium (Be)	<0.002	0.002	mg/L		28-JAN-02	ZG
	Cadmium (Cd)	<0.001	0.001	mg/L		28-JAN-02	ZG
	Cobalt (Co)	0.007	0.002	mg/L		28-JAN-02	ZG
	Chromium (Cr)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Copper (Cu)	0.004	0.001	mg/L		28-JAN-02	ZG
	Molybdenum (Mo)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Nickel (Ni)	0.027	0.002	mg/L		28-JAN-02	ZG
	Lead (Pb)	<0.005	0.005	mg/L		28-JAN-02	ZG
	Tin (Sn)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Strontium (Sr)	0.529	0.002	mg/L		28-JAN-02	ZG
	Titanium (Ti)	0.010	0.001	mg/L		28-JAN-02	ZG
	Thallium (Tl)	<0.05	0.05	mg/L		28-JAN-02	ZG
	Vanadium (V)	0.003	0.001	mg/L		28-JAN-02	ZG
	Zinc (Zn)	0.039	0.001	mg/L		28-JAN-02	ZG
	Total Major Metals						
	Calcium (Ca)	147	0.5	mg/L		30-JAN-02	EC
	Potassium (K)	4.0	0.1	mg/L		30-JAN-02	EC
	Magnesium (Mg)	99.0	0.1	mg/L		30-JAN-02	EC
	Sodium (Na)	39	1	mg/L		30-JAN-02	EC
	Iron (Fe)	0.372	0.005	mg/L		30-JAN-02	EC
	Manganese (Mn)	0.427	0.001	mg/L		30-JAN-02	EC
	Ion Balance Calculation						
	Ion Balance	93.9		%		29-JAN-02	
	TDS (Calculated)	1160		mg/L		29-JAN-02	
	Hardness (as CaCO3)	817		mg/L		29-JAN-02	
	ICP metals and SO4 for routine water						
	Calcium (Ca)	154	0.5	mg/L		29-JAN-02	MOR
	Potassium (K)	4.2	0.1	mg/L		29-JAN-02	MOR
	Magnesium (Mg)	105	0.1	mg/L		29-JAN-02	MOR
	Sodium (Na)	37	1	mg/L		29-JAN-02	MOR
	Sulfate (SO4)	752	0.5	mg/L		29-JAN-02	MOR

ENVIRO-TEST CHEMICAL ANALYSIS REPORT

Lab ID	Sample ID	Test Description	Result	D.L.	Units	Extracted	Analyzed	By
L56178-6	KM 10, MILE 73 ALASKA HWY~BH 107							
Sample Date:	18-JAN-02							
Matrix:	WATER							
		Cyanide, Total	<0.002 UND	0.002	mg/L	28-JAN-02	30-JAN-02	MRR
		Uranium (U)-Total	<0.05	0.05	mg/L		28-JAN-02	ZG
		Ammonia-N	<0.05	0.05	mg/L		25-JAN-02	TL
		Cyanide, Weak Acid Diss	<0.002 UND	0.002	mg/L	29-JAN-02	30-JAN-02	MRR
		Phenols (4AAP)	<0.001	0.001	mg/L		29-JAN-02	DDN
		Sulphide	<0.003	0.003	mg/L		28-JAN-02	TL/WN
		Total Organic Carbon	16	1	mg/L		24-JAN-02	JTV

Methodology Reference

ETL Test Code	Test Description	Methodology Reference (In-House Standard Operating Procedures which Generally Follow:)
AS-TOT-HYD-ED	Arsenic (As)-Total	APHA 3114 C-AAS - Hydride
BTX,TVH-BC-ED	BTEX and VPH (C6-C10)	5030/8020 (BTEX); CSR-Anal. Meth.2 (VPH)
C-TOT-ORG-ED	Total Organic Carbon	APHA 5310 B-Instrumental
CL-ED	Chloride (Cl)	APHA 4500 Cl E-Colorimetry
CN-TOT-TB	Cyanide, Total	APHA 4500CN C E-Strong acid Dist Colorim
CN-WAD-TB	Cyanide, Weak Acid Diss	APHA 4500CN I-Weak acid Dist Colorimet
ETL-LEPH/HEPH-ED	LEPHs and HEPHs	BC MELP CSR-Analytical Method 4
ETL-PAH-BCMELP-ED	PAHs	EPA 3510/8270-GC/MS
ETL-ROUTINE-ICP-ED	ICP metals and SO4 for routine water	APHA 3120 B-ICP-OES
F-ED	Fluoride (F)	APHA 4500 F-C-Electrode
HG-TOT-HYD-ED	Mercury (Hg)-Total	APHA 3112 B-AAS Cold Vapor
IONBALANCE-ED	Ion Balance Calculation	APHA 1030E
MET1-TOT-ED	Total Trace Metals	APHA 3120 B-ICP-OES
MET2-TOT-ED	Total Major Metals	APHA 3120 B-ICP-OES
N2N3-ED	Nitrate+Nitrite-N	APHA 4500 NO3H-Colorimetry
NH4-ED	Ammonia-N	APHA4500NH3F Colorimetry
NO2-ED	Nitrite-N	APHA 4500 NO2B-Colorimetry
NO3-ED	Nitrate-N	APHA 4500 NO3H-Colorimetry
PH/EC/ALK-ED	pH, Conductivity and Total Alkalinity	APHA 4500-H, 2510, 2320
PHENOLS-CL	Phenols (4AAP)	EPA 420.2-Colorimetric
SB-TOT-HYD-ED	Antimony (Sb)-Total	APHA 3114 C-AAS-Hydride
SE-TOT-HYD-ED	Selenium (Se)-Total	APHA 3114 C-AAS-Hydride
SULPHIDE-ED	Sulphide	APHA 4500 -S E-Auto-Colorimetry
U-TOT-ED	Uranium (U)-Total	APHA 3120 B-ICP-OES

Clifton Associates Ltd.
engineering science technology

Appendix A

Province of British Columbia

MINISTRY OF ENVIRONMENT, LANDS AND PARKS

BC Environment

Environmental Protection
1011 Fourth Avenue
Prince George, British Columbia
V2L 3H9
Telephone: (604) 565-6452
Fax: (604) 565-6629

February 15, 1994

File: PR-10758

Rudiger Enterprises Ltd.
SS #2, Site 18
Comp 10
Fort St. John, B.C.
V1J 4M7

Attention: Mr. E. Rudiger

Dear Sir:

Re: Application Pursuant to the Waste Management Act on behalf of Rudiger Enterprises Ltd., dated April 15, 1991

Thank you for the water level data from February 2 and 14, 1994.

Section 28 (3) of the Special Waste Regulation requires that a land treatment facility have a minimum separation of 1 metre of unsaturated soil with a permeability less than 1×10^{-6} cm/s above the seasonally high water table.

I require confirmation from a qualified professional that your proposed site meets this minimum separation requirement. It is my understanding that periodic water levels have been measured at your site. This information may be sufficient to show the depth to the seasonally high water level.

I look forward to receiving this information in the near future so that I can continue with my assessment of your application.

Yours truly,

Ian Mitchell, P.Eng.
Environmental Protection Officer
Northern Interior Region

HBT AGRA Limited
Engineering & Environmental Services

10201 - 17 Street
Dawson Creek, B.C.
V1G 4C3
Tel (604) 782-1883
Fax (604) 782-3430

March 31, 1994
Project No. GX02369

Rudiger Enterprises Ltd.
S.S. #2, Site #18, Comp #10
Fort St. John, B.C.
V1J 4M7

Attention: Emil Rudiger

Dear Sir:

RE: WATER LEVEL DETERMINATIONS
PROPOSED LANDFILL/LANDFARM SITE
MILE 73, ALASKA HIGHWAY, B.C.

A preliminary geotechnical assessment for the proposed landfill/landfarm site was completed by HBT AGRA Limited in February, 1993. Background data on site characteristics and monitoring well completions were presented in a summary report titled "Preliminary Site Assessment, proposed Landfill/Landfarm Site, Mile 73, Alaska Highway, B.C., dated, February 1993. The present letter summarizes the condition of the site with respect to groundwater levels.

The monitoring wells were last purged on January 29, 1993. Table 1 records water level determinations in the wells since that date. The water levels were measured by Rudiger Enterprises Ltd., and reported to HBT AGRA Limited. Measurements were taken five times during February/March, 1993, once in February, 1994, and again in March, 1994. The readings during 1993 showed a continuous rise in water level in all except two of the 14 monitoring wells for which measurements could be made. The two exceptions were wells 92-6 and 92-8A, both of which showed a very slight drop in water level over the 1993 period of record. Readings in 1993 were taken over a period of 51 days.

Water levels in 1994 were considerably higher than the levels in 1993. The net rise in water level from 1993 to 1994 varied from approximately 1.5 m to nearly 6 m in the shallow monitoring wells, and from 0.2 m to 18 m in the deeper wells. The greatest rise of approximately 18 m occurred in well 92-7. Other notable rises were in 92-1 (more than 8 m), and 92-6A and 92-5A (almost 6 m in both).

Water levels in 1994 were at a shallow depth in all the shallower ("A") wells. Measured water levels in these wells were within a very narrow range of 1.15 m to 1.67 m below ground surface. The water was frozen in two wells (92-2A and 92-8A), implying an even higher water level in these two wells.

The deeper wells (92-1, 92-3 to -8) showed a wide range of water levels. The water level in 92-7 was high (at 1.28 m below ground surface on February 2, 1994), but was at a much greater depth, varying from 4.43 m to 17.68 m, in all the other deep wells.

The water level differences from 1993 to 1994 are believed to be related to very low hydraulic conductivity of the natural earth materials at the site. It is believed that water levels in all or nearly all the monitoring wells still had not stabilized at the end of the 51 days of record in 1993, and were still rising at that time towards stability. The 1994 levels are assumed to be stabilized levels which will henceforth be affected only (mainly) by natural seasonal fluctuations and construction drainage.

The rising water levels following purging in 1993, have allowed a calculation of hydraulic conductivity to be made. The resultant values (field determinations) compared to laboratory determinations made previously are shown in Table 2. The field determinations correspond very closely to the laboratory determinations. All values are very low, in the range of 3×10^{-8} cm/sec to less than 10^{-9} cm/sec, which is in keeping with the long time period required for water level stabilization. The near correspondence of field and laboratory determinations also indicates that secondary permeability (fissures, fractures, granular lenses) which may not be detected in laboratory determinations is largely lacking or ineffective.

As noted in our previous report, the land slopes from the southeast to the northwest, with a total elevation difference of approximately 55 m from the highest point of land to the lowest. The shallow groundwater table in the February/March, 1994 readings was within 2 m of the land surface (at the eight shallow monitoring wells). These wells are completed in surficial silty clay and/or in the uppermost few metres of the thick underlying glacial clay till sequence. The deeper monitoring wells are all completed within the clay till sequence at depths greater than 15 m below ground surface, and all but one have water levels deeper than 4 m below ground surface. Contours of the water level elevations (Figure 1) show that the deep groundwater flow direction is to the northwest co-incident with the general slope of the land surface. Depths to water level from ground surface are, in general, greatest in upslope locations.

The water level data also show that there is a strong downward component of groundwater movement at all monitoring wells except possibly wells 92-7/7A. Water levels in the deep and shallow wells at 92-7/7A may be approximately the same (February 2, 1994 readings), or may be slightly higher in the shallow well (92-7A), as determined on March 19, 1994.

There is a shallow groundwater zone within the silty clay/uppermost till which has a high water table level. Perimeter ditching to prevent flow of surface water across the site and to channel flow around the site of proposed landfilling would help to alleviate this condition. The low hydraulic conductivity shows that the rate of groundwater movement through this zone would be very slow. Low volumes of flow would therefore be involved.

The site is considered to be suitable for landfill/landfarming after making provision to lower and control the shallow groundwater table, and to channel runoff away from the site. The low hydraulic conductivity of the surficial silty clay and underlying clay till, and low water table levels recorded within the deeper monitoring wells are favourable characteristics of the site for the proposed development.

Respectfully submitted,

HBT AGRA Limited

Orest Tokarsky, M.Sc.
Senior Hydrogeologist

Reviewed by:

Paul Glen, P.Eng.
Senior Geological Engineer

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
T. E. STAPLES
Aug 4/94

Tom E. Staples, P.Eng.
Project Engineer

cc: B.C. Environment - Mr. I. Mitchell

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GX02369.2

TABLE 2
SUMMARY OF HYDRAULIC CONDUCTIVITIES

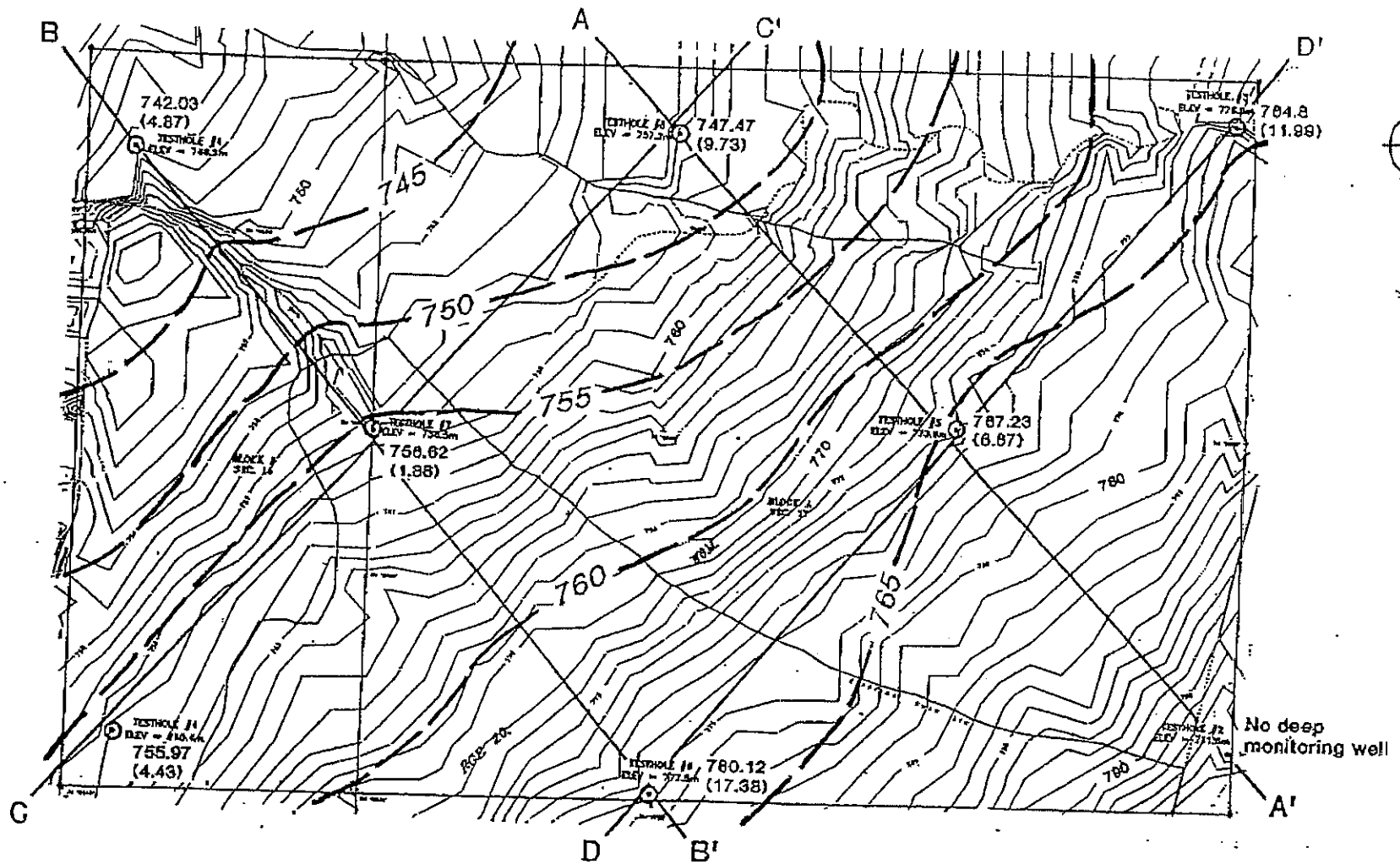
Monitoring Well No.	Hydraulic Conductivity, cm/sec, and Material Tested	
	Laboratory Determination	Field Determination (From Rising Water Level)
92-1	---	1.7×10^{-8} (clay till)
92-1A	5.7×10^{-9} (clay till)	4.3×10^{-9} (till/silty clay)
92-2A	2.4×10^{-8} (clayey silt)	---
92-3	2.8×10^{-8} (clay till)	1.0×10^{-8} (clay till)
92-3A	---	2.5×10^{-9} (till/silty clay)
92-4	---	1.4×10^{-8} (till with sand lenses)
92-4A	---	1.3×10^{-9} (clay till)
92-5	---	2.9×10^{-8} (clay till)
92-5A	---	$< 10^{-9}$ (clay till)
92-6A	---	$< 10^{-9}$ (clay till)
92-7	2.5×10^{-8} (silty clay with sand pockets)	---
92-7	4.3×10^{-9} (clay till)	$< 10^{-8}$ (clay till)
92-7A	---	1.7×10^{-8} (clay till)

TABLE 1

WATER LEVELS IN MONITORING WELLS SINCE LAST DATE OF PURGING (JANUARY 29, 1993)

GX02369.2

Well No.	Elev. (m)	Slotted Interval (m)	Water Level Elevation (m)							Depth to Water Level (m) Mar 19, 1994	Net Change (m)		Hydraulic Conductivity, K cm/sec
			Feb 6 1993	Feb 15 1993	Feb 23 1993	Mar 6 1993	Mar 21 1993	Feb 2 1994	Mar 19 1994		Mar 21 1993 to Feb 2 1994	Feb 2 1994 to Mar 19 1994	
92-1	746.9	16.30-19.35	728.31	728.75	729.10	729.51	730.14	738.81	742.03	4.87	+8.57	+3.22	1.7×10^{-4}
92-1A	746.9	1.05-7.15	740.71	741.43	741.92	742.64	743.32	745.75	745.57	1.33	+2.43	-0.18	4.3×10^{-3}
92-2A	791.8	3.95-7.0	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	Frozen	---	---	
92-3	776.8	16.15-19.2	Dry	757.81	757.96	758.13	758.33	763.69	764.81	11.99	+5.36	+1.12	$<10^{-3}$
92-3A	776.8	2.45-8.55	772.38	773.28	773.64	773.90	774.02	775.51	775.61	1.19	+1.49	+0.10	2.5×10^{-3}
92-4	760.4	16.7-19.75	743.76	747.11	749.27	751.77	753.58	755.97	755.97	4.43	+2.39	Nil	1.4×10^{-4}
92-4A	760.4	1.2-7.3	753.73	753.96	754.10	754.34	754.61	758.98	758.73	1.67	+4.37	-0.25	1.3×10^{-3}
92-5	773.9	15.4-18.45	761.60	765.55	766.40	766.70	766.79	766.93	767.23	6.67	+0.14	+0.30	2.9×10^{-4}
92-5A	773.9	1.4-7.5	766.50	766.62	766.70	766.83	766.99	772.54	772.72	1.18	+5.55	+0.18	$<10^{-3}$
92-6	777.5	16.75-19.8	757.90	757.89	757.87	757.75	757.73	759.82	760.12	17.38	+2.09	+0.30	---
92-6A	777.5	1.2-7.3	Dry	Dry	770.05	770.14	770.26	776.00	776.20	1.30	+5.74	+0.20	$<10^{-3}$
92-7	758.5	16.9-19.95	738.59	738.71	738.82	738.87	739.00	757.22	756.62	1.88	+18.22	-0.60	$<10^{-3}$
92-7A	758.5	1.4-7.5	751.32	751.62	751.82	752.18	752.59	757.16	757.01	1.49	+4.57	-0.15	1.7×10^{-3}
92-8	757.2	16.75-19.8	745.08	746.07	746.28	746.33	746.42	746.67	747.47	9.73	+0.25	+0.80	---
92-8A	757.2	3.4-7.3	755.38	755.36	755.32	755.22	755.12	Frozen	Frozen	Frozen	+ ≈ 1m (?)	---	---



REVISIONS	**HBT AGRA Limited** *Engineering & Environmental Services*	DEEP GROUNDWATER LEVELS, m. ABOVE SEALEVEL, MARCH 19, 1994 (DEPTH TO WATER LEVEL BRACKETED)
REFERENCES		

SCALE SHOWN | DATE MAR 4 | MADE OT, AV | CHKD OT | JOB GX-02369

Province of
British Columbia
MINISTRY OF
ENVIRONMENT,
LANDS AND PARKS

BC Environment
Omineca-Peace

Environment Protection
Third Floor - 1011 Fourth Avenue
Prince George, British Columbia
V2L 3H9
Telephone: (604) 565-6155
Facsimile: (604) 565-6629

June 16, 1995

File: PR-10758

Rudiger Enterprises Ltd.
SS #2, Site 18, Comp. 10
Fort St. John, B.C.
V1J 4M7

Attention: Mr. Emil Rudiger

Dear Emil:

Re : Rudiger, Fort St. John Land Treatment Facility, Plans

We have reviewed the AGRA Earth & Environmental letter dated May 29, 1995 and the associated plans, dated 05-08-95 (Figure 1), titled Rudiger Enterprises Ltd., Proposed Landfarm Facility. The plans submitted are acceptable.

These plans are a requirement of clause 4.1 of Permit PR-10758. Acceptance of the submitted plans is for the purpose of administration of the permit. It is responsibility of the Permittee to ensure that the works are adequately designed and operated to meet permit conditions and the requirements of the *Special Waste Regulation*. Acceptance of the plans does not preclude the requirement that additional works may be necessary.

If you have any questions, please contact Ian Mitchell at 565-6452

Yours truly,

Blake Medlar
Assistant Regional Waste Manager
Omineca-Peace Region

/IJDM

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff, medium plastic, mottled grey-brown, rootlets, trace fine gravel, shale & sandstone fragments, cool		1		<--- Steel Casing Protector 0.61 m Pipe Stickup	0.0
1.0						2			1.0
2.0		CI				3			2.0
3.0						4			3.0
						5		<--- Flowable Bentonite Grout	
4.0				CLAY(TILL) – silty, very stiff, medium plastic, dark grey with oxide staining, fine gravel, trace shale & sandstone fragments, coal chips occasional fissures		6			4.0
						7		4.57 m 19 MAR 94 ▽	
5.0									5.0
						8			
6.0						9			6.0
7.0		CI		– light grey clayey silt lamminations @ 7.15 m		10			7.0
						11		<--- 50 mm Dia. Schedule 40 PVC Pipe	
8.0									8.0
						12			
9.0				– fissured between 8.70 and 9.15 m, salt lined, sub-vertical, closed – oxidized zones between 9.15 and 10.65 m		13			9.0
10.0						14			10.0
						15			
11.0									11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B1	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/14

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

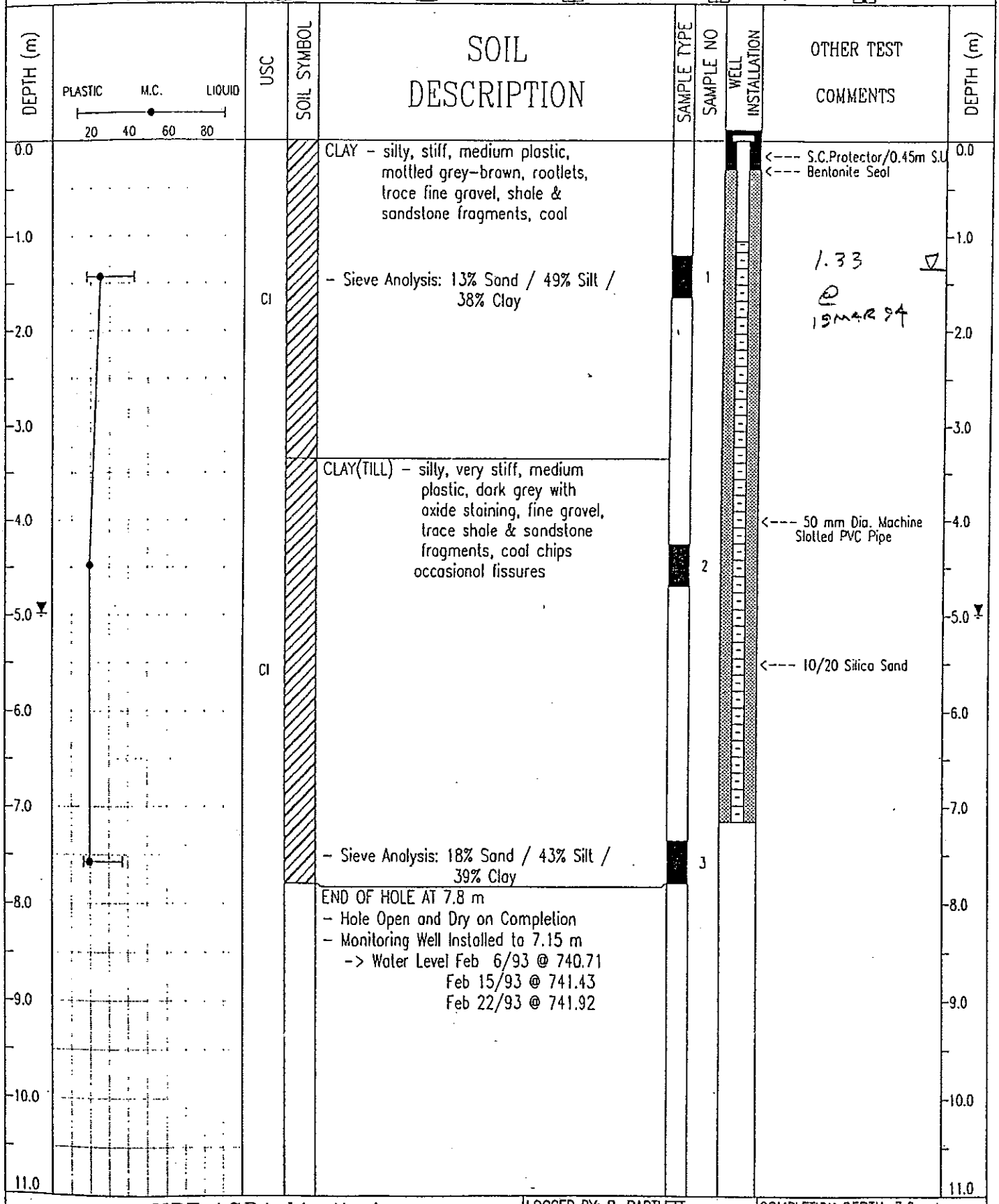
DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued - 150 mm thick oxidized zone		16			11.0
12.0						17			12.0
13.0						18			13.0
14.0				- gravel sizes to 50 mm @ 13.55 m		19			14.0
15.0		CI				20			15.0
16.0				- becomes siltier, lighter grey below 15.55 m		21		<--- Bentonite Seal	16.0
17.0				- more abundant shale and sandstone fragments below 17.05 m		22			17.0
18.0						23			18.0
19.0						24		<--- 50 mm Dia. Machine Slotted PVC Pipe	19.0
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.35 m -> Water Level Feb 6/93 @ 728.31 Feb 15/93 @ 728.75 Feb 22/93 @ 729.10		25		<--- 10/20 Silica Sand	20.0
21.0						26			21.0
22.0						27			22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/14
Fig. No: B1	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-1A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 746.90 (m)

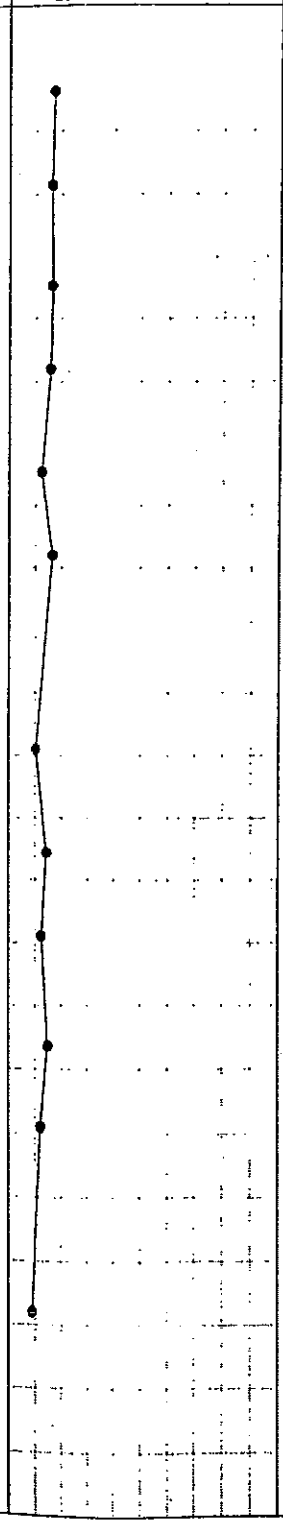
SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B2	COMPLETION DEPTH: 7.8 m COMPLETE: 92/12/14 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-2
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 791.80 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	SPT(N)	OTHER TEST COMMENTS	DEPTH (m)
0.0	CL-CI		CLAY – very silty, low to medium plastic, dark brown					0.0
1.0	CI		CLAY – silty, medium plastic, grey-brown, sandstone & shale fragments, trace gravel		1			1.0
2.0					2			2.0
3.0	CI		CLAY(TILL) – silty, gravelly zones, medium plastic, dark grey with oxide stained zones, shale & sandstone fragments		3			3.0
4.0					4			4.0
5.0	CS		CLAYSTONE – very silty, medium plastic, light grey, occasional oxidized zones		5			5.0
6.0			– free water @ 4.9 m in fractured zone		6			6.0
7.0			– siltstone stringers between 5.5 and 5.8m		7	60/150		7.0
8.0			– cool seams below 7.6 m		8			8.0
9.0					9	58/150		9.0
10.0					10			10.0
11.0					11	70/75		11.0
					12	00/100		
			END OF HOLE AT 10.45 m – Hole Open and Dry on Completion – Hole Backfilled With Bentonite Chips					

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 10.5 m
	REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/15
	Fig. No: B3	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-2A
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: CX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 791.80 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0		CL-CI		CLAY - very silty, low to medium plastic, dark brown				<--- Steel Casing Protector 0.45 m Pipe Stickup	0.0
1.0				CLAY - silty, medium plastic, grey-brown, sandstone & shale fragments, trace gravel				<--- Bentonite Seal	1.0
2.0		CI				1		<--- 50 mm Dia. Schedule 40 PVC Pipe	2.0
3.0				CLAY(TILL) - silty, gravelly zones, medium plastic, dark grey with oxide stained zones, shale & sandstone fragments		2			3.0
4.0		CI							4.0
5.0				CLAYSTONE - very silty, medium plastic, light grey, occasional oxidized zones - free water @ 4.9 m in fractured zone		3		- Sieve Analysis: 18% Sand 46% Silt / 36% Clay	5.0
6.0		CS		- siltstone stringers between 5.5 and 5.8m				<--- 50 mm Dia. Machine Slotted PVC Pipe	6.0
7.0				END OF HOLE AT 7.0 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.0 m -> Well Frozen @ 791.40				<--- 10/20 Silica Sand	7.0
8.0									8.0
9.0									9.0
10.0									10.0
11.0									11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B4	COMPLETION DEPTH: 7.0 m COMPLETE: 92/12/15 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-3
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 776.80 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY - silty, gravelly, medium plastic, nuggely to 1.5 m, grey-brown, trace sandstone & claystone fragments, coal chips, rootlets to 1.2 m		1		<--- Steel Casing Protector 0.61 m Pipe Stickup	0.0
1.0						2			1.0
2.0		CI				3			2.0
3.0						4		<--- Flowable Bentonite Grout	3.0
4.0				CLAY(TILL) - silty, gravelly, medium plastic, grey-brown with dark grey zones, sandstone & claystone fragments, occasional crystolline salts and fissures		5			4.0
5.0						6			5.0
6.0						7			6.0
7.0				- becomes grey below 6.1 m, occasional oxidized zones		8		<--- 50 mm Dia. Schedule 40 PVC Pipe	7.0
8.0		CI		- trace free water @ 7.45 m ? - sandstone cobble/layer @ 7.6 m - light grey silty clay layer between 7.9 and 8.4 m		9			8.0
9.0						10			9.0
10.0						11			10.0
11.0				- weathered claystone/sandstone fragments @ 10.65 m		12			11.0
						13			
						14			

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B5	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/15

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-3
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 776.80 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued		15			11.0
				- 25 mm thick light grey high plastic silty clay layer @ 11.45 m		16			
12.0									12.0
						17			
13.0									13.0
						18			
14.0									14.0
						19			
15.0						20		<--- Bentonite Seal	15.0
		CI							
16.0						21			16.0
				- Sieve Analysis: 11% Sand / 45% Silt / 44% Clay		22			
17.0								<--- 10/20 Silica Sand	17.0
						23			
18.0				- abundant claystone fragments below 18.0m		24		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0 ▼						25			19.0 ▼
						26			
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.20 m -> Water Level Feb 6/93 @ Dry Feb 15/93 @ 757.81 Feb 22/93 @ 757.96					20.0
21.0									21.0
22.0									22.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
	REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/15
	Fig. No: B5	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-3A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 776.80 (m)

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; A-Casing; Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, gravelly, medium plastic, nuggety to 1.5 m, grey-brown, trace sandstone & claystone fragments, coal chips, rootlets to 1.2 m		<--- Steel Casing Protector 0.61 m Pipe Stickup	0.0
1.0							1.0
		CL				<--- Bentonite Seal	
2.0							2.0
3.0 ▼							3.0 ▼
				CLAY(TILL) - silty, gravelly, medium plastic, grey-brown with dark grey zones, sandstone & claystone fragments, occasional crystalline salts and fissures			
4.0							4.0
5.0							5.0
6.0		CL		- becomes grey below 6.1 m, occasional oxidized zones		<--- 10/20 Silica Sand	6.0
7.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	7.0
				- possible trace free water @ 7.45 m - sandstone cobble/layer @ 7.6 m - light grey silty clay layer between 7.9 and 8.4 m			
8.0							8.0
9.0				END OF HOLE AT 8.85 m - Hole Open and Dry on Completion - Monitoring Well Installed to 8.55 m -> Water Level Feb 6/93 @ 772.38 Feb 15/93 @ 773.28 Feb 22/93 @ 773.64			9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 8.6 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/15
Fig. No: B6	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-4
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 760.40 (m)

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; A-Casing; Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, very stiff, medium plastic, dark brown, occasional fine gravel		1		<--- Steel Casing Protector 0.67 m Pipe Stickup	0.0
1.0		CI							1.0
				CLAY(TILL) – silty, gravelly, medium plastic, grey-brown, claystone & sandstone fragments, coal specks		2			
2.0						3		<--- Bentonite Grout	2.0
3.0						4			3.0
4.0						5			4.0
						6		4.43 9MAR94 ▽	
5.0				– grey with oxidized zones between 4.55 and 6.1 m		7			5.0
						8		<--- 50 mm Dia. Schedule 40 PVC Pipe	
6.0		CI		– grey with trace oxidized zones below 6.1 m		9			6.0
7.0						10			7.0
						11			
8.0						12			8.0
9.0						13			9.0
10.0				– silt parting @ 9.9 m		14			10.0
						15			
11.0				– brown with grey zones below 10.6 m					11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B7	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/16 Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-4
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 760.40 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued		16			11.0
12.0						17			12.0
				- silt pockets to 450 mm thick between 12.2 and 15.2 m		18			
13.0						19			13.0
14.0						20			14.0
15.0						21		<--- Bentonite Seal	15.0
		CI		- becomes grey with some brown below 15.3 m		22			
16.0						23			16.0
17.0						24		<--- 10/20 Silica Sand	17.0
18.0						25		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0						26			19.0
				- sand lenses to 20 mm thick @ 19.5 m		27			
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.75 m -> Water Level Feb 6/93 @ 743.76 Feb 15/93 @ 747.11 Feb 22/93 @ 749.27					20.0
21.0									21.0
22.0									22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: P. BARTLETT	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/16
Fig. No: B7	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-4A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 760.40 (m)

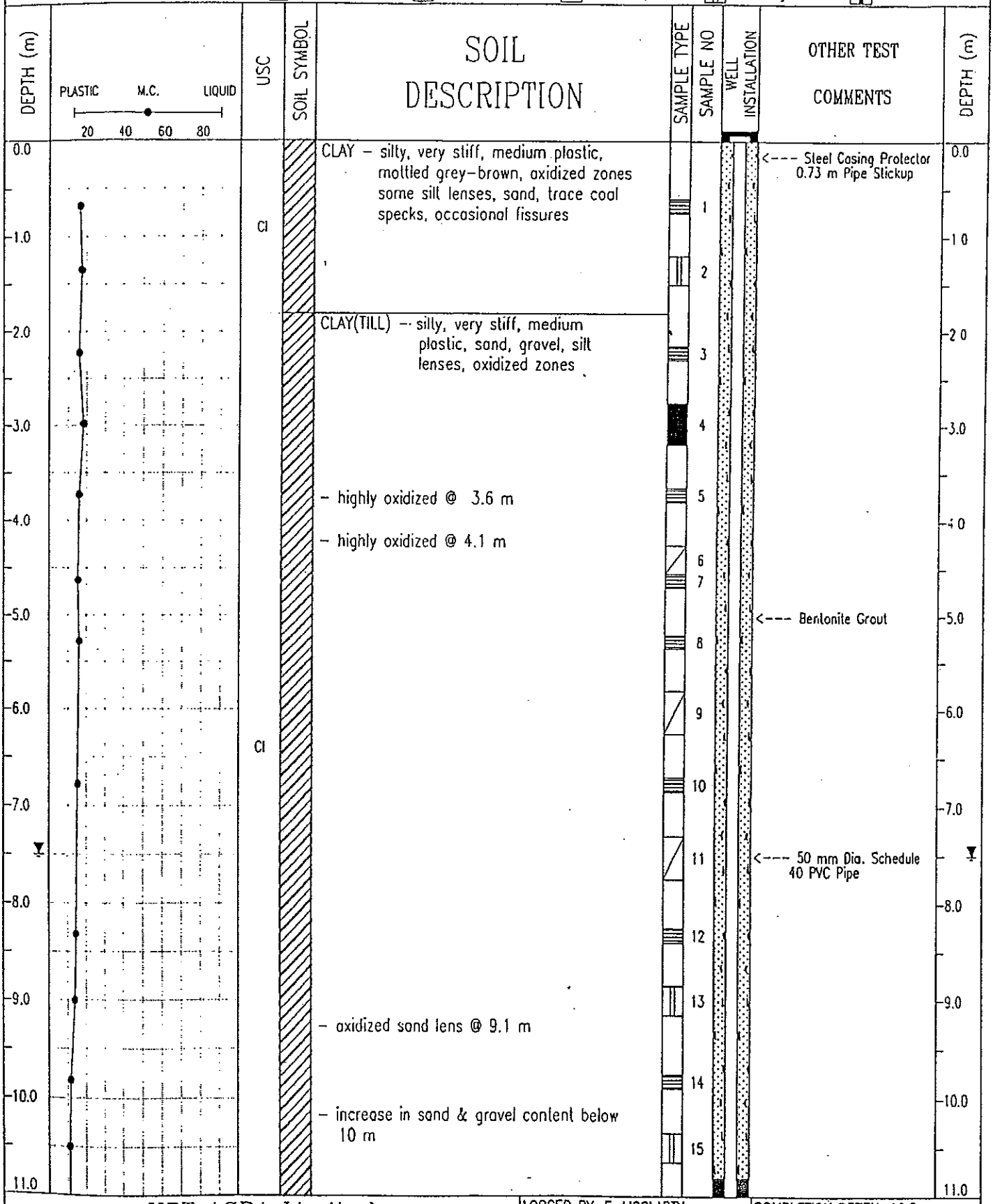
SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; A-Casing; Core

DEPTH (m)	PLASTIC — M.C. — LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, very stiff, medium plastic, dark brown, occasional fine gravel		<--- S.C.Protector/0.63m S.U. <--- Bentonite Seal	0.0
1.0		Cl					1.0
2.0				CLAY(TILL) - silty, gravelly, medium plastic, grey-brown, claystone & sandstone fragments, coal specks		1.2 m 15MAR94 ▽	2.0
3.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	3.0
4.0		Cl					4.0
5.0				- grey with oxidized zones between 4.55 ond 6.1 m			5.0
6.0 ▼						<--- 10/20 Silica Sand	6.0 ▼
7.0				- grey with trace oxidized zones below 6.1 m			7.0
8.0				END OF HOLE AT 7.3 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.30 m -> Water Level Feb 6/93 @ 753.73 Feb 15/93 @ 753.96 Feb 22/93 @ 754.10			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: P. BARTLETT REVIEWED BY: P. BARTLETT Fig. No: B8	COMPLETION DEPTH: 7.3 m COMPLETE: 92/12/16 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-5
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 773.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: 89	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/19

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-5
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 773.90 (m)

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; A-Casing; Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued		16		<--- Bentonite Seal	11.0
12.0						17			12.0
13.0				- becomes grey, hord below 13.1 m		18			13.0
14.0						19			14.0
15.0						20			15.0
16.0		CI		- sandstone cobble @ 15.4 m		21			16.0
17.0						22			17.0
18.0						23			18.0
19.0						24		<--- 50 mm Dia. Machine Slotted PVC Pipe	19.0
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 18.45 m -> Water Level Feb 6/93 @ 761.60 Feb 15/93 @ 765.55 Feb 22/93 @ 766.40		25		<--- 10/20 Silica Sand	20.0
21.0						26			21.0
22.0									22.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B9	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/19 Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-5A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: CX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 773.90 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

PLASTIC — M.C. — LIQUID
20 40 60 80

DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0					<--- S.C.Protector/0.42m SU <--- Bentonite Seal	0.0
1.0	CI		CLAY - silty, very stiff, medium plastic, mottled grey-brown, oxidized zones some silt lenses, sand, trace coal specks, occasional fissures			1.0
2.0			CLAY(TILL) - silty, very stiff, medium plastic, sand, gravel, silt lenses, oxidized zones			2.0
3.0						3.0
4.0			- highly oxidized @ 3.6 m - highly oxidized @ 4.1 m		<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0	CI				<--- 10/20 Silica Sand	5.0
6.0						6.0
7.0 ▼						7.0 ▼
8.0			END OF HOLE AT 7.5 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.50 m -> Water Level Feb 6/93 @ 766.50 Feb 15/93 @ 766.62 Feb 22/93 @ 766.70			8.0
9.0						9.0
10.0						10.0
11.0						11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 7.5 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/19
Fig. No: B10	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-6
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 777.50 (m)

SAMPLE TYPE: Shelby Tube; No Recovery; SPT Test (N); Grab Sample; A-Casing; Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff, medium plastic, brown, oxidized zones, trace sand, occasional fissures		1		<--- Steel Casing Protector 0.42 m Pipe Stickup	0.0
1.0		CI				2			1.0
2.0				CLAY(TILL) – silty, very stiff, medium plastic, mottled grey-brown, sand, fine gravel, silt lenses, oxidized zones, trace crystalline salts, coal specks, occasional fissures		3			2.0
3.0						4		<--- Bentonite Grout	3.0
4.0				– becomes grey with some brown below 3.6 m		5			4.0
5.0						6			5.0
6.0						7			6.0
7.0		CI		– becomes grey, hard, with oxide specks below 6.7 m		8		<--- 50 mm Dia. Schedule 40 PVC Pipe	7.0
8.0						9			8.0
9.0				– cobble at 9.0 m		10			9.0
10.0						11			10.0
11.0				– A-Casing Refusal @ 10.8 m – light grey, low plastic silt pockets		12			11.0
						13			
						14			

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 19.8 m
	REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/19
	Fig. No: B11	Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-6
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 777.50 (m)

SAMPLE TYPE ■ Shelby Tube ⊘ No Recovery ⊠ SPT Test (N) ▤ Grab Sample ▥ A-Casing ▯ Core

DEPTH (m)	PLASTIC M.C. LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				to 300 mm thick below 11.0 m CLAY(TILL) - continued		15			11.0
12.0				- light brown sandy silt pocket @ 11.9 m		16			12.0
13.0						17			13.0
14.0				- light grey sandy, clayey silt pocket @ 13.4 m - A-Casing Refusal @ 13.7 m		18			14.0
15.0		CI				19		<--- Bentonite Seal	15.0
16.0						20			16.0
17.0						21			17.0
18.0						22			18.0
19.0						23		<--- 50 mm Dia. Machine Slotted PVC Pipe	19.0
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.80 m -> Water Level Feb 6/93 @ 757.90 Feb 15/93 @ 757.89 Feb 22/93 @ 757.87		24		<--- 10/20 Silica Sand	20.0
21.0						25			21.0
22.0						26			22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/19
Fig. No: B11	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-6A
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 777.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

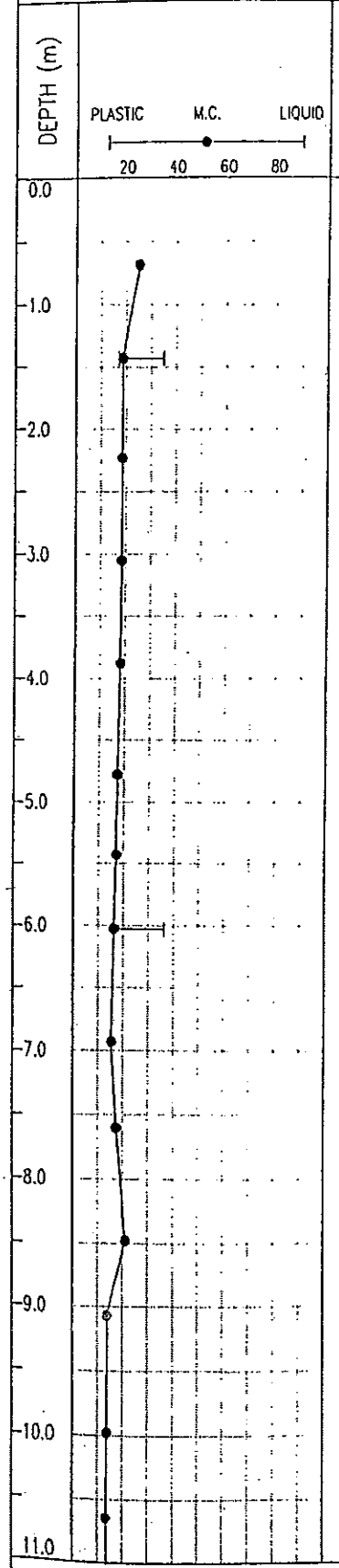
DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
0.0				CLAY – silty, stiff, medium plastic, brown, oxidized zones, trace sand, occasional fissures		<--- Steel Casing Protector 0.40 m Pipe Stickup <--- Bentonite Seal	0.0
1.0		CL					1.0
2.0				CLAY(TILL) – silty, very stiff, medium plastic, mottled grey-brown, sand, fine gravel, silt lenses, oxidized zones, trace crystalline salts, cool specks, occasional fissures			2.0
3.0				– becomes grey with some brown below 3.6 m			3.0
4.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	4.0
5.0		CL					5.0
6.0						<--- 10/20 Silica Sand	6.0
7.0				– becomes grey, hard, with oxide specks below 6.7 m			7.0
8.0				END OF HOLE AT 7.6 m – Hole Open and Dry on Completion – Monitoring Well Installed to 7.60 m -> Water Level Feb 6/93 @ Dry Feb 15/93 @ Dry Feb 22/93 @ 770.05			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 7.6 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/20
Fig. No: B12	Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



DEPTH (m)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0							<--- Steel Casing Protector 0.72 m Pipe Stickup	0.0
1.0	CI		CLAY - silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m		1		- Bulk Sample 0.00 - 1.20 m	1.0
			- trace free water @ 1.5 m		2		- Sieve Analysis: 13% Sand / 49% Silt / 38% Clay	
2.0			CLAY(TILL) - silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occosional fissures		3		- Bulk Sample 1.80 - 2.75 m	2.0
3.0					4		<--- 50 mm Dia. Schedule 40 PVC Pipe	3.0
4.0					5			4.0
			- becomes grey with some brown, trace crystalline salts		6			
5.0					7			5.0
					8			
6.0			- becomes grey, hard below 5.8 m		9		- Sieve Analysis: 10% Sand / 51% Silt / 39% Clay	6.0
	CI							
7.0					10			7.0
					11		<--- Bentonite Grout	
8.0								8.0
					12			
9.0					13			9.0
10.0					14			10.0
					15			
11.0								11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B13	COMPLETION DEPTH: 20.0 m COMPLETE: 92/12/20 Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST / COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued - light brown silt pockets to 300 mm thick between 11.15 and 12.2 m		16			11.0
12.0				- A-Casing Refusal @ 12.2 m		17			12.0
13.0						18			13.0
14.0						19			14.0
15.0		CI				20		<--- Bentonite Seal	15.0
16.0						21			16.0
17.0						22			17.0
18.0						23		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0						24			19.0
20.0				END OF HOLE AT 19.95 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.95 m -> Water Level Feb 6/93 @ 738.59 Feb 15/93 @ 738.71 Feb 22/93 @ 738.82		25		<--- 10/20 Silica Sand	20.0
21.0						26			21.0
22.0						27			22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 20.0 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/20
Fig. No: B13	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-7A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 758.50 (m)

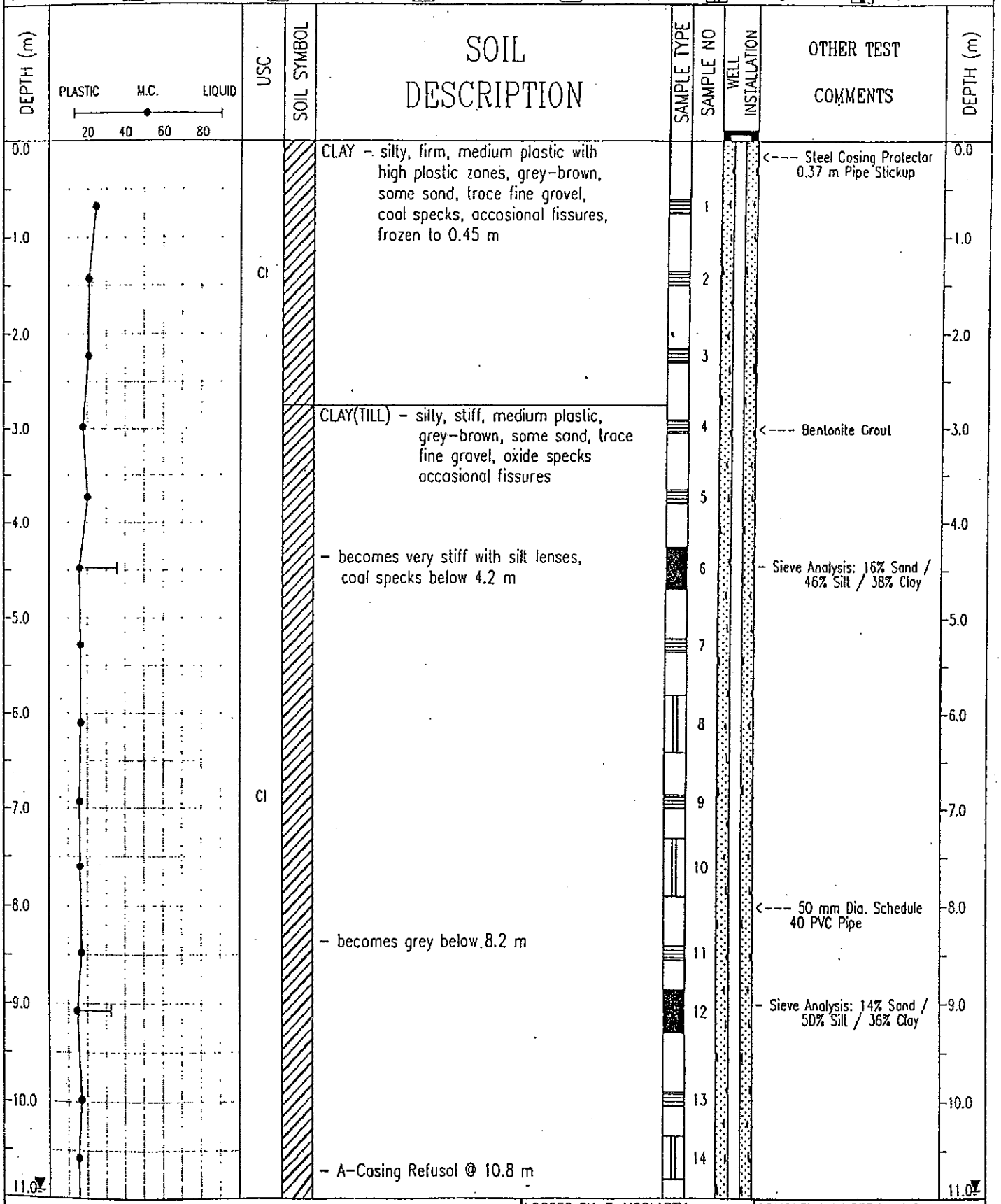
SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, stiff with firm zones, medium plastic with high plastic zones, grey-brown, sand, rootlets, oxidized zones, frozen to 0.45 m		<--- Steel Casing Protector 0.41 m Pipe Stickup	0.0
						<--- Bentonite Seal	
1.0		CI					1.0
				- trace free water @ 1.5 m		1.5 m @ 19 mins	
2.0				CLAY(TILL) - silty, very stiff, medium plastic, grey-brown, some sand, trace fine gravel, silt lenses, oxidized zones, coal specks, occasional fissures			2.0
3.0							3.0
4.0							4.0
		CI		- becomes grey with some brown, trace crystolline salts			
5.0						<--- 50 mm Dia. Machine Slotted PVC Pipe	5.0
6.0				- becomes grey, hard below 5.8 m			6.0
						<--- 10/20 Silica Sand	
7.0							7.0
				END OF HOLE AT 7.5 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.50 m -> Water Level Feb 6/93 @ 751.32 Feb 15/93 @ 751.62 Feb 22/93 @ 751.82			
8.0							8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B14	COMPLETION DEPTH: 7.5 m COMPLETE: 92/12/20 Page 1 of 1

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-8
PROJECT: Landfill/Landform Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 757.20 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core



HBT AGRA Limited Dawson Creek, B.C.	LOGGED BY: E. MCCLARTY REVIEWED BY: P. BARTLETT Fig. No: B15	COMPLETION DEPTH: 19.8 m COMPLETE: 92/12/21 Page 1 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-8
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 757.20 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NO	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
11.0				CLAY(TILL) - continued		15			11.0
12.0						16			12.0
13.0						17			13.0
14.0						18		<--- Bentonite Seal	14.0
15.0						19			15.0
16.0		CI		- silt pockets to 300 mm thick below 15.5 m		20 21 22			16.0
17.0						23			17.0
18.0						24		<--- 50 mm Dia. Machine Slotted PVC Pipe	18.0
19.0				- lamminated zone with trace silt and fine grained sand lenses @ 19.5 m		25 26		<--- 10/20 Silica Sand	19.0
20.0				END OF HOLE AT 19.8 m - Hole Open and Dry on Completion - Monitoring Well Installed to 19.80 m -> Water Level Feb 6/93 @ 745.08 Feb 15/93 @ 746.07 Feb 22/93 @ 746.28					20.0
21.0									21.0
22.0									22.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 19.8 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/21
Fig. No: B15	Page 2 of 2

CLIENT: Rudiger Enterprises Ltd.	DRILLER: Peace Drilling & Research	BOREHOLE No: 92-8A
PROJECT: Landfill/Landfarm Facility	METHOD: Solid Stem Auger	Project No: GX02369
PROJECT: Hydrogeological Investigation	DATUM: OPP SE BLK B SEC 7-88-20-W6M	ELEVATION: 757.20 (m)

SAMPLE TYPE: Shelby Tube | No Recovery | SPT Test (N) | Grab Sample | A-Casing | Core

DEPTH (m)	PLASTIC / M.C. / LIQUID (20 40 60 80)	USC	SOIL SYMBOL	SOIL DESCRIPTION	WELL INSTALLATION	OTHER TEST COMMENTS	DEPTH (m)
0.0				CLAY - silty, firm, medium plastic with high plastic zones, grey-brown, some sand, trace fine gravel, coal specks, occasional fissures, frozen to 0.45 m		<--- Steel Casing Protector 0.37 m Pipe Stickup <--- Bentonite Seal	0.0
1.0							1.0
2.0 ▼		CI					2.0 ▼
3.0				CLAY(TILL) - silty, stiff, medium plastic, grey-brown, some sand, trace fine gravel, oxide specks occasional fissures			3.0
4.0				- becomes very stiff with silt lenses, coal specks below 4.2 m			4.0
5.0		CI				<--- 50 mm Dia. Machine Slotted PVC Pipe	5.0
6.0							6.0
7.0						<--- 10/20 Silica Sand	7.0
8.0				END OF HOLE AT 7.3 m - Hole Open and Dry on Completion - Monitoring Well Installed to 7.30 m -> Water Level Feb 6/93 @ 755.38 Feb 15/93 @ 755.36 Feb 22/93 @ 755.32			8.0
9.0							9.0
10.0							10.0
11.0							11.0

HBT AGRA Limited
Dawson Creek, B.C.

LOGGED BY: E. MCCLARTY	COMPLETION DEPTH: 7.3 m
REVIEWED BY: P. BARTLETT	COMPLETE: 92/12/21
Fig. No: B16	Page 1 of 1

Clifton Associates Ltd.
engineering science technology

Appendix B

Groundwater

Ministry of Water, Land and Air Protection

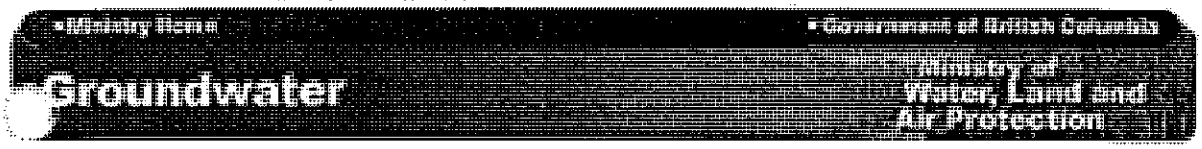
Water Well Data Output

Date: 21 December 01
Query: Land District=43; Range=20; Township=88;

no rows selected

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan

Number of Wells: **0**



Water Well Data Output

Date: 21 December 01
Query: Land District=43; Township=111;

no rows selected

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan

Number of Wells: **0**

Water Well Data Output

Date: 21 December 01
Query: Land District=43; Range=20; Township=88; Section=8;

no rows selected

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan

Number of Wells: **0**

Groundwater

Ministry of Water, Land and Air Protection

Water Well Data Output

Date: 21 December 01
Query: Land District=43; Township=113;

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan
000000016445		113		10		
000000058205		113		30		
000000033800		113		33		
000000031563		113		13		

Number of Wells: **4**

BRITISH COLUMBIA

11 Tag Number 000000016445	Construction Date 19600101
Owner: NURNBERGER RANCH LTD	Driller CLIFF BAKER DRILLING
Address:	License Number
Area:	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 113 Section 10 Range Indian Reserve Meridian Block Quarter SE Island BCGS Number (NAD 27) 094A075222 Well 1	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 0 Artesian Flow Static Level UNK feet Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag
Well Use Unknown Well Use Construction Method Drilled Diameter 0.0 inches Well Depth 90.0 feet Elevation 0 Bedrock Depth UNK feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	

GENERAL REMARKS:
Y HOLE

From 0 To 90 Ft. gumbo clay

Date entered to WELL

BRITISH COLUMBIA

.11 Tag Number 000000058205

Owner: HAN BINSCH

Address:

Area: BUICK CREEK

WELL LOCATION:
PEACE RIVER Land District
District Lot Plan Lot
Township 113 Section 30 Range
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A075233 Well 1

Well Use Domestic
Construction Method Drilled
Diameter 6.0 inches
Well Depth 158.0 feet
Elevation 0
Bedrock Depth feet
Screen from 0 to 0 feet
Slot Size 1 0 Slot Size 2 0
Slot Size 3 0 Slot Size 4 0

Construction Date 19880610

Driller Anderson Water Wells
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 18 GPM
Artesian Flow 0
Static Level UNK feet

Water Utility
Lithology Info Flag
Pump Test Info Flag Y
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From	0	To	10 Ft.	FILL-CLAY
From	10	To	48 Ft.	MED GREY/BROWN CLAY
From	48	To	59 Ft.	MED GREY CLAY-TRACE OF SAND
From	59	To	78 Ft.	LIGHT GREY CLAY
From	78	To	80 Ft.	LIGHT GREY/BROWN CLAY
From	80	To	97 Ft.	MED GREY CLAY-TRACE OF SAND
From	97	To	132 Ft.	LIGHT GREY CLAY-SWELLING
From	132	To	134 Ft.	MED GREY CLAY
From	134	To	137 Ft.	MED GREY CLAY-SOME SAND
From	137	To	144 Ft.	SWELLING-LIGHT GREY CLAY
From	144	To	147 Ft.	MAKING WATER-SAND GREY CLAY
From	147	To	158 Ft.	MED GREY CLAY

12 rows selected.

Date entered to WELL

BRITISH COLUMBIA

ll Tag Number 000000033800

Owner: TERRY IVERSON

Address:

Area: BUICK CREEK

WELL LOCATION:
PEACE RIVER Land District
District Lot Plan Lot
Township 113 Section 33 Range
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A075412 Well 1

Well Use Unknown Well Use
Construction Method Drilled
Diameter 0.0 inches
Well Depth 240.0 feet
Elevation 0
Bedrock Depth 200 feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19751101

Driller BOB'S WATER DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 2 GPM
Artesian Flow
Static Level 70 feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From	0	To	20 Ft.	heavy brown clay
From	20	To	30 Ft.	sandy brown clay
From	30	To	62 Ft.	heavy brown and grey clay
From	62	To	102 Ft.	sandy brown clay layers of heavy brn
From	0	To	0 Ft.	clay, seepage.
From	102	To	200 Ft.	same
From	200	To	207 Ft.	crystal shale
From	0	To	0 Ft.	- yield 2 GPM
From	0	To	0 Ft.	- 135' of water

9 rows selected.

Date entered to WELL

BRITISH COLUMBIA

.ll Tag Number 000000031563

Owner: GEO MERCER

Address: BLUEBERRY RIVER

Area: BUICK

WELL LOCATION:
PEACE RIVER Land District
District Lot Plan Lot
Township 113 Section 13 Range
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A076112 Well 1

Well Use Unknown Well Use
Construction Method Drilled
Diameter 4.5 inches
Well Depth 160.0 feet
Elevation 0
Bedrock Depth UNK feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19741101

Driller BOB'S WATER DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 1 GPM
Artesian Flow
Static Level 90 feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From	0	To	46 Ft.	heavy brown clay
From	46	To	75 Ft.	heavy blue clay
From	75	To	80 Ft.	grey clay
From	80	To	85 Ft.	black clay, very oily
From	85	To	95 Ft.	shale coarse
From	95	To	120 Ft.	very fine shale, water at 101'
From	120	To	138 Ft.	coarse softer shale
From	138	To	142 Ft.	blue clay
From	142	To	148 Ft.	shale
From	148	To	160 Ft.	heavy blue grey clay, 70' water in well
From	0	To	0 Ft.	- yield: @ 1/2 GPM

11 rows selected.

Date entered to WELL

Groundwater

Water Well Data Output

Date: 21 December 01
Query: Land District=43; Range=20; Township=87;

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan
000000021154	20	87		18		
000000036490	20	87		11		

Number of Wells: **2**

BRITISH COLUMBIA

ell Tag Number 000000021154

Owner: A TETERIS

Address:

Area:

WELL LOCATION:
PEACE RIVER Land District
District Lot Plan Lot
Township 87 Section 18 Range 20
Indian Reserve Meridian Block
Quarter SE
Island
BCGS Number (NAD 27) 094A055134 Well 1

Well Use Domestic
Construction Method Drilled
Diameter 4.0 inches
Well Depth 90.0 feet
Elevation 0
Bedrock Depth 30 feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19680101

Driller CLIFF BAKER DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 7 GPM
Artesian Flow
Static Level 30 feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag Y
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:
OD QUANTITY, PUMPED AT 7 GPM

From 0 To 30 Ft. clay
From 30 To 90 Ft. sandstone with clay and layers

Date entered to WELL

BRITISH COLUMBIA

ell Tag Number 000000036490	Construction Date 19770101
Owner: DENNIS AUGUSTINE	
Address:	Driller BOB'S WATER DRILLING License Number
Area: MURDALE	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 87 Section 11 Range 20 Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 094A055241 Well 1	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 0 Artesian Flow Static Level UNK feet
Well Use Unknown Well Use Construction Method Drilled Diameter 0.0 inches Well Depth 79.5 feet Elevation 0 Bedrock Depth UNK feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:
.Y HOLE

From 0 To 80 Ft. sandstone and brown clay

Date entered to WELL

Groundwater

Water Well Data Output

Date: 21 December 01
Query: Land District=43; Range=21; Township=88;

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan
000000081620	21	88		30		

Number of Wells: **1**

BRITISH COLUMBIA

;ll Tag Number 000000081620	Construction Date 20001110
Owner: TERRY WIEBE	
Address: 18231 BARTCH STREET	Driller Jacob's Water Wells License Number
Area: BUICK	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 88 Section 30 Range 21 Indian Reserve Meridian Block S2 Quarter Island BCGS Number (NAD 27) 094A064321 Well 1	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 11 USGM Artesian Flow 0 Static Level 26 feet
Well Use Domestic Construction Method Drilled Diameter 6 inches Well Depth 49 feet Elevation 0 Bedrock Depth 25 feet Screen from 31 to 49 feet Slot Size 1 30 Slot Size 2 0 Slot Size 3 0 Slot Size 4 0	Water Utility Lithology Info Flag Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Y Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:

From	0	To	25 Ft.	clay
From	25	To	27 Ft.	hard rock
From	27	To	37 Ft.	sandstone
From	37	To	49 Ft.	shale
From	49	To	49 Ft.	rock

Date entered to WELL 20011003

Groundwater

Ministry of Water, Land and Air Protection

Water Well Data Output

Date: 21 December 01
Query: Land District=43; Range=21; Township=87;

7 rows selected.

Well Tag Number	Range	Township	District Lot	Section	Lot	Plan
000000044900	21	87	284	2		
000000042379	21	87		2		
000000042254	21	87		2		
000000040373	21	87	153	11		
000000042323	21	87	3183	11		
000000021155	21	87		11		
000000022091	21	87		11		

Number of Wells: 7

BRITISH COLUMBIA

.ll Tag Number 000000044900

Owner: MIKE SPRUYT

Address: ALASKA HWY

Area:

WELL LOCATION:
PEACE RIVER Land District
District Lot 284 Plan Lot
Township 87 Section 2 Range 21
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A054223 Well 1

Well Use Unknown Well Use
Construction Method Drilled
Diameter 4.5 inches
Well Depth 180.0 feet
Elevation 0
Bedrock Depth 20 feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19800429

Driller I. & M. DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 7 GPM
Artesian Flow
Static Level UNK feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From	0	To	20 Ft.	brown clay
From	20	To	75 Ft.	shale
From	75	To	90 Ft.	limeclay
From	90	To	115 Ft.	grey sandstone(dry)
From	115	To	131 Ft.	shale
From	131	To	150 Ft.	grey sandstone(lost circ 131')
From	150	To	180 Ft.	grey sandstone 7 GPM
From	0	To	0 Ft.	- bail at 7 GPM

8 rows selected.

Date entered to WELL

BRITISH COLUMBIA

Well Tag Number 000000042379

Owner: DENNIS BEATTIE

Address: ALASKA HWY

Area:

WELL LOCATION:
PEACE RIVER Land District
District Lot Plan Lot
Township 87 Section 2 Range 21
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A054223 Well 2

Well Use Unknown Well Use
Construction Method Drilled
Diameter 4.5 inches
Well Depth 121.0 feet
Elevation 0
Bedrock Depth UNK feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19790523

Driller I. & M. DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 5 GPM
Artesian Flow
Static Level UNK feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From	0	To	10	Ft.	brown clay
From	10	To	55	Ft.	blue clay
From	55	To	91	Ft.	limestone
From	91	To	105	Ft.	shale
From	105	To	120	Ft.	sandstone
From	120	To	121	Ft.	clay

6 rows selected.

Date entered to WELL

BRITISH COLUMBIA

ll Tag Number 000000042254	Construction Date 19790501
Owner: DENNIS BEATIE	
Address: ALASKA HWY	Driller I. & M. DRILLING License Number
Area:	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 87 Section 2 Range 21 Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 094A054223 Well 3	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 4 GPM Artesian Flow Static Level UNK feet
Well Use Unknown Well Use Construction Method Drilled Diameter 5.0 inches Well Depth 133.0 feet Elevation 0 Bedrock Depth 112 feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:

From	0	To	8 Ft.	brown clay
From	8	To	58 Ft.	blue clay
From	58	To	61 Ft.	rock
From	61	To	80 Ft.	blue clay
From	80	To	112 Ft.	blue clay (80' - 82')
From	112	To	133 Ft.	sandstone (water zone)
From	0	To	0 Ft.	133' hardpan
From	0	To	0 Ft.	- bailing at 4 GPM

8 rows selected.

Date entered to WELL

BRITISH COLUMBIA

.11 Tag Number 000000040373	Construction Date 19780812
Owner: ROD WARK	
Address: ALASKA HWY	Driller I. & M. DRILLING License Number
Area:	
WELL LOCATION: PEACE RIVER Land District District Lot 153 Plan Lot Township 87 Section 11 Range 21 Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 094A054241 Well 1	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 7 GPM Artesian Flow Static Level UNK feet
Well Use Unknown Well Use Construction Method Drilled Diameter 4.5 inches Well Depth 150.0 feet Elevation 0 Bedrock Depth UNK feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:

From	0	To	47 Ft.	clay
From	47	To	65 Ft.	sandstone and shale
From	65	To	98 Ft.	sandstone limestone mix
From	0	To	0 Ft.	-bail well , no water
From	98	To	106 Ft.	hard pan
From	106	To	130 Ft.	sandstone (water zone) bail at 7 GPM
From	130	To	150 Ft.	clay

7 rows selected.

Date entered to WELL

5

BRITISH COLUMBIA

11 Tag Number 000000042323

Owner: COONTY KITCHEN

Address: ALASKA HWY

Area:

WELL LOCATION:
PEACE RIVER Land District
District Lot 3183 Plan Lot
Township 87 Section 11 Range 21
Indian Reserve Meridian Block
Quarter
Island
BCGS Number (NAD 27) 094A054241 Well 2

Well Use Unknown Well Use
Construction Method Drilled
Diameter 5.0 inches
Well Depth 130.0 feet
Elevation 0
Bedrock Depth 45 feet
Screen from 0 to 0 feet
Slot Size 1 Slot Size 2
Slot Size 3 Slot Size 4

Construction Date 19790511

Driller I. & M. DRILLING
License Number

PRODUCTION DATA AT TIME OF DRILLING:
Well Yield 8 GPM
Artesian Flow
Static Level UNK feet

Water Utility
Lithology Info Flag Y
Pump Test Info Flag
File Info Flag
Sieve Info Flag
Screen Info Flag
Water Chemistry Info Flag
Field Chemistry Info Flag
Site Info (SEAM)
Other Info Flag

GENERAL REMARKS:

From 0 To 45 Ft. blue clay
From 45 To 85 Ft. limestone
From 85 To 130 Ft. sandstone

Date entered to WELL

BRITISH COLUMBIA

11 Tag Number 000000021155	Construction Date 19680101
Owner: CHARLES COMER	
Address: ALASKA HWY	Driller KNIGHT'S RAT HOLE DRILLING License Number
Area:	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 87 Section 11 Range 21 Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 094A054241 Well 3	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 0 Artesian Flow Static Level 12 feet
Well Use Domestic Construction Method Drilled Diameter 3.0 inches Well Depth 32.0 feet Elevation 0 Bedrock Depth 22 feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:
OR QUANTITY

From 0 To 12 Ft. clay
From 12 To 22 Ft. silty sand
From 22 To 32 Ft. sandstone

Date entered to WELL

BRITISH COLUMBIA

11 Tag Number 000000022091	Construction Date 19690101
Owner: DORVEL	
Address: ALASKA HWY	Driller SILUCH'S RAT HOLE DRILLING License Number
Area:	
WELL LOCATION: PEACE RIVER Land District District Lot Plan Lot Township 87 Section 11 Range 21 Indian Reserve Meridian Block Quarter Island BCGS Number (NAD 27) 094A054241 Well 4	PRODUCTION DATA AT TIME OF DRILLING: Well Yield 0 Artesian Flow Static Level 39 feet
Well Use Domestic Construction Method Drilled Diameter 3.0 inches Well Depth 45.0 feet Elevation 0 Bedrock Depth UNK feet Screen from 0 to 0 feet Slot Size 1 Slot Size 2 Slot Size 3 Slot Size 4	Water Utility Lithology Info Flag Y Pump Test Info Flag File Info Flag Sieve Info Flag Screen Info Flag Water Chemistry Info Flag Field Chemistry Info Flag Site Info (SEAM) Other Info Flag

GENERAL REMARKS:
OD QUANTITY

From 0 To 0 Ft. in sandstone

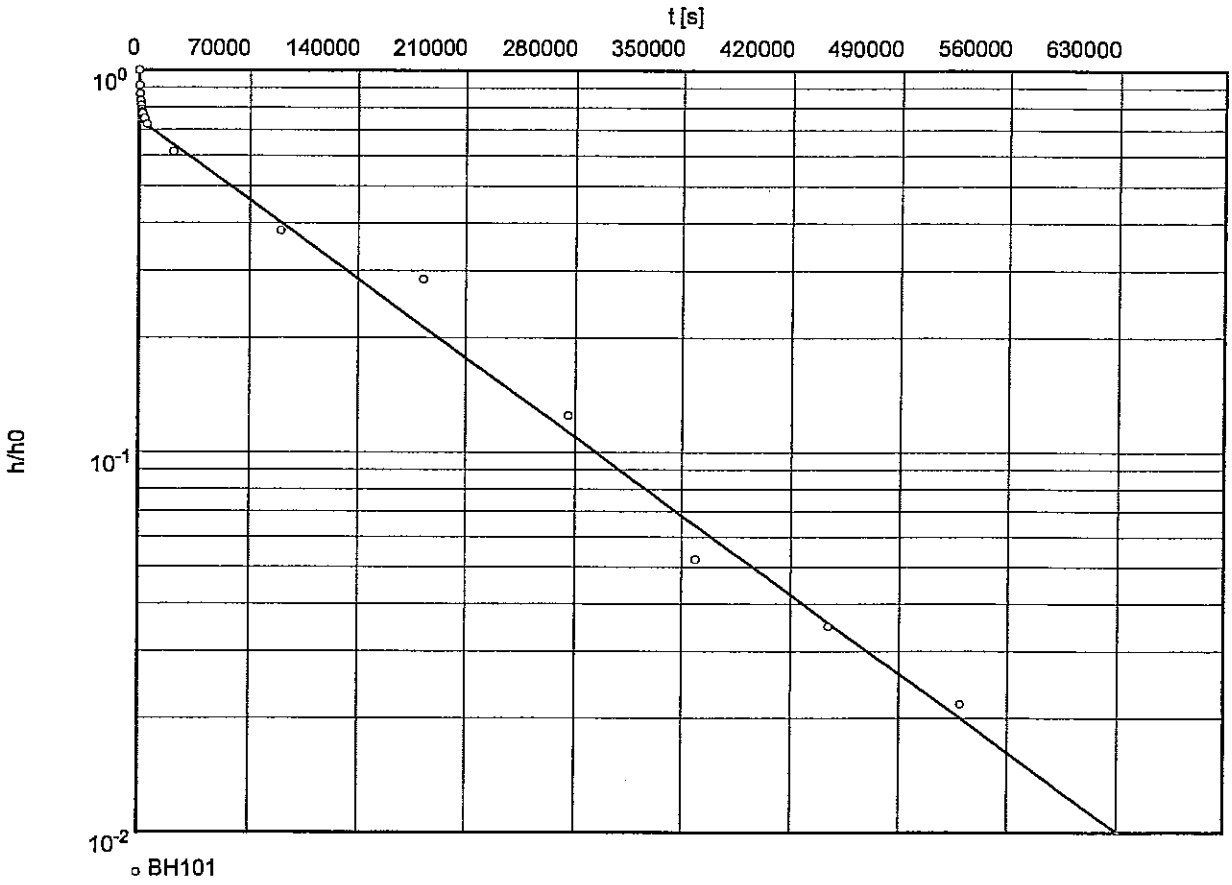
Date entered to WELL

Clifton Associates Ltd.
engineering science technology

Appendix C

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548	
		Evaluated by: IHH	

Slug Test No. 1 - Rising Head Test	Test conducted on: 12 - 18 January 2001
Borehole - BH101	



Hydraulic conductivity [cm/s]: 3.00×10^{-7}

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548	
		Evaluated by: IHH	

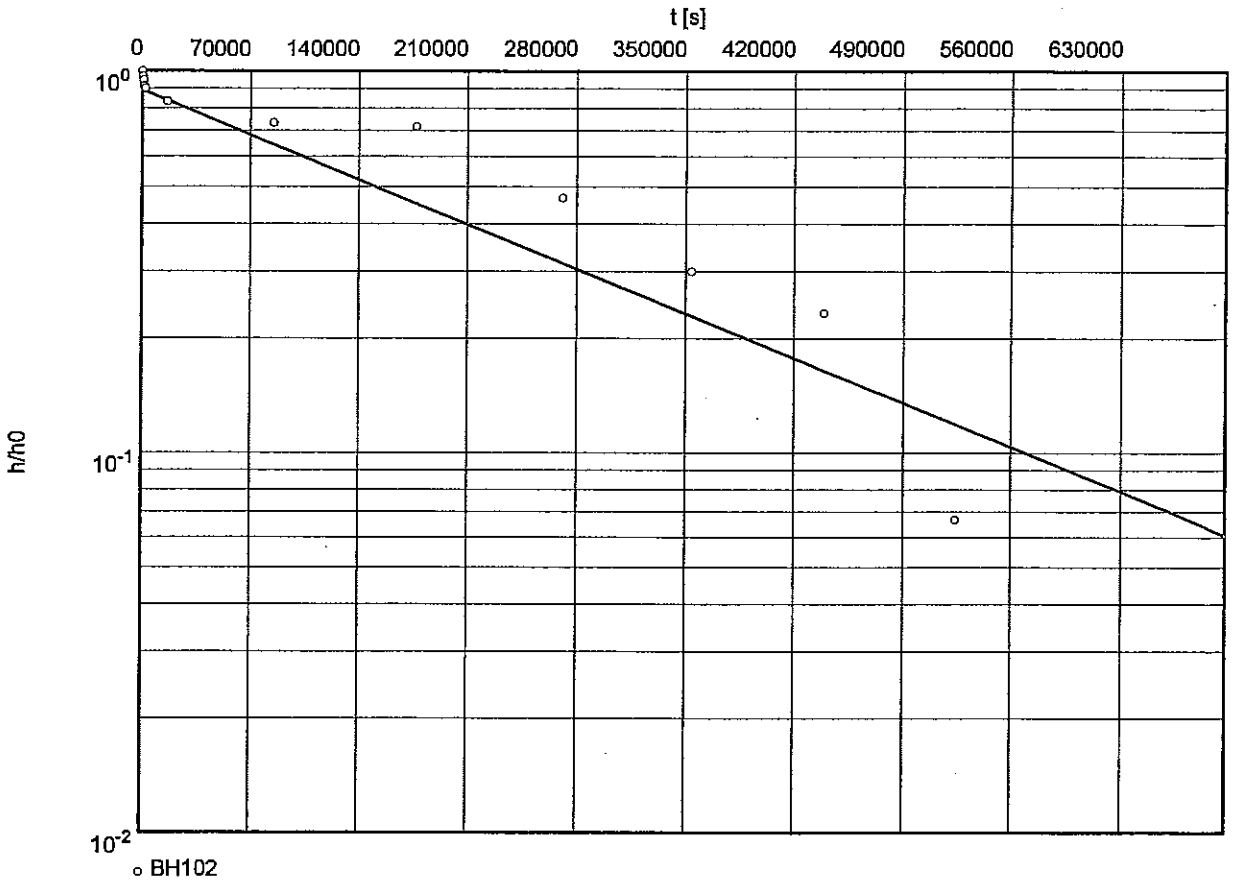
Slug Test No. 1 - Rising Head Test	Test conducted on: 12 - 18 January 2001
Borehole - BH101	BH101

Static water level: 267.0 cm below datum

	Pumping test duration [s]	Water level [cm]	Drawdown [cm]	
1	0	611.0	344.0	
2	300	581.0	314.0	
3	600	565.5	298.5	
4	900	553.5	286.5	
5	1200	545.5	278.5	
6	1500	539.0	272.0	
7	1800	535.0	268.0	
8	2100	532.5	265.5	
9	3360	524.5	257.5	
10	4920	516.0	249.0	
11	21600	478.0	211.0	
12	90000	398.5	131.5	
13	182520	365.0	98.0	
14	275760	310.0	43.0	
15	358500	285.0	18.0	
16	444960	279.0	12.0	
17	529080	274.5	7.5	

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548	
		Evaluated by: IHH	

Slug Test No. 2 - Rising Head Test	Test conducted on: 12 - 18 January 2001
Borehole - BH102	



Hydraulic conductivity [cm/s]: 7.86×10^{-7}

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548	
		Evaluated by: IHH	

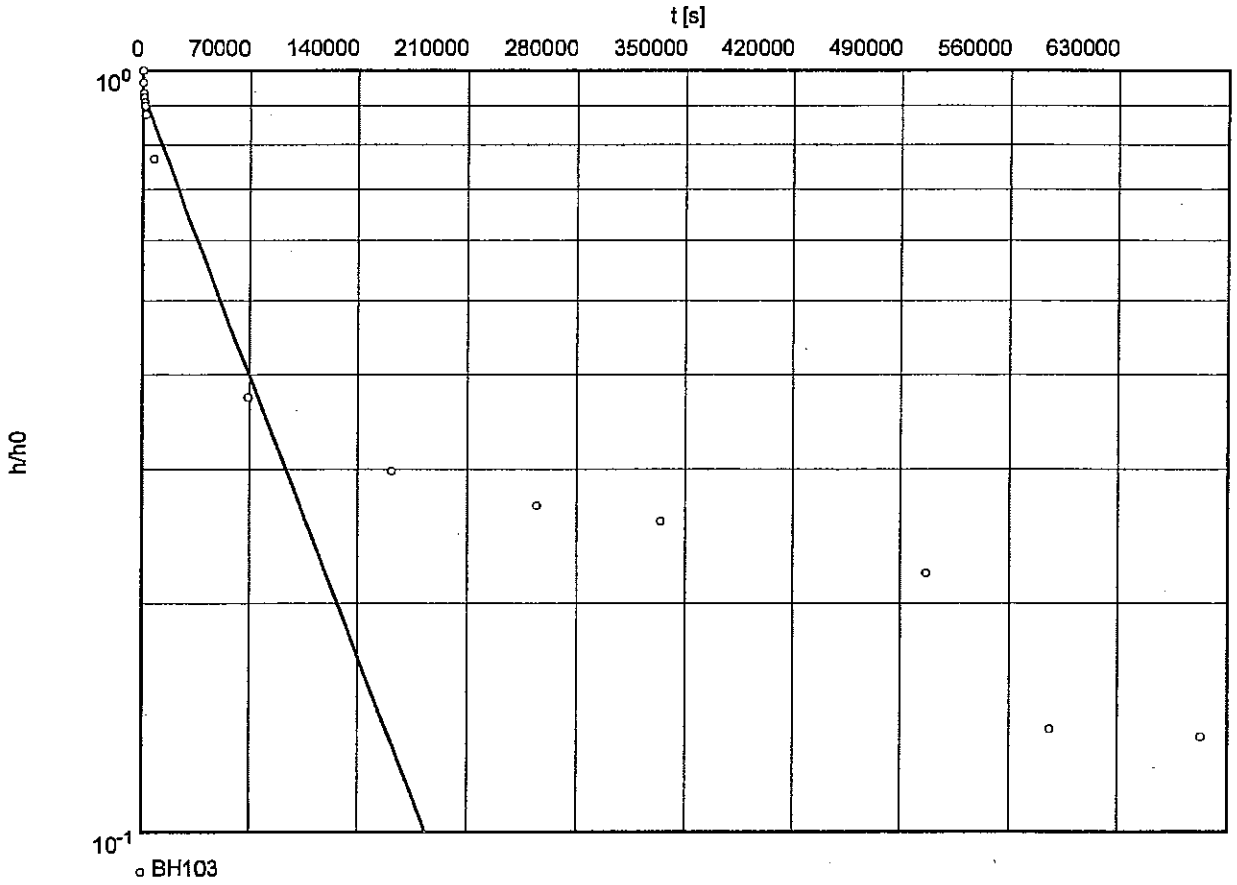
Slug Test No. 2 - Rising Head Test	Test conducted on: 12 - 18 January 2001
Borehole - BH102	BH102

Static water level: 1940.0 cm below datum

	Pumping test duration [s]	Water level [cm]	Drawdown [cm]	
1	0	1970.0	30.0	
2	420	1969.0	29.0	
3	780	1968.4	28.4	
4	1320	1967.4	27.4	
5	1920	1967.0	27.0	
6	16020	1965.0	25.0	
7	85080	1962.0	22.0	
8	177540	1961.5	21.5	
9	270720	1954.0	14.0	
10	353520	1949.0	9.0	
11	440040	1947.0	7.0	
12	524160	1942.0	2.0	

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548 - CCS	
		Evaluated by: IHH	

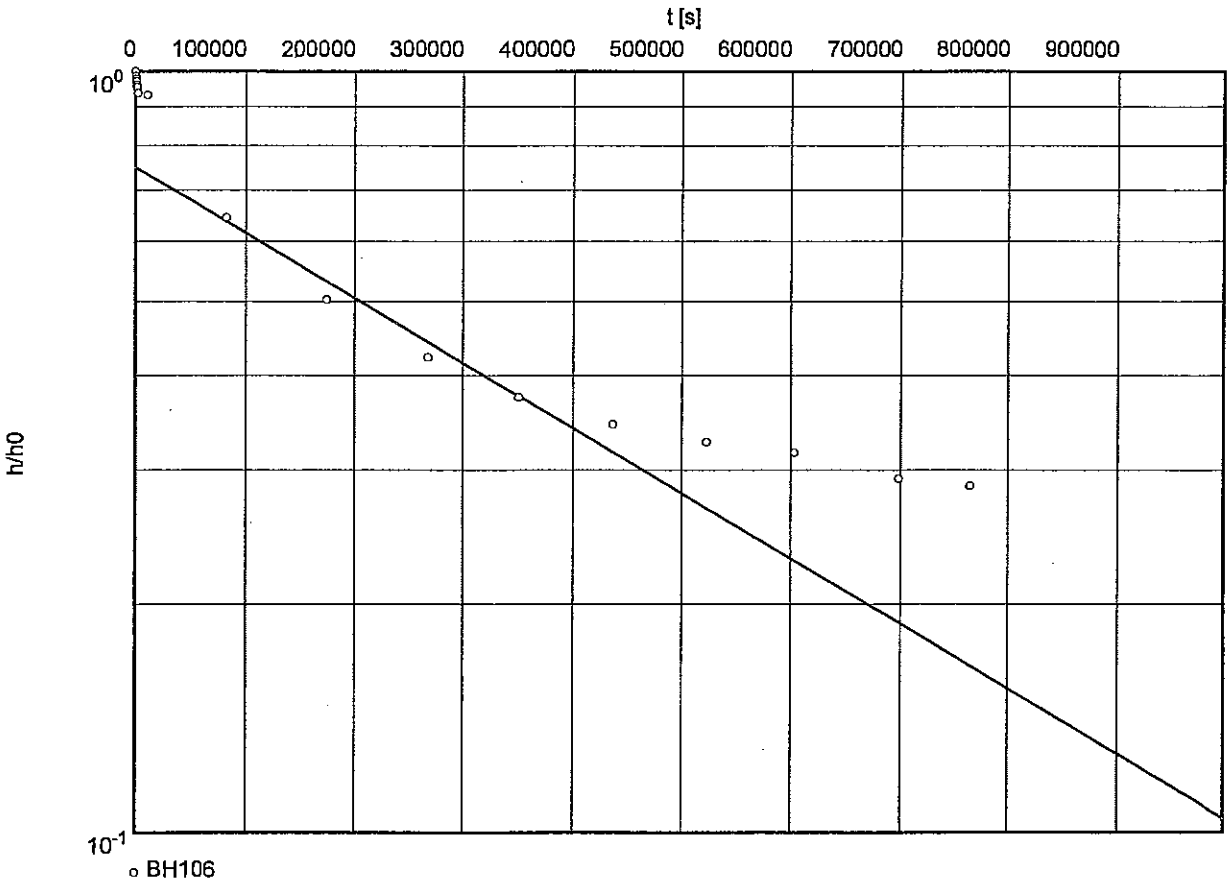
Slug Test No. 3 - Rising Head	Test conducted on: 12 - 20 January 2002
Borehole - BH103	



Hydraulic conductivity [cm/s]: 6.92×10^{-6}

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548 - CCS	
		Evaluated by: IHH	

Slug Test No. 5 - Rising Head	Test conducted on: 12 - 21 January 2002
Borehole - BH106	



Hydraulic conductivity [cm/s]: 3.98×10^{-7}

Clifton Associates Ltd. 4409 - 94 Street Edmonton, Alberta (780) 432-6441	slug/bail test analysis BOUWER-RICE's method	Date: 21 Jan. 2002	Client: Canadian Crude S
		Project: CG1548 - CCS	
		Evaluated by: IHH	

Slug Test No. 5 - Rising Head	Test conducted on: 12 - 21 January 2002
Borehole - BH106	BH106

Static water level: 619.5 cm below datum

	Pumping test duration [s]	Water level [cm]	Drawdown [cm]
1	0	1771.0	1151.5
2	300	1755.0	1135.5
3	600	1746.0	1126.5
4	900	1737.0	1117.5
5	1200	1725.5	1106.0
6	1500	1718.0	1098.5
7	2220	1699.0	1079.5
8	10680	1692.0	1072.5
9	82380	1362.0	742.5
10	174480	1199.0	579.5
11	267540	1106.0	486.5
12	350400	1050.5	431.0
13	436920	1016.5	397.0
14	523080	996.0	376.5
15	603180	984.0	364.5
16	697860	956.0	336.5
17	765000	949.0	329.5

Appendix 6
Vegetation Survey Report

Vegetation Survey Report for the Tervita Silverberry Landfill Amendment Application Project

PREPARED FOR:	Tervita Corporation
PREPARED BY:	Jacobs
DATE:	July 31, 2018

Background

Tervita Corporation (Tervita) owns and operates the Silverberry Secure Landfill (the existing landfill), which is located on Tervita-owned land at 8-88-20 W6M, approximately 50 km northwest of Fort St. John, British Columbia (BC). Tervita is proposing to expand the capacity of the existing landfill in the Tervita Silverberry Landfill Amendment Application Project (the Project).

A Project Approval Certificate (now known as an Environmental Assessment Certificate) Application was submitted to the BC Environmental Assessment Office for the existing landfill in March 2002 and the project was approved in July 2002, with the existing landfill being constructed in 2003. The existing landfill consists of seven secure landfill cells, with one to be developed under the existing approval, for a total of eight cells and an approved capacity of 6 million tonnes.

The purpose of the Project is to replace the depleted capacity of the existing landfill. The Project will be located immediately east of the existing landfill, and will be approximately the same size as the existing landfill footprint (roughly 25 ha). Similar to the existing landfill, the Project will be developed as a series of cells. The future landfill development area has been conceptually designed to accommodate six cells of varying sizes. As additional cells are developed, the liner and leachate collection systems will be tied together to provide a continuous liner system under the entire Project footprint. This will allow final development of the area as one contiguous fill mass, rather than six individual pockets, as is standard landfill operating and construction practice. The location of the Project provides for a 50-m wide secure buffer zone on the property owned by Tervita, surrounding the active area of the existing landfill, as required under Section 25 (10) of the *Hazardous Waste Regulation*.

Survey Methods

The landfill expansion study area was traversed on foot during vegetation, wildlife and soil surveys by three qualified professionals. Several databases, field guides and protocols were used during the vegetation field visit, including the field guide to ecosystem identification for the Boreal White and Black Spruce Zone of British Columbia the British Columbia (DeLong et al. 2011), Conservation Data Centre Species and Ecosystems Explorer (2018), Protocols for Rare Plant Surveys (Penny and Klinkenberg 2013), Field Manual for Describing Terrestrial Ecosystems – Second Edition (BC Ministry of Forests and Range and BC Ministry of Environment 2010), Field Guide to Noxious and Other Selected Weeds of British Columbia – Fourth Edition (Cranston et al. 2014).

The BC *Weed Control Regulation* includes lists of provincial weeds (Schedule A, Part I) and regional weeds (Schedule A, Part II). Provincial weeds are non-native vascular plants that are designated as Noxious within all regions of BC. Regional weeds are non-native vascular plants that are designated as

Noxious within the boundaries of corresponding regional districts, as identified in the BC *Weed Control Regulation*. Noxious weeds must be controlled as per the BC *Weed Control Act*. In addition to the BC *Weed Control Regulation*, the Peace River Regional District (PRRD) *Invasive Plant Program Strategic Plan and Profile* (PRRD, 2018) was consulted to determine weeds of management concern and locations that warrant mitigation.

Survey Results

A vegetation survey was conducted for the Project on June 24, 2015.

The majority of the Project footprint is a hayfield, with a young aspen-rose-creamy peavine forest at the eastern edge. The hayfield is dominated by common timothy grass (*Phleum pratense*) and clover [white clover (*Trifolium repens*) and alsike clover (*Trifolium hybridum*)]. The young aspen-rose-creamy peavine forest at the eastern edge is characterized as a zonal ecosystem in the Moist Warm Boreal White and Black Spruce (BWBSmw/101$4B) in a pole/sapling structural stage. The forests to the south of the Project footprint (> 100 m from the Project footprint boundary) are also dominated by young aspen-rose-creamy peavine forests (BWBSmw/101$5B) with remnant patches of white spruce-trailing raspberry-step moss forests (BWBSmw/1015M) ranging between 60 and 80 years old.

A moist, shrubby area was observed at the eastern side of the Project footprint composed of willows (*Salix* spp.), alder (*Alnus incana*) and bluejoint reedgrass (*Calamagrostis canadensis)*. Wet swales were evident, however they were dry during the time of the survey.

No occurrences of invasive plants were observed in the Project footprint or adjacent young forests. The hayfield is mainly composed of agronomic species as mentioned above with a mix of non-native and native plants.

No occurrences of rare vegetation species (species of conservation concern) were observed in the Project footprint or in the adjacent forests to the south.

During wildlife surveys in June 2017, there was no changes observed to the vegetation conditions in the landfill expansion area, however logging activities and wildfires had occurred nearby to the north and south.

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Appendix 7
Early Summer Wildlife Survey Report

TECHNICAL MEMORANDUM

Wildlife Survey Results for the Tervita Silverberry Landfill Amendment Application Project

PREPARED FOR:	Peter Nelson, Tervita
COPY TO:	Suzanne Byrne, Project Manager, CH2M HILL Canada Limited
PREPARED BY:	Jessica Harvey, Biologist, CH2M HILL Canada Limited
DATE:	March 31, 2016
PROJECT NUMBER:	661198
REVISION NO.:	0
APPROVED BY:	Heather Conquergood, Environmental Planner, CH2M Hill Canada Limited

Introduction

Tervita Corporation (Tervita) owns and operates the Silverberry Secure Landfill approximately 50 km north of Fort St John, British Columbia (BC). Tervita is proposing to replace the depleted capacity of the Silverberry Secure Landfill in the proposed Tervita Silverberry Landfill Amendment Application Project (the proposed Project). The proposed landfill capacity replacement is located immediately east of the current landfill footprint at 8-88-20 W6M, and is approximately the same size as the existing landfill footprint (approximately 25 hectares).

In support of the Environmental Assessment Certificate amendment application, CH2M conducted a wildlife desktop/literature review and wildlife field work for the proposed Project footprint. This technical memo provides the methods and results of the desktop review and field survey conducted on June 24, 2015.

Methods

The objectives of the wildlife field work were to:

- identify wildlife presence and use on and adjacent to the proposed Project footprint including habitats to support wildlife species with special conservation status; and
- identify habitat features (*e.g.,* stick nest) that may be affected by construction and/or operations of the proposed Project.

Desktop/Literature Review

Primary sources of information that were used in the preparation of this report include the following:

- Guidelines for Raptor Conservation during Urban and Rural Land Development in BC (BC Ministry of Environment [BC MOE] 2013a);
- Develop with Care 2014 (BC MOE 2014a);
- provincially identified wildlife areas (e.g., Ungulate Winter Ranges [UWRs], Wildlife Habitat Areas [WHA]) (BC MOE 2012, 2014b);
- BC Conservation Data Centre (BC CDC) element occurrence database (BC CDC 2012a,b);
- Parks and Protected Areas (BC MOE 2013b); and
- Migratory Bird Sanctuaries (Environment Canada 2016), National Wildlife Areas (Environment Canada 2016), Important Bird Areas (Bird Studies Canada and Nature Canada 2016), Western Hemisphere Shorebird Reserves (Western Hemisphere Shorebird Reserve Network [WHSRN] 2014), Ramsar Wetlands (Bureau of the Conservation on Wetlands 2016) and World Biosphere Reserves (United Nations Educational, Scientific and Cultural Organization [UNESCO] 2016).

Field Data Collection

Wildlife surveys were on the proposed Project footprint and within immediately adjacent areas to document wildlife and wildlife sign (*e.g.,* scat, browse, tracks, cavity nests, stick nests, etc.). In addition, areas of potential interest beyond the Footprint were investigated (*e.g.,* game trails, riparian areas). The areas surveyed were reviewed for their potential to support species with special conservation status, as well as to provide comment on the proposed Project footprint from a wildlife and wildlife habitat perspective.

All wildlife observations, evidence of wildlife use and wildlife habitat features were documented during the field surveys and their location recorded (*i.e.,* field data sheets, UTM coordinates taken with a hand-held GPS and photographs for record keeping). All incidental wildlife observations and sign and wildlife features (*e.g.,* stick nests) were also recorded. Selected Photoplates from the field work are provided in Appendix A.

Breeding Bird Survey

Breeding bird point count surveys were conducted to collect information on the presence of breeding bird species and information on habitat use. Survey protocols were modified from the point count survey protocols outlined in the Inventory Methods for Forest and Grassland Songbirds (BC MELP 1999a). Survey locations were selected to represent different habitat types (e.g., young forest, mature forest), maintaining a minimum separation of 200 m between point count locations to avoid detection of individual birds in more than one count and to maintain a minimum 100 m buffer from any habitat edge or transitional area (BC MELP 1999).

Observers positioned themselves at a good vantage point to observe the surrounding habitat. A 2 minute quiet period was observed to allow for any disturbances in accessing the site to subside. Species observed during this time period were recorded as incidental observations. At each survey point, both acoustic and visual records of songbirds were recorded over a 5 minute period. Binoculars were used to observe species at a distance and to confirm identification. Birds observed by sight or sound within a 50 m radius of the observer were recorded. The approximate location, species, age, gender (where possible) and number of all birds detected were recorded at each point count station. Birds outside the 50 m radius, detected outside of the 5 minute survey period and flyovers were recorded as incidental observations.

The surveys were completed between sunrise and 10:00 AM, and during suitable weather conditions (wind <10 km/h, temperature >7°C, minimal precipitation and visibility >10 km) to achieve the most accurate results. Additional information that will be recorded at each station will include the date, time, weather conditions, noise level, GPS location and description of the general habitat, and any site-specific features.

Incidental Wildlife Observations

Incidental wildlife observations were recorded during meandering general wildlife surveys of each habitat type, when travelling to and from point count locations, non-focal species observed during surveys, and observations that occur outside of the specified survey locations and/or time period (*e.g.,* birds observed outside of the 50 m radius during breeding bird surveys). All incidental wildlife observations (visual/auditory) and sign (*e.g.,* tracks, scat/pellets, foraging), as well as habitat features (*e.g.,* stick nest), are recorded. Where possible, information recorded for each observation includes the date, time, species, number, age and sex, general habitat description and GPS location. Photographs were also taken where possible.

Results

Desktop/Literature Review

The Project is located in the Boreal White and Black Spruce Zone Biogeoclimatic Zone (Meidinger and Pojar 1991) within the Peace River Regional District. Land uses in the area include agriculture and oil and gas activity.

The Project is not located within any provincially identified wildlife areas (*e.g.,* UWR or WHA) (BC MOE 2012, 2014b). The Project is not located within any Parks and Protected Areas (BC MOE 2013b), Important Bird Areas (Bird Studies Canada and Nature Canada 2016), Migratory Bird Sanctuaries (Environment Canada 2016), National Wildlife Areas (Environment Canada 20146), Western Hemisphere Shorebird Reserves (WHSRN 2014), or Ramsar wetlands (Bureau of the Convention on Wetlands 2016).

Species of Conservation Concern

The BC CDC (2016) identifies 47 potentially occurring species at risk in the Peace River Forest District (which includes the Project Area), including 42 species on the provincial red and blue lists, and 15 species listed as Threatened, Endangered or Special Concern on Schedule 1 of SARA. Only a fraction of these species are expected to occur in the vicinity of the project due to, for example, species range and habitat requirements.

Results of Field Work

The results of the wildlife field work are summarized below. Wildlife fieldwork identified 4 mammal species, 23 bird species and 1 amphibian species within the proposed Project footprint and immediately adjacent areas.

Selected Photoplates from the field work are provided in Appendix A. A summary of wildlife species and/or their sign observed is provided in Appendix B.

General Site Description

The Project is located in an area that may provide habitat for wildlife species, including mammals, birds and amphibians. Boreal forests, including coniferous, deciduous and mixedwood stands, may provide nesting and foraging habitat for birds (e.g., songbirds and raptors), as well as thermal and security cover for mammals (e.g., moose). Seasonally wet areas may provide nesting habitat for waterfowl and riparian birds, dispersal habitat for amphibians, and foraging habitat for mammals.

Terrain within the proposed Project footprint is level to gently undulating. The Project footprint is dominated by an agricultural hayfield (Plate 1). Adjacent to the Project footprint on the northern,

eastern and southern edges are forested areas (Plates 2,3, and 4). The forest extends up to 70 m onto the Project footprint on the eastern side (Plate 5). A damp, shrubby area, approximately 40 m x 60 m, extends into the hayfield from the forest on the eastern side of the footprint (Plate 6).

Birds

A total of 23 bird species were observed during the wildlife fieldwork on June 24, 2015. During the breeding bird surveys, 23 bird species were recorded at 3 point count stations. An additional 29 bird species were observed outside the point counts or during general wildlife surveys that were completed for the remainder of the Project footprint.

Of the 23 species of bird observed, 21 were songbirds. Most commonly observed were black-and-white warblers (observed primarily in the forest), Wilson's warblers and white-throated sparrows (observed in both forest and shrubby habitats), and savannah sparrows (observed primarily in the hayfield).

One raptor was observed, a northern harrier hovering over and diving into the hayfield. One nightjar species, the common nighthawk, was observed taking off from the ground in the hayfield when flushed by the northern harrier.

Mammals

Four mammal species or their sign were observed during wildlife fieldwork on June 24, 2015. Moose, elk and deer scat were observed in several locations, primarily in the shrubby margin between the forest and the hayfield (Plate 7). One set of elk tracks were observed. Several red squirrels middens were observed in the forested area of the Project footprint.

Amphibians

One amphibian species was observed during the wildlife fieldwork on June 24, 2015 (western toad). Seven juvenile western toads were observed in the damp shrubby area within the Project footprint (Plate 8). No suitable breeding habitat was observed within the Project footprint.

Species with Special Conservation Status

Three species of conservation concern were observed during the wildlife field survey on June 24, 2015:

- Canada warbler (Blue-listed in BC [BC CDC 2016], Threatened under Schedule 1 of *SARA* and by COSEWIC [COSEWIC 2016, Environment Canada 2016]);
- common nighthawk (Threatened under Schedule 1 of *SARA* and by COSEWIC [COSEWIC 2016, Environment Canada 2016]); and
- western toad (Blue-listed in BC [BC CDC 2016], Special Concern under Schedule 1 of *SARA* and by COSEWIC [COSEWIC 2016, Environment Canada 2016]).

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Appendix A

Photoplates

Plate 1 Hayfield on the Project footprint at 8-88-20 W6M (June 24, 2015).

Plate 2 Forested area on the east side of the Project footprint at 8-88-20 W6M (June 24, 2015).

Plate 3 Young forest on the east side of the Project footprint at 8-88-20 W6M (June 24, 2015).

Plate 4 Forested area to the south of the Project footprint at 8-88-20 W6M (June 24, 2015).

Plate 5 *Transition between hayfield and forested area on the east side of the Project footprint at 8-88-20 W6M (June 24, 2015).*

Plate 6 *Shrubby area on the Project footprint at 8-88-20 W6M (June 24, 2015).*

Plate 7 *Moose scat observed in shrubby transitional area between hayfield and forest on the east side of the Project footprint at 8-88-20 W6M (June 24, 2015).*

Plate 8 *Juvenile western toad observed in shrubby area on the Project footprint at 8-88-20 W6M (June 24, 2015).*

Appendix B

Species Observed during Wildlife Field Survey - June 24, 2015

Table 2 Wildlife Species Observed during June 24, 2015 Wildlife Surveys at 8-88-20 W6M

Common Name	Scientific Name	Type of Observation	Provincial Designation[1]	Federal Designation
Birds				
American redstart	*Setophaga ruticilla*	Audio	--	--
American robin	*Turdus migratorius*	Audio	--	--
Black-capped chickadee	*Poecile atricapillus*	Audio	--	--
Black-and-white warbler	*Mniotilta varia*	Audio	--	--
Canada warbler	*Cardellina canadensis*	Audio	Blue	Threatened[2,3]
Clay-coloured sparrow	*Spizella pallida*	Audio	--	--
Chipping sparrow	*Spizella passerina*	Audio	--	--
Common nighthawk	*Chordeiles minor*	Visual	--	Threatened[2,3]
Hermit thrush	*Catharus guttatus*	Audio	--	--
House sparrow	*Passer domesticus*	Audio	--	--
Lazuli bunting	*Passerina amoena*	Audio	--	--
Northern harrier	*Circus cyaneus*	Visual	--	--
Red-breasted nuthatch	*Sitta canadensis*	Audio	--	--
Ruby-crowned kinglet	*Regulus calendula*	Audio	--	--
Red-eyed vireo	*Vireo olivaceus*	Audio	--	--
Savannah sparrow	*Passerculus sandwichensis*	Audio	--	--
Swainson's thrush	*Catharus ustulatus*	Audio	--	--
Townsend's solitaire	*Myadestes townsendi*	Audio	--	--
Wilson's warbler	*Cardellina pusilla*	Audio	--	--
Golden-crowned kinglet	*Regulus satrapa*	Audio	--	--
Winter wren	*Troglodytes hiemalis*	Audio	--	--
White-throated sparrow	*Zonotrichia albicollis*	Audio	--	--
Yellow-rumped warbler	*Setophaga coronata*	Audio	--	--
Mammals				
Red squirrel	*Tamiasciurus hudsonicus*	Sign (midden)	--	--
Elk	*Cervus elaphus*	Scat, Track	--	--
Deer species	--	Scat	--	--
Moose	*Alces americanus*	Scat	--	--
Amphibians				
Western toad	*Anaxyrus boreas*	Visual	Blue	Special Concern[2,3]

Notes:

1 Species that are Red or Blue-listed (BC CDC 2016).

2 Species listed as Endangered, Threatened or Special Concern on Schedule 1 of SARA (Environment Canada 2016).

3 Species listed as Endangered, Threatened or Special Concern by COSEWIC (2016).

Appendix 8
Early-mid Winter Snow Tracking Survey Report

Early-mid Winter Snow Tracking Surveys for the Tervita Silverberry Landfill Expansion Project

PREPARED BY: Jessica Harvey, CH2M

DATE: January 31, 2017

PROJECT NUMBER: 661198

Introduction

The first of two winter supplemental wildlife surveys was conducted to collect information on mammals and game bird abundance and habitat use in the vicinity of the Project to supplement existing information and desktop review, and to inform Project mitigation measures. Ungulates (e.g., moose), mesocarnivores (e.g., weasel, marten), and predators (e.g., lynx and wolves) are readily detected during winter snow track surveys, and can have very low detection frequencies during surveys throughout the rest of the year.

In addition to the snow track surveys, the area of trees overlapping the Project footprint was surveyed for wildlife trees and potential wildlife trees that may be affected by clearing for the Project.

Participants from local First Nations were present for the winter survey. Mabel Harding was present form the Doig River First Nation, and Beaufort Acko was present from the Blueberry River First Nation. Both completed visitor orientations for the two days of work. Jessica Harvey (CH2M) recertified the contractor orientation for 2017.

Methods

Winter track surveys were used to collect information on the presence, distribution, relative abundance, and habitat associations of mammals and upland bird species in the Project area. The protocols used for the winter track surveys were adapted from those outlined in the Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher & Badger (BC Ministry of Environment, Lands and Parks [BC MELP] 1999a), Inventory Methods for Marten and Weasel (BC MELP 1998a), and Ground-Based Inventory Methods for Ungulates Snow-Track Surveys (D'Eon et al. 2006).

The locations of the transects were selected prior to fieldwork using a review of 1:20,000 base maps and aerial imagery. A modified version of the Finnish track transect method (Linden et al. 1996) was used. Transects were 500m long, and created triangles on the landscape, where feasible. Transect locations were stratified by habitat type. Three transects were placed in each habitat type: open field, shrub, and forest.

Winter snow tracking surveys must be completed between 12 hours and 8 days following a major snowfall event (i.e., complete ground cover and obliteration of previous wildlife tracks) to allow for accumulation and accurate identification of tracks. The most recent snowfall on the Silverberry site was on January 23rd, 2017. Winter tracking surveys were completed on January 24th and 25th.

All wildlife tracks that either crossed the transect or were observed within 1 m of the transect mid-line were recorded. In the case where the exact number of individuals could not always be determined for hare and squirrel 'runs', track categories of five tracks/hare run and three tracks/squirrel run were used in calculating track densities. Wildlife tracks were identified to species, where possible, or assigned to

broader categories: deer (mule deer and white-tailed deer); upland game birds (spruce grouse, ruffed grouse, sharp-tailed grouse); fisher/marten (distinguishing female fisher and male marten tracks is unreliable); and weasel (weasels, mink and ermine).

Detailed habitat information was recorded every 100 m and included the abundance of cavity trees, snags, canopy composition, structural information, amount of browse and amount of cover. Browse and cover were categorized as nil (0-5%), low (6-25%), moderate (26-50%), high (51-75%), or very high (>75%). Snow depths were recorded with a graduated probe (mean of 3 depths at each location) and snow condition (e.g., crust, powder) was noted every 100 m.

All incidental (sign, visual observations, observations outside the survey boundary or time period) wildlife observations and sign, as well as habitat features (e.g., stick nest) were recorded during field surveys.

Track density was calculated for each species along each transect using the following formula (Thompson et al. 1989):

$$Tracks/km/day = \frac{total\ \#\ of\ tracks}{\sum[(segment\ length\ in\ km) \times (days\ since\ last\ snow)]}$$

Results

A total of 13 wildlife species or their sign were observed during the early/mid winter supplemental wildlife survey on January 24th and 25th, 2016 (Table 1). No species of conservation concern were conclusively observed during the survey (i.e., marten/fisher tracks were observed, but it is not possible to confirm which species).

Mammal tracks that were observed during the surveys included moose, deer, coyote, lynx, marten/fisher, weasel/ermine, snowshoe hare, red squirrel and mouse/vole. The most abundant tracks observed by a significant margin were snowshoe hare. Photos of selected tracks are provided in Appendix A.

Five types of tracks were observed in the open hayfield, deer, moose, coyote, hare and mouse. With the exception of mouse and vole tracks, tracks occurred at lower density in the hayfield than in either the shrubby and forested habitats, as during the winter there is very little cover and/or forage in the open field.

The tracks of eight species were observed in the shrubby habitat to the north of the hayfield. Moose and coyote tracks were observed at the highest density in the shrubby habitat. In addition, a shed moose antler and evidence of browsing activity was observed. The shrubby habitat provides sufficient cover for these species, while providing abundant moose forage and hunting grounds for coyotes.

The highest number of species was observed in the forest to the east of the hayfield and landfill: the tracks of ten species were observed in the forest. Tracks of seven of these species were at the highest density in the forest habitat. Lynx and grouse tracks were observed only in the forest habitat.

Table 1. Wildlife Species Observed during Winter Snow Tracking Surveys on January 24th and 25th, 2016 at the Tervita Silverberry Landfill

Common Name	Conservation Status	Type of Observations	Total Number of Observations	Mean Density of Tracks (tracks/km/day) in Habitat Type		
				Hayfield	Shrubby	Forest
Deer	--	Tracks	4	0.7	0	**1.0**
Elk	--	Scat	1	0	0	0
Moose	--	Tracks, scat, antler, browse	22	1.3	**6.0**	0.7
Coyote	--	Tracks	23	2.0	**6.0**	0.7
Lynx	--	Tracks	19	0	0	**6.3**
Black bear	--	Markings/scratches on trees	1	0	0	0
Marten/fisher	--/Blue-listed[a]	Tracks, scat	15	0	1.0	**4.0**
Weasel/ermine	--	Tracks	15	0	2.3	**2.7**
Snowshoe hare	--	Tracks, scat, visual, browse/chews	1308	1.3	138.0	**297.3**
Red squirrel	--	Tracks	15	0	0.7	**4.3**
Mouse/vole	--	Tracks	14	**5.3**	0.7	1.3
Grouse sp.	--	Tracks, scat	7	0	0	**2.3**
Raptor/owl sp.	--	Tracks (wing prints)	1	0	1	0

[a]BC Provincial List (BC CDC, 2017). Only Red and Blue list designations are displayed.

Red List: includes species that have been legally designated as Endangered or Threatened under the BC Wildlife Act, are extirpated, or are candidates for such designation.
Blue List: includes species not immediately threatened, but of concern due to characteristics that make them particularly sensitive to human activities or natural events.

No existing wildlife trees were observed within the Project footprint. Several potential wildlife trees, including both existing and newly burned snags were observed, however, no evidence of wildlife use or nesting was observed.

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Appendix A – Snow Track Photographs

Photo 1. Snowshoe hare track (January 24, 2017)

Photo 2. Squirrel tracks (January 25, 2017)

Photo 3. Weasel tracks (January 25, 2017)

Photo 4. Grouse tracks (January 25, 2017)

Photo 5. Lynx tracks (January 25, 2017)

Photo 6. Moose tracks (January 25, 2017)

Appendix 9
Late-Winter Snow Tracking Survey Report

Late-Winter Snow Tracking Surveys for the Tervita Silverberry Landfill Expansion Project

PREPARED BY: Jessica Harvey, CH2M

DATE: March 17, 2017

PROJECT NUMBER: 661198

Introduction

The second of two winter supplemental wildlife surveys was conducted to collect information on mammals and game bird abundance and habitat use in the vicinity of the Project to supplement existing information and desktop review, and to inform Project mitigation measures. Ungulates (e.g., moose), mesocarnivores (e.g., weasel, marten), and predators (e.g., lynx and wolves) are readily detected during winter snow track surveys, and can have very low detection frequencies during surveys throughout the rest of the year.

Participants from local First Nations were invited for the winter survey. Peter Yahey, from the Blueberry River First Nation, was present for a portion of the fieldwork (March 14). Peter completed a visitor orientation for the days work.

Methods

Winter track surveys were used to collect information on the presence, distribution, relative abundance, and habitat associations of mammals and upland bird species in the Project area. The protocols used for the winter track surveys were adapted from those outlined in the Inventory Methods for Medium-Sized Territorial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher & Badger (BC Ministry of Environment, Lands and Parks [BC MELP] 1999a), Inventory Methods for Marten and Weasel (BC MELP 1998a), and Ground-Based Inventory Methods for Ungulates Snow-Track Surveys (D'Eon et al. 2006).

The locations of the transects were selected prior to fieldwork using a review of 1:20,000 base maps and aerial imagery. A modified version of the Finnish track transect method (Linden et al. 1996) was used. Transects were 500m long, and created triangles on the landscape, where feasible. Transect locations were stratified by habitat type. Three transects were placed in each habitat type: open field, shrub, and forest.

Winter snow tracking surveys must be completed between 12 hours and 8 days following a major snowfall event (i.e., complete ground cover and obliteration of previous wildlife tracks) to allow for accumulation and accurate identification of tracks. The most recent snowfall on the Silverberry site was on March 12th, 2017. Winter tracking surveys were completed on March 13th and 14th.

All wildlife tracks that either crossed the transect or were observed within 1 m of the transect mid-line were recorded. In the case where the exact number of individuals could not always be determined for hare and squirrel 'runs', track categories of five tracks/hare run and three tracks/squirrel run were used in calculating track densities. Wildlife tracks were identified to species, where possible, or assigned to broader categories: deer (mule deer and white-tailed deer); upland game birds (spruce grouse, ruffed grouse, sharp-tailed grouse); fisher/marten (distinguishing female fisher and male marten tracks is unreliable); and weasel (weasels, mink and ermine).

Detailed habitat information was recorded every 100 m and included the abundance of cavity trees, snags, canopy composition, structural information, amount of browse and amount of cover. Browse and cover were categorized as nil (0-5%), low (6-25%), moderate (26-50%), high (51-75%), or very high (>75%). Snow depths were recorded with a graduated probe (mean of 3 depths at each location) and snow condition (e.g., crust, powder) was noted every 100 m.

All incidental (sign, visual observations, observations outside the survey boundary or time period) wildlife observations and sign, as well as habitat features (e.g., stick nest) were recorded during field surveys.

Track density was calculated for each species along each transect using the following formula (Thompson et al. 1989):

$$Tracks/km/day = \frac{total\ \#\ of\ tracks}{\sum[(segment\ length\ in\ km) \times (days\ since\ last\ snow)]}$$

Results

Seven of nine planned winter transects were completed on March 13 and 14th, 2016. The final two transects were not completed due to rain, and therefore, unsuitable track-counting conditions.

A total of 10 wildlife species or their sign were observed during the late-winter supplemental wildlife survey (Table 1). No species of conservation concern were conclusively observed during the survey (i.e., marten/fisher tracks were observed, but it is not possible to confirm which species). Notably, fewer tracks were observed overall during the late-winter survey than during the early to mid-winter survey in January 2017.

Mammal tracks that were observed during the surveys included moose, deer, coyote, lynx, marten/fisher, weasel/ermine, snowshoe hare, red squirrel. The most abundant tracks observed were snowshoe hare. Photos of selected tracks are provided in Appendix A.

Only one type of tracks was observed in the open hayfield: coyote. The previous survey identified a number of mouse tracks that were not observed during the late-winter survey. This may be due to the deeper snow covering much of the vegetation and multiple crust layers later in the winter that make surface access more difficult for small animals in this habitat. Fewer tracks were observed in the hayfield than in either the shrubby and forested habitats, as during the winter there is very little cover and/or forage in the open field.

The tracks of four species were observed in the shrubby habitat to the north of the hayfield, including moose, snowshoe hare, squirrel and mouse/vole tracks. The shrubby habitat provides sufficient cover for moose, while providing abundant moose forage. Smaller animals may be using this habitat in late winter to search for fresh browse.

The highest number of species was observed in the forest to the east of the hayfield and landfill: the tracks of eight species were observed in the forest. Tracks of seven of these species were at the highest density in the forest habitat. Lynx, marten/fisher, weasel/ermine, deer and grouse tracks were observed only in the forest habitat. The forest habitat provides the most abundant cover during the winter season.

Table 1. Wildlife Species Observed during Late-Winter Snow Tracking Surveys on March 13th and 14th, 2017 at the Tervita Silverberry Landfill

Common Name	Conservation Status	Type of Observations	Total Number of Observations	Mean Density of Tracks (tracks/km/day) in Habitat Type		
				Hayfield	Shrubby	Forest
Deer	--	Tracks	4	0	0	**5.3**
Moose	--	Tracks, scat, browse	5	0	**8.0**	1.3
Coyote	--	Tracks	1	**2.0**	0	0
Lynx	--	Tracks	2	0	0	**0.9**
Marten/fisher	--/Blue-listed[a]	Tracks	1	0	0	**0.4**
Weasel/ermine	--	Tracks	3	0	0	**1.3**
Snowshoe hare	--	Tracks, scat, browse/chews	81	0	28.0	**36.9**
Red squirrel	--	Tracks	15	0	6.0	**6.2**
Mouse/vole	--	Tracks	1	0	**2.0**	0
Grouse sp.	--	Tracks, visual	2	0	0	**0.9**

[a]BC Provincial List (BC CDC, 2017). Only Red and Blue list designations are displayed.

Red List: includes species that have been legally designated as Endangered or Threatened under the BC Wildlife Act, are extirpated, or are candidates for such designation.

Blue List: includes species not immediately threatened, but of concern due to characteristics that make them particularly sensitive to human activities or natural events.

References

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Government of Canada. 2017. Species at Risk Public Registry. Website: http://www.sararegistry.gc.ca/default.asp?lang=en&n=24F7211B-1. Accessed: January 2017

Appendix A – Snow Track Photographs

Photo 1. Red squirrel track (March 13, 2017)

Photo 2. Grouse in forest habitat (March 14, 2017)

Photo 3. Hayfield habitat in the proposed landfill expansion footprint (March 13, 2017)

Photo 4. Shrubby habitat located north of the proposed landfill expansion footprint (March 13, 2017)

Photo 5. Forest habitat (burned during the 2015 wildfire) located within the proposed landfill expansion footprint (March 14, 2017)

Photo 6. Forest habitat (not affected by the 2015 wildfire) located within the proposed landfill expansion footprint (March 14, 2017)

Appendix 10
Spring Breeding Bird and Amphibian Survey Report

REPORT

Spring Breeding Bird and Amphibian Survey Report for the Tervita Silverberry Landfill Expansion Project

PREPARED BY: Tyler Innes, CH2M

DATE: July 31, 2017

PROJECT NUMBER: 661198

Background

Tervita Corporation (Tervita) owns and operates the Silverberry Secure Landfill approximately 50 km north of Fort St. John, British Columbia (BC). Tervita is proposing to expand the capacity of the Silverberry Secure Landfill in the Tervita Silverberry Landfill Amendment Application Project (the Project).

Tervita's Silverberry Secure Landfill was constructed in 2003 and currently operates seven secure landfill cells as defined under the Hazardous Waste Regulation (HWR). The landfill is constructed on privately owned land at 8-88-20 W6M. Within the current landfill footprint, an additional landfill cell (Cell 8) will be constructed approximately the same size as the existing landfill footprint (roughly 25 hectares). The location of the expansion area provides for a 50-m-wide secure buffer zone on the property owned by Tervita, surrounding the active area of the secure landfill, as required by the HWR, Section 25 (10).

Introduction

Three spring supplemental wildlife surveys were conducted in June 2017 to collect information on breeding birds, amphibians, and habitat use in the vicinity of the Project to supplement existing information and desktop review, and to inform Project mitigation measures.

CH2M HILL Energy Canada, Ltd. (CH2M) has prepared this Report to detail the results of the wildlife surveys. Breeding bird point count surveys can be used to collect information on the presence, distribution, and habitat associations of birds, including songbirds, that may not have been observed during the 2015 summer survey. Amphibian surveys in the area can be used to expand the survey coverage beyond the areas checked in 2015. Juvenile western toads were observed in 2015 at the east boundary of the footprint expansion and a spring survey may provide insight into their breeding areas, as well as determine whether breeding amphibians are using the on-site ~~wetland~~low-lying areas.

Participants from local First Nations were invited for the spring surveys.

Methods

Surveys were conducted during suitable weather conditions (wind < 10 km/h, temperature > 3°C, minimal precipitation, and visibility > 10 km) to obtain the most accurate results. Additional information recorded at each station includes the date, time, weather conditions, noise level, GPS location, and description of the general habitat and any site-specific features. All incidental (outside the survey boundary or time period) wildlife observations (visual/auditory) and signs (e.g., tracks, scat/pellets, foraging), as well as habitat features (e.g., stick nest), were recorded during field surveys.

The locations of the point counts and amphibian surveys were selected prior to fieldwork using a review of 1:20,000 base maps and aerial imagery. Survey locations were selected to sample a variety of habitats and ~~wetlands~~ low-lying areas both outside the expansion area and within the expansion footprint.

Breeding Birds

Spring breeding bird surveys were used to collect information on the presence, distribution, and habitat associations of birds, including songbirds in the Project area. Survey protocols are modified from the point count survey protocols outlined in the Inventory Methods for Forest and Grassland Songbirds (BC MELP 1999). Survey locations were selected to represent a variety of habitat types, maintain a minimum separation of 200 m between point count locations to avoid detection of individual birds in more than one count, and to maintain a minimum 100 m buffer from any habitat edge or transitional area (BC MELP 1999).

The field crew was positioned at a good vantage point to observe the surrounding habitat. A 2-minute quiet period was observed to allow for any disturbances in accessing the site to subside. At each survey point, both acoustic and visual records of songbirds were recorded over a 5-minute period. Binoculars were used to observe species at a distance and to confirm identification. Birds observed by sight or sound (including fly-overs and fly-throughs) within a 50-m radius of the observer were recorded. The approximate location, species, age, gender (where possible) and number of all birds detected were recorded at each point count station. Birds observed outside the 50-m radius or detected outside of the 5-minute survey period were recorded as incidental. Surveys were generally completed between sunrise and 10:00 a.m.

Amphibians

Amphibian surveys were targeted at ~~open water wetland~~low-lying wet areas adjacent to the expansion area to expand the survey coverage beyond the areas checked in 2015. Juvenile western toads were observed in 2015 at the east edge of the capacity replacement footprint. One of the goals of these spring surveys was to identify potential breeding habitat near the Project, including the possible habitat in a small shrubby ~~wetland~~ low-lying area at the east edge of the capacity replacement footprint.

Pond-dwelling amphibian survey protocols are modified from the presence/not-detected survey protocols outlined in the Inventory Methods for Pond-Breeding Amphibians and Painted Turtle (BC MELP 1998). At ~~open water wetland~~low-lying wet area ~~location~~s, time-constrained searches were used as this survey technique is the most effective method for determining presence/not detected of a species within a specific area (BC MELP 1998). This technique also provides the number of individuals per unit of search effort and eliminates the bias of clustered populations. A 15-minute survey time was set for each site and therefore provided a 30-minute survey time effort when two crew members were searching (e.g., two people searching for 15 minutes).

Results

The Silverberry Landfill expansion area was visited in June on three separate days, June 9, 13, and 30, 2017 (refer to Figure 1 at the end of this document). “A” waypoints refer to amphibian surveys and “B” waypoints refer to bird surveys.

- June 9 – waypoints: A01 to A08 and B01 to B09
- June 13 – waypoints: AA01 to AA07 and BB01 to BB09
- June 30 – waypoints: AAA01 to AAA07 and BBB01 to BBB09

Breeding Birds

A total of 27 bird point counts were conducted in June 2017. For each site visit, a total of nine breeding bird point count surveys were performed, two inside the expansion footprint and seven outside the footprint within 200 m of the footprint boundary. The same nine breeding bird point count locations were surveyed during each site visit.

A total of 36 bird species were observed during the June 2017 site visits, including ten incidental observations (See Table 1). Many of the incidental observations were observed during the amphibian surveys.

Table 1. Bird Species Observed During Spring Breeding Bird Surveys on June 9, 13, and 30, 2017 at the Tervita Silverberry Landfill

Common Name	BC Status Designation	Federal Status Designation	Observation Type
Alder flycatcher	--	--	Visual/audio
American crow	--	--	Visual
American kestrel	--	--	Visual
American redstart	--	--	Visual/audio
American robin	--	--	Visual
Black-capped chickadee	--	--	Visual/audio
Bufflehead	--	--	Incidental/visual
Canada goose	--	--	Incidental/visual
Clay-colored sparrow	--	--	Visual/audio
Common yellowthroat	--	--	Visual/audio
Dark-eyed junco	--	--	Visual/audio
Eastern kingbird	--	--	Incidental/visual
Hairy woodpecker	--	--	Audio
Hermit thrush	--	--	Audio
Killdeer	--	--	Incidental/visual
Least flycatcher	--	--	Audio
Lesser yellowlegs	--	--	Visual
Lincoln's sparrow	--	--	Visual/audio
MacGillivray's warbler	--	--	Visual/audio
Mallard duck	--	--	Incidental/visual
Northern rough-winged sparrow	--	--	Visual/audio
Olive-sided flycatcher	Blue-listed	*SARA* Schedule 1 –Threatened	Incidental/audio
Ovenbird	--	--	Audio
Pacific-slope flycatcher	--	--	Audio
Red-eyed vireo	--	--	Audio
Red-tailed hawk	--	--	Incidental/visual

Table 1. Bird Species Observed During Spring Breeding Bird Surveys on June 9, 13, and 30, 2017 at the Tervita Silverberry Landfill

Common Name	BC Status Designation	Federal Status Designation	Observation Type
Red-winged blackbird	--	--	Visual
Ruby-crowned kinglet	--	--	Audio
Savannah sparrow	--	--	Visual/audio
Song sparrow	--	--	Audio
Swainson's thrush	--	--	Audio
White-throated sparrow	--	--	Visual/audio
Wilson's phalarope	--	--	Incidental/visual
Wilson's snipe	--	--	Incidental/visual
Winter wren	--	--	Audio
Yellow warbler	--	--	Incidental/audio

One auditory, incidental observation of an olive-sided flycatcher (*Contopus cooperi*) was recorded on June 30 in the southeast corner approximately 100 m from the expansion footprint. The olive-sided flycatcher is listed as Threatened under the *Species at Risk Act* and is Blue-listed in BC. The species has a relatively wide, yet sparse, distribution across Canada and breeds in open coniferous or mixedwood forests, often located near water or wetlands with the presence of tall snags. Population trends follow widespread and unabated declines. The causes of the population decreases are not well understood. Threats include reduced availability of insect prey, fire suppression, deforestation and land conversion in nonbreeding habitat, forest harvesting, energy and mining exploration and extraction, and residential and commercial development. The significance of each threat varies across olive-sided flycatcher's geographical range (Environment Canada 2016).

Amphibians

A total of 22 amphibian surveys were conducted in June 2017. Amphibian surveys were conducted at eleven ~~open water wetland~~low-lying wet areas during the course of the June surveys, one location inside the expansion footprint and nine outside the footprint. The breakdown of amphibian surveys are as follows:

- June 9 – Eight ~~wetlands~~ low-lying areas were surveyed (waypoints: A01 to A08)
- June 13 – Seven ~~wetlands~~ low-lying areas were surveyed (waypoints: AA01 to AA07)
- June 30 – Seven ~~wetlands~~ low-lying areas were surveyed (waypoints: AAA01 to AAA07)

Two amphibian species were observed during the June 2017 site visits, including numerous wood frog tadpoles, juveniles and adults; and only one western toad juvenile observation (see Table 2). Wood frog tadpoles and adults were observed in all but three ~~wetland location~~low-lying areas during the site (Photos 1 and 2).

Table 2. Amphibian Species Observed During Spring Surveys on June 9, 13, and 30, 2017 at the Tervita Silverberry Landfill

Common Name	BC Status Designation	Federal Status Designation	Observation Type
Western toad	Yellow-listed	(COSEWIC) Special Concern	Juvenile
Wood frog	--	--	Tadpoles/juveniles/adults

One western toad juvenile was observed at the east edge of the expansion footprint (10 V 613623 6276731) in the same ~~wetland~~ low-lying ditch where the other toad was observed in 2015 (Photos 3 and 4). No breeding habitat was observed during the site visits in June 2017, therefore it is still unknown where the western toad breeding habitat occurs.

Western toads use a wide variety of aquatic and upland habitats. They breed in a variety of ~~wetlands including~~habitats such as shallow, sandy margins of lakes, ponds, streams, river deltas, river backwaters, river estuaries, and geothermal springs. Following breeding, adults may remain to forage in the marshy or riparian edges of breeding sites, or they may disperse several kilometres to foraging areas in other ~~wetlands,~~ riparian areas along streams, or upland sites (COSEWIC 2012).

Recommendations

An amphibian salvage permit from BC Ministry of Forests, Land and Nature Resource Operations is recommended to salvage any potential frogs or toads from the capacity replacement footprint prior to construction. The highest likelihood of amphibians occurring in the capacity replacement footprint is in the southeast quadrant. In addition, CH2M recommends nest sweeps in the shrubby ~~wetland~~ low-lying area (southeast corner) prior to construction if vegetation clearing occurs in the breeding bird window of May 1 to July 10 (BC MELP 1999).

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Insert

Figure 1. Spring Breeding Bird Point Count and Amphibian Survey Locations
https://delivery.ch2m.com/projects/661198/Shared%20Documents/05%20-%20Deliverables/Wildlife%20Surveys%20SOW/20170719_MAP_CH2M_Wildlife_Surveys_Rev0.pdf

Appendix A
Spring Wildlife Photos

Photo 1. Wood Frog Adult (June 30, 2017)

Photo 2. Wood Frog Tadpoles (June 30, 2017)

Photo 3. Western Toad Juvenile (June 30, 2017)

Photo 4. Shrubby Wetland Ditch at the East Edge of the Landfill Expansion Footprint (June 30, 2017)

Appendix 11
Screening Level Human Health Risk Assessment

FINAL REPORT

Screening Level Human Health Risk Assessment, Silverberry Secure Landfill Expansion

Prepared for

Tervita Corporation

June 2018

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Acronyms and Abbreviations

--	not applicable
<	less than
>	greater than
≤	less than or equal to
µg/m^3	micrograms per cubic metre
AAIR	Amendment Application Information Requirements
AAQOs	Ambient Air Quality Objectives
AL	agricultural land
ALR	Agricultural Land Reserve
asl	above sea level
AW	Aquatic Life
BC EAO	BC Environmental Assessment Office
BC MECCS	BC Ministry of Environment and Climate Change Strategy
BC MOF	BC Ministry of Forests
BC OGC	BC Oil and Gas Commission
BC	British Columbia
Bq/g	becquerels per gram
BTEX	benzene, toluene, ethylbenzene, xylenes
CAC	criteria air contaminant
CCME	Canadian Council of Ministers of the Environment
CCS	Canadian Crude Separators Inc.
CH2M	CH2M HILL Canada Limited
CH_4	methane
cm/s	centimetre(s) per second
cm/y	centimetre(s) per year
CNSC	Canadian Nuclear Safety Commission
CO	carbon monoxide
CO_2	carbon dioxide
COPC	contaminant of potential concern
CSM	conceptual site model
CSR	Contaminated Sites Regulation
dBA	decibel(s)
DW	Drinking Water

EBA	Engineering Consultants Ltd.
EMA	*Environmental Management Act*
EPH	extractable petroleum hydrocarbon
F	fraction
h/a	hour(s) per annum
H_2S	sulphide
HEPH	heavy extractable petroleum hydrocarbon
HI	hazard index
HQ	hazard quotient
IL	industrial land
IW	Irrigation Water
km	kilometre(s)
kW	kilowatt(s)
LAA	Local Assessment Area
LEPH	light extractable petroleum hydrocarbon
LW	Livestock Water
m	metre(s)
m^3	cubic metre(s)
Matrix	Matrix Solutions Inc.
max	maximum (concentration)
mbgs	metre(s) below ground surface
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per litre
mSv/a	millisievert(s) per annum
MTBE	methyl tert butyl ether
nc	not calculated
Nichols	Nichols Environmental [Canada] Ltd.
NLR/AE	NLR/AE Consultants
NO	nitric oxide
No.	number
NO_2	nitrogen dioxide
NORM	naturally occurring radioactive material
NO_x	nitrogen oxide
NSv/h	nanosievert(s) per hour
O_3	ozone

ON MOECC	Ontario Ministry of the Environment and Climate Change
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PDMA	Potential Dust Migration Area
pH	hydrogen (ion) concentration
PHC	petroleum hydrocarbon
PM	particulate matter
PM_{10}	small particles with a diameter of 10 microns
$PM_{2.5}$	fine particles with a diameter of 2.5 microns
ppb	part(s) per billion
PPE	personal protective equipment
PSL	Permissible Sound Level
RA	Risk Assessment
RAA	RAA
SDl	sample detection limit
SLHHRA	screening level human health risk assessment
SLRA	screening level risk assessment
SO_2	sulphur dioxide
SWDA	Surface Water Drainage Area
Tervita	Tervita Corporation
the Facility	the Silverberry Secure Landfill
the proposed Project	the Tervita Silverberry Landfill Amendment Application Project
TSP	total suspended particulate
USEPA	United States Environmental Protection Agency
VC	Valued Component
VH	volatile hydrocarbon
VI	vapour intrusion
VOC	volatile organic compound
VPH	volatile petroleum hydrocarbons

SECTION 1

Introduction

CH2M HILL Canada Limited (CH2M) was retained by Tervita Corporation (Tervita) to prepare a screening level human health risk assessment (SLHHRA) to support the assessment of human health impacts associated with the expansion of the Silverberry Secure Landfill (the Facility). Tervita is proposing to replace the depleted capacity of the Facility in the proposed landfill expansion outlined in the Tervita Silverberry Landfill Amendment Application Project (the proposed Project).

The Facility is located approximately 50 kilometres (km) northwest of Fort St. John in northeastern British Columbia (BC). The landfill is used primarily for the disposal of waste associated with oil and gas exploration.

The Environmental Assessment Certificate Amendment Application for the proposed Project has been initiated with the BC Environmental Assessment Office (BC EAO) with the submission of the Valued Component (VC) Rationale document. As part of the VC review, BC EAO and Working Group members have requested a SLHHRA to be completed in support of the assessment of human health impacts. This screening level risk assessment (SLRA) will be appended to the BC EAO Amendment Application and used to support the assessment of effects to human health, as well as the identification of proposed mitigation measures.

1.1 Background

The Facility was constructed in 2003, and currently consists of seven secure landfill cells, as defined under the Hazardous Waste Regulation. Cells are constructed in a staged manner dependent on fill rate, typically with only one cell operational at a time. The landfill is on privately owned land. Associated infrastructure and facilities located on the same property include access roads, drainage ditches, and groundwater monitoring wells, as well as the office and weigh scales. Infrastructure and associated facilities are in operation for the existing landfill and will continue to be used for the landfill capacity replacement area. Stormwater and leachate management and monitoring systems are in place at the Facility and will be expanded or upgraded, where appropriate, to account for stormwater retention and leachate generation associated with the proposed landfill capacity replacement. The proposed replacement capacity is approximately the same size as the existing landfill footprint (approximately 25 hectares). Similar to the existing landfill footprint, the proposed Project will be developed as a series of cells.

One more secure landfill cell (Cell 8) is proposed to be constructed within the current approved footprint and to accept waste. The types of waste that are currently accepted at the Facility include hydrocarbon-contaminated soils and sands, sulphur-contaminated soil, salt-contaminated soils, drill cuttings, and other wastes associated with the oil and gas industry. Examples of other waste that may be accepted include construction and demolition materials such as cement, absorbents and desiccants, and other sources of industrial waste.

1.2 Scope and Objectives

The scope of this SLHHRA was developed based on the approved Amendment Application Information Requirements (AAIR), the nature of the proposed Project, regulatory requirements and standards, and concerns expressed by Aboriginal groups, the public, regulatory agencies, and other stakeholders. This report qualitatively evaluates the potential risks to the Human Health VC associated with the proposed Project.

The objectives of this SLHHRA are to:

- Predict the incremental risk to human health from the proposed Project
- Identify potential mitigation or risk management options to reduce potential health risks to human receptors

Risks to the Human Health VC from the proposed Project may be related to changes in environmental conditions, such as noise levels, air quality, drinking water quality, or soil quality. Changes to country foods quality may occur if there is a change to water or soil quality. Country foods are defined as foods that are trapped, fished, hunted, harvested, or grown for subsistence or medicinal purposes, or obtained from recreational activities, such as sport fishing or game hunting. Country foods do not include foods produced in commercial operations, such as large farms or greenhouses (Health Canada, 2012).

This SLHHRA uses a desktop analysis to identify potential risks to the Human Health VC within the proposed Project assessment boundaries and evaluates potential exposure pathways and receptors, as well as the nature and magnitude of exposures to these receptors using conservative estimates. It also discusses the potential health risks associated with the predicted exposure scenarios. If there are no pathways or receptors identified, there are no predicted health risks associated with the proposed Project. In situations where the desktop SLHHRA identifies potential risks, the risks are evaluated in greater detail. The assessment is based on the assumption that the expansion operates under a similar condition, accepting similar wastes, and will impact the environment with similar environmental emissions and exposures, as observed to date.

The BC Ministry of Environment and Climate Change Strategy (BC MECCS) provides guidance for the use of Risk Assessment (RA) methods as part of the Contaminated Sites Regulation (CSR) legislation. This assessment uses BC MECCS Protocol No. 13 (BC MOE, 2008) and Health Canada (2010a) guidance.

The following reference documents from Health Canada were also utilized, and provided additional guidance for the assessment of human health risk:

- Evaluating Human Health Impacts in Environmental Assessment: Noise (2017a)
- Evaluating Human Health Impacts in Environmental Assessment: Air Quality (2017b)
- Evaluating Human Health Impacts in Environmental Assessment: Water Quality (2017c)
- Evaluating Human Health Impacts in Environmental Assessment: Radiological Impacts (2017d)

SECTION 2

Environmental Setting

The following subsections summarize the general geographic, geologic, and hydrogeologic conditions of the area surrounding the Facility. This information provides regional context for the site to identify viable release points and exposure pathways. Identifying these pathways assisted with the development of the conceptual site model (CSM) to support the SLHHRA.

2.1 Regional Context

The Facility is situated in the Boreal Plains Ecoprovince and the Boreal White and Black Spruce Zone (CCS, 2002). This zone is characterized by long and cold winters, with a warm and short growing season. Approximately 35 to 55 percent of precipitation falls as snow (BC MOF, 1991). The topography ranges from 650 metres (m) above sea level (asl) to 850 m asl (Clifton, 2002).

The Blueberry River is located approximately 6.5 km to the north of the Facility.

2.2 Geology

The Facility is underlain by bedrock of middle Cenomanian age known as the Dunvegan Formation. The formation is characterized as grey sandstone, interbedded with grey to dark siltstone, shale, and carbonaceous shale (CCS, 2002; Matrix, 2017). This formation ranges from 50 to 250 m in thickness and is located at depths of approximately 6 to 18 m below ground surface (mbgs) in the vicinity of the Facility (Clifton, 2002). Surficial deposits are characterized as glaciolacustrine deposits (clay) overlying clay till (CCS, 2002; Clifton, 2002; Matrix, 2017). This information is consistent with CH2M's observations during shallow soil sampling at the Facility (CH2M, 2017), where topsoil underlain by clay and silty clay with trace fine sand and gravel was encountered.

2.3 Hydrogeology

A hydrogeological study (Clifton, 2002) was completed prior to the construction of the Facility. This study encountered a shallow water table ranging from 1.8 to 3.8 mbgs. No aquifers identified as a groundwater resource are located below or within several kilometres of the Facility. Groundwater flow was found to be to the northwest. The hydraulic conductivity of the clay till was found to be low, ranging from 3×10^{-7} centimetres per second (cm/s) to 8×10^{-7} cm/s. Horizontal groundwater migration rates were estimated in the range of centimetres per year (cm/y).

Recent investigations (Matrix, 2017) have encountered the water table ranging from 0.65 to 9.54 mbgs, with flow to the northwest. Horizontal groundwater velocity was estimated at approximately 40 cm/y.

2.4 Facility History and Existing Conditions

Canadian Crude Separators Inc. (CCS) (2002) provides the following history of the Facility:

- The Facility is located within the provincial Agricultural Land Reserve (ALR), and is surrounded by Crown land.
- Between 1970 and 1972, the south part of Block A, Section 8 and Block B, Section 7 was cleared. There is no evidence of cultivation of this land.
- Between 1973 and 1987, land in Block B, Section 18 and Block A, Section 17 was cleared. This land was used for range land and a hay field until 1996.

- The Silverberry Land Treatment Centre was established in 1996 and was purchased by CCS from Rudiger Enterprises Ltd. in 2002.

Tervita (2014a) provides the following additional history:

- The first landfill cell at the Facility was opened in October 2002, with additional cells opened in the period between 2003 and 2012.

More recently, cell 7 was opened in 2015. The following subsections describe the existing environmental conditions based on site studies conducted from 2002 to 2017.

2.4.1 Surface Water

Clifton (2002) identified several permanent creeks and lakes within a 10-km radius of the Facility. The nearest surface water bodies include two unnamed creeks (tributaries to the Blueberry River), that are located approximately 1.4 km both to the west and north of the Facility. Upset Creek, St. John Creek, an unnamed creek, and two unnamed lakes or sloughs are also listed as being present within 5 km of the Facility (Clifton, 2002). The nearest major surface water body is the Blueberry River, located approximately 7 km to the north, at an elevation approximately 100 m lower than the elevation of the Facility. An ephemeral stream is located adjacent to the Facility, to the north (CH2M, 2017; Matrix, 2017).

At the Facility, precipitation and runoff that does not contact waste drains offsite to the northwest following the topography. Precipitation that falls on the landfill is directed west using berms and ditches towards a stormwater retention pond (Tervita, 2014a). Surface water is sampled and analyzed prior to being pumped offsite to a forested area to the north of the Facility for re-infiltration (CH2M, 2017). There are no known channel connections between the Facility and nearby fish-bearing water bodies (CCS, 2002).

Section 3.1.1 summarizes the results of the most recent surface water sampling activities. Section 3.1.3 describes soil sampling activities that were conducted within the area where surface water is re-infiltrated.

2.4.2 Groundwater

As part of the Clifton (2002) study, groundwater was sampled and analyzed for general chemistry, metals, hydrocarbons, phenols, and polycyclic aromatic hydrocarbons (PAHs). The groundwater was characterized as a “sulphate type water with no dominant cation”. Total dissolved solids concentrations ranged between 1,160 milligrams per litre (mg/L) to 7,060 mg/L, and is considered “brackish”. Hydrocarbons, phenols, and PAHs were absent (nondetect) in the samples collected, while metals analytes were generally detected. Clifton (2002) indicates that the concentrations measured in groundwater are indicative of natural background conditions, and that the groundwater would not be suitable for potable use because of high sulphate, sulphide, and TDS concentrations.

Matrix (2017) recently conducted a water well search through the BC Water Resources Atlas. Within 5 km of the Facility, three water wells were identified. Two wells are located 2.5 km to the east, owned by Leucrotta Exploration Inc., and used for monitoring; the third well is a domestic well owned by the BC Railway Company, and located 4 km to the northwest.

Potable water is trucked to the Facility, where it is stored in a cistern for general water use. A septic tank captures and stores waste water until it is pumped out for offsite disposal (CCS, 2002).

To prevent impacts to groundwater from the operations at the Facility, the landfill is lined and equipped with a leachate collection and leak detection system (Tervita, 2014a). The proposed landfill expansion will be lined and connected to the existing leachate collection and leak detection systems.

Per the Facility's BC MECCS permit, a groundwater monitoring program is conducted (Tervita, 2014a). A summary report of the groundwater monitoring program is prepared annually (EBA, 2009, 2010; Golder, 2006, 2007; Matrix, 2004, 2015, 2017; NLR/AE, 2012, 2013). The annual reports assess whether groundwater shows evidence of impacts from the landfill or if the groundwater quality is indicative of natural conditions. The reports also comment on whether the leachate collection and leak detection systems are functioning as designed.

Section 3.1.2 summarizes the results of the 2003 through 2016 groundwater sampling activities.

2.4.3 Soil

Soils within the proposed landfill expansion comprise topsoil underlain by clay and silty clay with trace fine sand and gravel (CH2M, 2017). The proposed Project will extend the existing double-liner system already in place to the new landfill cells. The liner is in place to protect existing soil and groundwater from impacts from the landfill activities (Tervita, 2014a).

During construction and operation of the landfill, topsoil and subsoil is salvaged, stockpiled, and maintained with the purpose of using the salvaged soil as the final cover for the landfill cells (Tervita, 2014a). Measures taken to maintain these soils can include: "seeding, hydroseeding, erosion mitigation, cutting, weeding, or contouring to maintain efficient drainage" (Tervita, 2014a).

Section 3.1.3 describes soil sampling activities that were conducted within two areas: where surface water is re-infiltrated, and the area downwind of the existing Facility for potential dust migration.

The types of waste that are currently accepted at the Facility include hydrocarbon-contaminated soils and sands, sulphur-contaminated soil, and salt-contaminated soils. These soils generate leachate. The Facility is equipped with a leachate collection and a leak detection system (CCS, 2002). The proposed Project will connect to the existing system. The collected leachate is pumped into leachate vault, which is subsequently pumped out and disposed of in an offsite licenced disposal well (Golder, 2008). As described in Section 2.4.3, leachate is monitored as part of the groundwater monitoring program.

Section 3.1.3 summarizes the results of the 2003 through 2016 leachate sampling activities as part of the groundwater monitoring program.

2.4.4 Country Foods

Members of Blueberry River First Nation have indicated that they use the land in proximity to the Facility and the proposed Project for traditional land and resource use activities, such as gathering, fishing, hunting, and trapping.

2.4.5 Air

Industrial emission sources (for example, well sites, flare stacks, and gas plants) are present in the region surrounding the Facility, and with the exception of Tervita's adjacent TRD facility none are located within 1 km of the Facility (CCS, 2002; Tervita, 2014a).

Onsite, as part of the existing landfill operations, air emissions are generated by heavy machinery and one diesel generator, which supplies power to the Facility (CCS, 2002; Tervita, 2014a).

Dust from construction material handling and earth grading may contain potential contaminants of concern that could affect human health. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic (Tervita, 2014a). Naturally occurring radioactive materials (NORMs) may be present in dust, and could be released in the air when moving vehicles and other equipment over the proposed Project area. Tervita conducts air monitoring for NORM activity levels bi-annually to determine if dust being carried in the air has NORM activity levels above regulatory restrictions.

Due to the waste types present at the landfill (that is, waste materials from the oil and gas industry), minimal landfill gas is generated; however, this material can produce odours and vapours from volatile petroleum hydrocarbons (VPH) present in the waste (CCS, 2002; Tervita, 2014a). Section 3.1.5 summarizes the results of a sampling event for hydrocarbon-related volatile organic compound (VOC) vapours from the Facility.

2.4.6 Noise

The major source of noise contributing to existing sound levels around the proposed Project area are road and train traffic. Buick Creek Road is present to the west of the site with railway lines beyond. Frequent daily rail traffic is present; however, the noise from the road and rail traffic is considered "variable and intermittent" (Tervita, 2014a). Average car traffic along Buick Creek Road during the summer is estimated to be 735 vehicles per day (CCS, 2002). Natural sounds, such as wind rustling through vegetation and birds, are also expected to contribute to ambient noise levels when vehicle traffic is absent.

At the Facility, noise is generated from the waste-handling machinery and trucks hauling the waste (CCS, 2002). The noise from normal daytime Facility operations includes "truck traffic, heavy equipment, back-up beepers, speaker systems and radios" (Tervita, 2014a). These noise sources are also associated with cell construction activities.

The nearest neighbour to the Facility is seasonal and is located at a distance of 2.5 km from the Facility (Tervita, 2014a). The Facility is also surrounded by forest, which dampens noise generated from Facility operations (CCS, 2002).

These noise sources represent the baseline noise levels in the vicinity of the Facility.

2.4.7 Naturally Occurring Radioactive Materials

NORMs can accumulate in waste streams from the oil and gas industry at levels greater than background. Within the subsurface formations from which oil and gas are extracted, the source of NORMs is primarily naturally-occurring uranium-238 (U-238) and thorium-232 (Th-232) (Smith, 1992). Of most concern is the radium-226 (Ra-226) isotope, which is a decay product of U-238. Radon-222 (Rn-222) (a decay product of Ra-226) and lead-210 (Pb-210) (a decay product of Rn-222) may also be present (Smith, 1992). Depending on the geographic source, the original concentrations of U-238 and Th-232 in the formation, and the waste stream, levels of NORMs can vary widely (Smith, 1992).

All waste loads are screened for NORMs prior to acceptance at the landfill and known NORM waste loads must have proof of analysis prior to acceptance. NORMs may occur in the oil and gas waste streams accepted at the Facility, including decommissioned infrastructure materials, such as spent catalyst and refractory brick. As per Silverberry's *Environmental Management Act* (*EMA*) Permit, 17150, the maximum acceptable radioactive concentration for NORMs is 70 becquerels per gram (Bq/g), with a maximum radioactive concentration due to Ra-226 of 5 Bq/g.

SECTION 3

Identification of Contaminants of Potential Concern

3.1 Data Sources

The following subsections summarize the key information from previous reports, investigations, and studies that were used to identify the contaminants of potential concern (COPCs) for evaluation in the SLHHRA.

3.1.1 Surface Water

Three reports related to surface water monitoring and discharge were available for review (Nichols, 2015; 2016; 2017). Surface water at the Facility is directed via drainage ditches to a stormwater pond, located in the northwest corner of the Facility. Surface water from the stormwater pond is subsequently tested prior to discharge to a Surface Water Drainage Area (SWDA), which is a forested area containing an ephemeral stream, located offsite to the north of the Facility (CH2M, 2017). The surface water monitoring reports document the sampling of surface water from the stormwater pond twice per year. During the surface water sampling events, one or more of the following laboratory analyses are requested: metals, nutrients, phenols, petroleum hydrocarbons (PHCs), oil and grease, polychlorinated biphenyls (PCBs), extractable organic halides, and trout bioassay. In these reports, the analytical results are compared to the BC CSR water standards in the former Schedule 6 (Generic Numerical Water Standards) and Schedule 10 (Generic Numerical Soil and Water Standards) tables for the following water uses: Drinking Water (DW), Irrigation Water (IW), Livestock Water (LW), and Aquatic Life (AW) (freshwater). A summary of the results for each report is as follows:

- In 2014, over two events (May and July), all concentrations were below the applicable BC CSR water standards or nondetect. Nichols (2015) concluded that there were “no deleterious effects on the environment due to surface water discharge from the Silverberry Landfill”.
- In 2015, over two events (April and May), all concentrations were below the applicable BC CSR water standards or nondetect. A trout bioassay completed in April 2016 indicated no effects. It is noted that in 2015, no surface water was discharged offsite, as all the available surface water runoff (approximately 2,359 cubic metres [m^3]) was used onsite by the Facility for dust control and hydrating the clay liner as part of the construction of Cell 7 (Nichols, 2016).
- In 2016, over two events (April and August), all concentrations were below the applicable BC CSR water standards or nondetect. A trout bioassay completed in April 2015 indicated no effects. Based on these results, a total of 18,189 m^3 of surface water was discharged offsite from the stormwater pond.

3.1.2 Groundwater

Twelve annual reports were available for review regarding the quarterly groundwater monitoring program conducted as part of the *EMA* Permit 17150 for the Facility for the years 2003 through 2016 (EBA, 2009, 2010; Golder, 2007, 2008; Matrix, 2004, 2015 2017; NLR/AE, 2012, 2013). The effectiveness of the leachate collection system and leak detection system beneath the Facility is conducted concurrently with the groundwater monitoring program (Matrix, 2017).

As of 2016, 14 monitoring wells are included as part of the groundwater monitoring program; including nested (shallow/deep) monitoring wells located both upgradient and downgradient of the Facility (Matrix, 2017). Groundwater samples are submitted for analysis of one or more of the following tests: general chemistry, dissolved metals, PHCs, benzene, toluene, ethylbenzene, xylenes (BTEX), methyl tert butyl ether (MTBE), and PAHs. Analytical results are compared to the BC CSR water standards in the former Schedule 6 (Generic Numerical Water Standards) and Schedule 10 (Generic Numerical Soil and Water Standards) tables for the following water uses: DW, IW, LW, and AW (freshwater). The more recent groundwater results are also compared to groundwater data collected between 2008 and 2012 from an upgradient monitoring well which is considered representative of the local background conditions (Matrix, 2017).

Analytes which have had concentrations in groundwater greater than the former BC CSR Schedule 6 and 10 standards include: benzo(a)pyrene, cadmium, chloride, iron, lithium, magnesium, manganese, nitrate, nitrite, selenium, sodium, sulphate, and uranium. The reports generally attribute the concentrations of sodium, chloride, cadmium, magnesium, sulphate, manganese, iron, and uranium to be naturally occurring (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2015). The sporadic exceedances of benzo(a)pyrene in groundwater may be attributed to sediment entrained in the groundwater sample (Matrix, 2017). The general conclusion of the annual monitoring reports is that the leachate collection and containment system is operating and that the Facility does not appear to be impacting groundwater.

Leachate and leak detection sampling is conducted concurrently with the groundwater monitoring program. Leachate samples are compared to the BC CSR standards for water. An evaluation of the effectiveness of the leachate collection and containment system typically involves comparing the results of the leachate samples to that of the groundwater samples to determine if groundwater has been impacted by leachate.

Throughout the leachate monitoring program, concentrations of BTEX, metals, PAHs, PHCs, phenols, nitrate, nitrate, and sulphate have been detected greater than the BC CSR standards for water within the leachate vault riser. To a lesser extent, the same chemicals have been detected at concentrations greater than the BC CSR standards in the leak detection riser. Several reports (Golder, 2007; Matrix, 2004) indicate that the presence of certain COPCs in the leak detection riser was attributed to an issue with the leachate collection system at the time and was not related to a failure of the primary liner.

These results are consistent with the wastes accepted at the landfill, which may contain the following:

- Hydrocarbons, including BTEX, VPH, light extractable petroleum hydrocarbons (LEPHs), heavy extractable petroleum hydrocarbons (HEPHs), and PAHs
- Trace metals, including copper, cadmium, chromium, nickel, lead, vanadium and zinc and trace metals associated with wear from drilling equipment in waste
- Salts
- Trace NORMs, which may include uranium, strontium and thorium

3.1.3 Soil

Limited data were available on existing soil quality. In 2016, CH2M conducted a soil sampling investigation to assess soil quality in the SWDA and the Potential Dust Migration Area (PDMA) (CH2M, 2017), which are relevant to the Facility and the proposed Project. The objective of the SWDA soil sampling investigation was to assess concentration and distribution of potential impact in surficial soils resulting from surface water discharge pumped offsite and overland flow onsite draining towards the ephemeral stream. The PDMA covers the footprint associated with the proposed Project, as well as

additional land located to the south and west, which was determined from a wind rose analysis of prevailing winds and estimates of area of potential distribution. Ten and six shallow boreholes were advanced in the SWDA and PDMA, respectively, with a broad range of chemical parameters analyzed. Soil samples collected from soil borings identified concentrations of boron (SWDA and PDMA) and barium (PDMA) which exceeded BC CSR standards (agricultural land [AL] and industrial land [IL] use or Protocol 4 background) for soil. The BC CSR standards are broadly protective of human and ecological health. The boron concentrations greater than the BC CSR standards were concluded to be associated with naturally occurring background, as there were elevated concentrations present in both the SWDA and PDMA, as well as in boreholes advanced in undisturbed areas, and no other COPCs associated with the Facility (that is, hydrocarbons) were detected within the samples. Concentrations of barium were elevated above soil background concentrations (Protocol 4) in two samples. The report indicates that there is uncertainty as to whether these concentrations are indicative of naturally occurring concentrations or related to the materials stored at the Facility. The main source of the materials accepted at the Facility come from the oil and gas industry activities, where barite is a common mud additive (CH2M, 2017).

Soil beneath the landfill also may be impacted by leachate in the event that the leachate collection system or liner is not functioning as designed (refer to Section 3.1.2).

3.1.4 Country Foods

Blueberry River First Nation has indicated that they gather, hunt, fish, and trap in the vicinity of the proposed Project. COPCs for country foods will be based on the COPCs identified in soil, groundwater, and surface water. Vegetation, fish, and wildlife may uptake COPCs in these media.

3.1.5 Air

An air quality report was reviewed with respect to the emission of hydrocarbon-related VOC vapours from landfill wastes (CH2M, 2016b). The intent of the study was to measure the chemical composition of landfill gas emissions at the existing landfill cells. Bitumen or low-density polyurethane caps are in place on closed landfill cells, which limit the release of landfill gases. Therefore, the VOC sampling was conducted on cell 7, which was active and not capped at the time of sampling.

The sampling activities were conducted in two phases: the first phase was a survey to identify "worst-case" sampling locations, while the second phase involved sampling using Summa canisters. The preliminary survey was conducted over a grid using a hand-held landfill gas analyzer, measuring methane (CH_4), carbon dioxide (CO_2), hydrogen sulphide (H_2S), and carbon monoxide (CO) to potentially identify "hotspots" where emissions may be greatest. No detectable concentrations of CH_4, CO_2, H_2S, or CO were detected during this survey. As a result, the locations for the second phase of sampling were based on the terrain of the landfill cell. Two sampling points at higher elevations were selected for the Summa canister sampling. The results were compared to ambient air guidelines from Alberta and Ontario, as BC MECCS does not have ambient air criteria applicable to the VOCs analyzed (BC MOE, 2016b). Concentrations of VOCs were less than the selected ambient air criteria, except benzene. The concentration of benzene in one sample was equal to the Alberta 1-hr ambient air criteria. The report concludes that considering dispersion and dilution, VOC emissions from the landfill are unlikely to be greater than ambient air criteria at an offsite location.

As mentioned in Section 2.4.5, as part of the Facility operations, air emissions are generated by heavy machinery and one diesel generator which supplies power to the Facility (CCS, 2002; Tervita, 2014a). Criteria air contaminants (CACs) that may be emitted during current operations include nitrogen oxide (NO_x), sulphur oxide gases, and airborne particulate matter (PM), along with minor amounts of VOCs, as discussed above.

3.1.5.1 Ambient Air Quality in Project Region

There are numerous industrial emission sources near the proposed Project site (for example, well sites, flare stacks, and gas plants) and with the exception of Tervita's adjacent TRD facility, none are located within 1 km of the Facility (CCS, 2002; Tervita, 2014a).

Ambient air quality monitoring data were obtained from the Province of BC Northeast Air Zone dataset to define existing air quality near the proposed Project area. Specifically, data from the Fort St. John – Key Learning Center, Monitor Station ID# E299830 for the year 2016 were downloaded from BC MECCS (BC MOE, 2016a). The station is located at latitude 56.244722, and longitude -120.856111 approximately 46 km southeast of the proposed Project. This station was chosen because it is the nearest station to the proposed Project that measures a comprehensive list of CACs. Table 3-1 summarizes the results of the data.

Table 3-1. Summary of Ambient Air Quality in the Project Region – 2016 Data

NO	NO_2	NO_x	SO_2	O_3	$PM_{2.5}$	PM_{10}	Comments
ppb	ppb	ppb	ppb	ppb	µg/m³	µg/m³	--
18.9	20.5	39.2	1.2	41.0	15.4	49.8	98th percentile of 24-hour averages
2.9	5.7	7.7	0.32	22.6	5.6	15.7	Average of 24-hour averages (annual)

Notes:

µg/m³ = micrograms per cubic metre
NO = nitric oxide
NO_2 = nitrogen dioxide
O_3 = ozone
PM_{10} = small particles with a diameter of 10 microns
$PM_{2.5}$ = fine particles with a diameter of 2.5 microns
ppb = part(s) per billion
SO_2 = sulphur dioxide

3.1.5.2 Project Emissions

Dust from construction material (rock, gravel) handling and earth grading may contain contaminants, which could be transported away from the proposed Project. As part of the current landfill operations, roadways are wetted on an as-needed basis to reduce dust generation by vehicular traffic (Tervita, 2014a). Operational restrictions will take place if visible dust clouds are noted by on-site operators. These restrictions could include curtailment or cessation of work under high wind conditions, minimizing drop distances, covering or watering of open stockpiles, rehabilitating completed sections of the landfill as soon as practical, and adhering to posted speed limits on-site. Typically, fugitive dust particles are larger particles that will redeposit to the ground within a few hundred meters of the fugitive dust source. Therefore, total PM concentrations will approach background levels within a localized area. In addition, there is a significant distance to any potentially affected receptors, meaning that there is little potential for off-site dust nuisance. Emissions from construction equipment are expected to be localized and temporary in nature.

Table 3-2 summarizes the details of typical equipment to be used during cell construction. All equipment will adhere to low-emission Tier 4 engine specifications.

Table 3-2. Summary of Cell 9 Construction Equipment

Equipment Type	Number	Engine Model	Engine Size	Comments
CAT D6T Dozers	2	C9.3 ACERT	161-kW net	USEPA Tier 4
CAT 330F L Excavators	2	C7.1 ACERT	175-kW net	USEPA Tier 4

Table 3-2. Summary of Cell 9 Construction Equipment

Equipment Type	Number	Engine Model	Engine Size	Comments
CAT 735 C Trucks	6	C15 ACERT	329-kW net	USEPA Tier 4
CAT 815K compactors	2	C7.1 ACERT	185-kW net	USEPA Tier 4

Notes:

USEPA = United States Environmental Protection Agency
kW = kilowatt(s)

Due to the waste types present at the Facility (that is, waste materials from the oil and gas industry), minimal landfill gas is expected to be generated during operations of the proposed Project; however, this material can produce odours and vapours from VPH present in the waste (CCS, 2002; Tervita, 2014a). As discussed above, a preliminary study of landfill emissions was done in 2016 to quantify the nature and concentration or emissions of VOC vapours from the Facility (CH2M, 2016b). The results show that minor amounts of VOCs are emitted from the existing landfill cells under typical operating conditions. Due to the fact that similar wastes will be accepted at the proposed new landfill cell, VOC emissions are expected to be similar in nature and quantity.

3.1.6 Noise

Health Canada does not regulate noise levels, but does provide recommendations for the assessment of noise impacts, including:

- Identification and mapping of noise-sensitive receptors such as residences, schools, nursing homes and First Nations communities, relative to a project location
- Estimation of baseline sound levels for a project be estimated at both day and night
- Identification of all potential project noise during all project phases
- Comparison of baseline noise levels with predicted noise levels at sensitive receptor locations
- Evaluation of severity of predicted changes and prediction of health impacts
- Implementation of mitigation measures, noise management and complaint resolution planning (Health Canada, 2010a; 2017a)

An evaluation of the expected future operations and construction phase noise levels is discussed in the following subsections.

3.1.6.1 Construction Stage

During construction of the proposed Project, it is expected that the following equipment will be used:

- Two CAT D6T dozers
- Two CAT 330F excavators
- Six 30-ton CAT 735C rock trucks
- Two CAT 815K compactors

It is highly unlikely that all equipment will be used simultaneously and construction is only anticipated during the daylight hours. According to the U.S. Department of Transportation, Federal Highway Administration, *Construction Noise Handbook* (2017), the equipment listed above have measured and averaged sound pressure level measurements at 50 feet as follows: compactor (83 decibels [dBA]), dozer (82 dBA), dump truck (76 dBA), and excavator (81 dBA).

3.1.6.2 Operations Stage

The operations stage of the proposed Project will require the use of similar equipment in the same quantities as what is currently being used at the Facility.

3.1.7 Naturally Occurring Radioactive Materials

Six documents containing raw radiation level survey data from select locations across the Facility were reviewed. Data were reported on a monthly basis from up to 17 locations between January 2011, and November 2016. Table 3-3 presents the tabulated data and measurements.

Table 3-3. Summary of Radiation Survey Data for the Existing Facility

Statistic	nSv/h
Maximum	500
Minimum	20
Median	95

Note:

nSv/h = nanosievert(s) per hour

Review of the data suggests that the maximum value of 500 nSv/h is an outlier. This value was measured at Cell 6 in June of 2014. Of the 847 measurements provided, the next highest value is 200 nSv/h. If this value is present, it is noted that once the waste is covered, the cover material provides shielding for external exposure and blocks direct contact pathways with NORMs.

Two additional reports (Tervita, 2014b; 2016b) and one set of raw data were reviewed related to NORM monitoring activities in air (dust/particulates) for the years 2014 through 2016. Limited details were provided with regards to specific sample methodology. Samples were collected on filter discs via an air pump which drew air from three locations at the perimeter of the Facility (southwest, southeast, and north). Alpha counts were measured for background and from the filter discs after sampling and after 5 days using an Environmental Instruments Canada TM372B Sample Counter for a duration of 10 minutes. The 5-day sample was collected to account for the presence of radon gas (which has a half-life of 3.8 days) versus long-lived radioactive content. After 5 days, the decay of short-lived radon daughters would have occurred and can be compared to the initial counts to determine if long-lived radiation is present.

Tervita (2014b, 2016b) provides an interpretation of the data from each sampling event. In general, initial counts from the filter discs were measured greater than the initial background counts. However, after 5 days, the counts on the filter discs were found to be less than or equal to the 5-day background counts and less than the initial filter and background counts, suggesting the presence of radon gas. Tervita (2014b, 2016b) concluded that the data indicate no loose NORM contaminants or evidence of NORM-contaminated dust leaving the property.

3.2 Contaminants of Potential Concern Screening Process

Based on the current and anticipated future conditions of the Facility, the COPC screening process was conducted using the BC CSR standards (BC MOE, 1996), where applicable. As described in Section 18(3) of the CSR, “acceptable” risks to human health for carcinogens are one in one hundred thousand (that is, $1x10^{-5}$) and a hazard index of 1 for noncarcinogens.

The BC CSR establishes standards for six designated land-use categories: Wildlands (WL) (natural and reverted) AL, Urban Park (PL), Residential (RL) (low- and high-density), Commercial (CL), and IL.

The applicable standards depend on the primary land use on-site. The Facility is categorized as IL use and is surrounded by areas of undeveloped forest supporting natural ecosystems. Based on an iMapBC land search, the Facility, including the proposed Project and surrounding area, are located within the ALR. Per the Facility permit, the end land use for the Facility and proposed Project would be AL.

3.2.1 Screening Criteria

3.2.1.1 Surface Water

Water use standards applied at the site are determined based on the four water-use categories designated in the CSR: AW Water Use, IW Use, LW Use, and DW Use. The applicable water standards are provided in Schedule 3.2 (Generic Numerical Water Standards) of the CSR (BC MOE, 1996).

The AW standards were not applied as they are not applicable to human health. As there may be use of water for agricultural purposes in the vicinity of the proposed Project in the future, both the IW and LW standards were applied to the water at the site (both groundwater and storm water). Therefore, the Schedule 3.2 IW, LW, and DW standards were used for the initial screening of groundwater COPCs.

The lowest guideline value (that is, the most stringent standard) was compared with the analytical data, providing the most conservative approach to characterizing the groundwater conditions and selecting COPCs for further assessment. This criterion is referred to as the “Lowest Water Standard” throughout this report.

Table 3-4 provides the results of the preliminary screening of storm water data to identify COPCs in surface water. Section 3.2.2 provides greater detail regarding the screening process for surface water.

3.2.1.2 Groundwater

Groundwater data were screened against the Lowest Water Standard, as described in Section 3.2.1.1.

Table 3-5 provides the results of the preliminary screening to identify COPCs in groundwater. Section 3.2.2 provides greater detail regarding the screening process for groundwater.

3.2.1.3 Soil

The applicable soil standards are provided in Schedule 3.1 – Part 1 (Matrix Numerical Soil Standards) and Schedule 3.2 – Part 2 (Generic Numerical Soil Standards to Protect Human Health) of the CSR (BC MOE, 1996).

As part of Schedule 3.1 – Part 1, there are two site-specific factors applicable to the proposed Project. These factors take into account existing and possible human receptors and primary exposure pathways, as follows:

1. Intake of contaminated soil
2. Groundwater used for drinking water

For these site-specific factors, the lowest guideline value (that is, the most stringent standard) was compared with the analytical data, providing the most conservative approach to characterizing the soil conditions and selecting COPCs for further assessment. This criterion is referred to as the “Lowest AL Soil Standard” or the “Lowest IL Soil Standard” throughout this report.

A subset of the soil standards for groundwater used for drinking water (that is soil standards protective of groundwater used for drinking water) are based on soil pH (hydrogen [ion] concentration) (specifically for cadmium, copper, lead, and zinc). Soil pH from samples taken in the SWDA and PDMA was found to range from 4.75 to 7.18. The appropriate soil standard associated with this pH range was incorporated into the Lowest AL Soil Standard or Lowest IL Soil Standard used for COPC screening of soil.

Table 3-6a provides the results of the preliminary screening to identify COPCs in soil.

Leachate data were screened against the Lowest Water Standard, as described in Section 3.2.1.1. Table 3-6b provides the results of the preliminary screening to identify COPCs in leachate. Section 3.2.2 provides greater detail regarding the screening process for soil and leachate.

Table 3-4. Summary of Chemicals Detected and Maximum Concentrations in Surfacewater - Chemical of Concern Screening

SLHRRA, Tervita Silverberry Landfill, BC

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Ammonia	Non-Volatile	1	6	µg/L		26	50	50	--	--	**Included (no standard available; known to be present)**
Bismuth	Non-Volatile	1	8	µg/L			200	200	--	--	**Included (no standard available; not detected, elevated SDL)**
Manganese	Non-Volatile	1	12	µg/L	200	210	5	210	2	--	**Included (Max > Lowest Water Standard)**
Oil & Grease	Non-Volatile	1	4	µg/L			5000	5000	--	--	**Included (no standard available; not detected, elevated SDL)**
Silicon	Non-Volatile	1	8	µg/L		7490	1	7490	--	--	**Included (no standard available; known to be present)**
Silver	Non-Volatile	1	8	µg/L			0.05	0.05	--	--	**Included (no standard available; not detected, elevated SDL)**
Thallium	Non-Volatile	1	8	µg/L		2	0.05	2	--	--	**Included (no standard available; known to be present)**
Titanium	Non-Volatile	1	8	µg/L		129		129	--	--	**Included (no standard available; known to be present)**
Aluminum	Volatile	1	8	µg/L	5000	2810		2810	--	--	Excluded (Max ≤ Lowest Water Standard)
Antimony	Non-Volatile	1	8	µg/L	6	0.2	5	5	--	--	Excluded (Max ≤ Lowest Water Standard)
Arsenic	Non-Volatile	1	8	µg/L	100	1.2		1.2	--	--	Excluded (Max ≤ Lowest Water Standard)
Barium	Non-Volatile	1	8	µg/L	1000	85		85	--	--	Excluded (Max ≤ Lowest Water Standard)
Benzene	Volatile	1	3	µg/L	5		1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Beryllium	Volatile	1	8	µg/L	100		5	5	--	--	Excluded (Max ≤ Lowest Water Standard)
Boron	Non-Volatile	1	8	µg/L	5000	64	100	100	--	--	Excluded (Max ≤ Lowest Water Standard)
Bromide	Non-Volatile	1	2	mg/L			0.05	0.05	--	--	Excluded (no standard available; not detected, no elevated SDL)
Cadmium	Non-Volatile	1	8	µg/L	5	0.02	0.05	0.05	--	--	Excluded (Max ≤ Lowest Water Standard)
Chloride (Cl)	Non-Volatile	1	6	mg/L	100	11.7		11.7	--	--	Excluded (Max ≤ Lowest Water Standard)
Chromium (III)	Non-Volatile	1	8	µg/L	5	3.86	0.5	3.86	--	--	Excluded (Max ≤ Lowest Water Standard)
Cobalt	Non-Volatile	1	8	µg/L	50	5.3	0.1	5.3	--	--	Excluded (Max ≤ Lowest Water Standard)
Copper	Non-Volatile	1	8	µg/L	200	7		7	--	--	Excluded (Max ≤ Lowest Water Standard)
Cyanide (WAD)	Non-Volatile	1	8	µg/L			5	5	--	--	Excluded (no standard available; not detected, no elevated SDL)
Dichlorophenol	Non-Volatile	1	2	µg/L	0.3		0.1	0.1	--	--	Excluded (Max ≤ Lowest Water Standard)
Ethylbenzene	Volatile	1	3	µg/L	2.4		1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Fluoride	Non-Volatile	1	8	µg/L	1000	164		164	--	--	Excluded (Max ≤ Lowest Water Standard)
Iron	Non-Volatile	1	8	µg/L	5000	1820		1820	--	--	Excluded (Max ≤ Lowest Water Standard)
Lead	Non-Volatile	1	8	µg/L	10	1.2	0.1	1.2	--	--	Excluded (Max ≤ Lowest Water Standard)
Lithium	Non-Volatile	1	8	µg/L	730	50		50	--	--	Excluded (Max ≤ Lowest Water Standard)
Magnesium	Non-Volatile	1	6	mg/L	100	11.8		11.8	--	--	Excluded (Max ≤ Lowest Water Standard)
Mercury	Non-Volatile	1	8	µg/L	1	0.007	0.05	0.05	--	--	Excluded (Max ≤ Lowest Water Standard)
Methyl tert-butyl ether (MTBE)	Volatile	1	49	µg/L	11000	5.1	5000	5000	--	--	Excluded (Max ≤ Lowest Water Standard)
Molybdenum	Non-Volatile	1	8	µg/L	10	1	1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Monochlorophenol	Non-Volatile	1	2	µg/L	0.1		0.1	0.1	--	--	Excluded (Max ≤ Lowest Water Standard)
Nickel	Non-Volatile	1	8	µg/L	200	5		5	--	--	Excluded (Max ≤ Lowest Water Standard)
Nitrate (as N)	Non-Volatile	1	2	mg/L	10	0.0388		0.0388	--	--	Excluded (Max ≤ Lowest Water Standard)
Nitrite (as N)	Non-Volatile	1	2	mg/L	3.2		0.001	0.001	--	--	Excluded (Max ≤ Lowest Water Standard)
Pentachlorophenol	Non-Volatile	1	2	µg/L	30		0.1	0.1	--	--	Excluded (Max ≤ Lowest Water Standard)
Phenol	Non-Volatile	1	2	µg/L	11000	1	2	2	--	--	Excluded (Max ≤ Lowest Water Standard)
Selenium	Non-Volatile	1	8	µg/L	10	0.5	2	2	--	--	Excluded (Max ≤ Lowest Water Standard)
Sodium	Non-Volatile	1	6	mg/L	200	5.6		5.6	--	--	Excluded (Max ≤ Lowest Water Standard)
Strontium	Volatile	1	8	µg/L	22000	148		148	--	--	Excluded (Max ≤ Lowest Water Standard)
Styrene	Volatile	1	3	µg/L			1	1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Sulphate	Non-Volatile	1	14	µg/L	500000	189000		189000	--	--	Excluded (Max ≤ Lowest Water Standard)
Tetrachlorophenol	Non-Volatile	1	2	µg/L	1		0.1	0.1	--	--	Excluded (Max ≤ Lowest Water Standard)
Tin	Non-Volatile	1	8	µg/L	22000		30	30	--	--	Excluded (Max ≤ Lowest Water Standard)
Toluene	Volatile	1	3	µg/L	24000		1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Total PCBs	Non-Volatile	1	2	µg/L			0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Trichlorophenols	Non-Volatile	1	2	µg/L	2		0.1	0.1	--	--	Excluded (Max ≤ Lowest Water Standard)
Uranium	Non-Volatile	1	8	µg/L	10	0.42	0.5	0.5	--	--	Excluded (Max ≤ Lowest Water Standard)
Vanadium	Non-Volatile	1	8	µg/L	100	1.2	30	30	--	--	Excluded (Max ≤ Lowest Water Standard)
Volatile Hydrocarbons (VH)	Volatile	1	3	µg/L	15000		50	50	--	--	Excluded (Max ≤ Lowest Water Standard)
Volatile Petroleum Hydrocarbon (VPH)	Volatile	1	3	µg/L			50	50	--	--	Excluded (no standard available; not detected, no elevated SDL)
Xylenes, Total	Volatile	1	3	µg/L	300		1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Zinc	Non-Volatile	1	8	µg/L	2000	11.1		11.1	--	--	Excluded (Max ≤ Lowest Water Standard)

Table 3-4. Summary of Chemicals Detected and Maximum Concentrations in Surfacewater - Chemical of Concern Screening

SLHRRA, Tervita Silverberry Landfill, BC

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Zirconium	Non-Volatile	1	8	µg/L			1	1	--	--	Excluded (no standard available; not detected, no elevated SDL)

[a.] Indicates whether the parameter is considered volatile or nonvolatile.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

[c.] Column lists the greater of the maximum concentration between Max Detected Concentration and Max Nondetect Concentration.

Notes:

Bold parameters are identified as COCs

COC = chemical of concern

EPH = extractable petroleum hydrocarbon

max = maximum (concentration)

No. = number

SDL = sample detection limit

VH = volatile hydrocarbon

-- = not applicable

Table 3-5. Summary of Chemicals Detected and Maximum Concentrations in Groundwater - Chemical of Concern Screening

SLHRRA, Tervita Silverberry Landfill, BC

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Acenaphthene	Non-Volatile	14	297	µg/L		0.109	0.15	0.15	--	--	**Included (no standard available; known to be present)**
Acenaphthylene	Non-Volatile	11	124	µg/L		--	0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Acridine	Non-Volatile	14	297	µg/L		--	0.2	0.2	--	--	**Included (no standard available; not detected, elevated SDL)**
Aluminum	Non-Volatile	14	268	mg/L	5	0.592	0.05	0.592	--	--	Excluded (Max ≤ Lowest Water Standard)
Anthracene	Non-Volatile	14	296	µg/L		--	0.15	0.15	--	--	**Included (no standard available; not detected, elevated SDL)**
Antimony	Non-Volatile	14	268	mg/L	0.006	0.003	0.002	0.003	--	--	Excluded (Max ≤ Lowest Water Standard)
Arsenic	Non-Volatile	14	268	mg/L	0.01	0.003	0.002	0.003	--	--	Excluded (Max ≤ Lowest Water Standard)
Barium	Non-Volatile	14	268	mg/L	1	0.0564	0.01	0.0564	--	--	Excluded (Max ≤ Lowest Water Standard)
Benzene	Volatile	14	312	µg/L	5	4	1	4	--	--	Excluded (Max ≤ Lowest Water Standard)
Benzo(a)anthracene	Non-Volatile	14	297	µg/L		0.059	0.15	0.15	--	--	**Included (no standard available; known to be present)**
Benzo(a)pyrene	Non-Volatile	14	297	µg/L	0.01	0.068	0.06	0.068	10	11	**Included (Max > Lowest Water Standard)**
Benzo(b)fluoranthene	Non-Volatile	11	124	µg/L		0.02	0.01	0.02	--	--	**Included (no standard available; known to be present)**
Benzo(g,h,i)perylene	Non-Volatile	11	124	µg/L		--	0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Benzo(k)fluoranthene	Non-Volatile	11	124	µg/L		--	0.02	0.02	--	--	Excluded (no standard available; not detected, no elevated SDL)
Beryllium	Non-Volatile	14	268	mg/L	0.008	--	0.005	0.005	--	--	Excluded (Max ≤ Lowest Water Standard)
Bismuth	Non-Volatile	14	268	mg/L		--	0.005	0.005	--	--	Excluded (no standard available; not detected, no elevated SDL)
Boron	Non-Volatile	14	268	mg/L	5	0.97	0.1	0.97	--	--	Excluded (Max ≤ Lowest Water Standard)
Cadmium	Non-Volatile	14	268	mg/L	0.005	0.0135	0.001	0.0135	10	--	**Included (Max > Lowest Water Standard)**
Chloride (Cl)	Non-Volatile	14	204	mg/L	100	166	5	166	2	--	**Included (Max > Lowest Water Standard)**
Chromium	Non-Volatile	14	268	mg/L	0.005	0.011	0.025	0.025	4	9	**Included (Max > Lowest Water Standard)**
Chrysene	Non-Volatile	14	297	µg/L	7	0.144	0.15	0.15	--	--	Excluded (Max ≤ Lowest Water Standard)
Cobalt	Non-Volatile	14	268	mg/L	0.001	0.0435	0.002	0.0435	132	38	**Included (Max > Lowest Water Standard)**
Copper	Non-Volatile	14	268	mg/L	0.2	0.06	0.01	0.06	--	--	Excluded (Max ≤ Lowest Water Standard)
Dibenzo(a,h)anthracene	Non-Volatile	11	124	µg/L	0.01	0.01	0.01	0.01	--	--	Excluded (Max ≤ Lowest Water Standard)
Electrical Conductivity	Non-Volatile	14	550	µS/cm		14840	--	14840	--	--	**Included (no standard available; known to be present)**
Ethylbenzene	Volatile	14	312	µg/L	140	0.7	1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Extractable Petroleum Hydrocarbons (EPH) C10-C19	Volatile	13	188	mg/L	5	1.16	0.25	1.16	--	--	Excluded (Max ≤ Lowest Water Standard)
Extractable Petroleum Hydrocarbons (EPH) C19-C32	Non-Volatile	13	188	mg/L		0.32	0.25	0.32	--	--	**Included (no standard available; known to be present)**
Fluoranthene	Non-Volatile	14	297	µg/L	150	0.129	0.15	0.15	--	--	Excluded (Max ≤ Lowest Water Standard)
Fluorene	Non-Volatile	14	297	µg/L	150	0.232	0.15	0.232	--	--	Excluded (Max ≤ Lowest Water Standard)
Fluoride	Non-Volatile	13	188	mg/L	1	0.593	0.2	0.593	--	--	Excluded (Max ≤ Lowest Water Standard)
Heavy Extractable Petroleum Hydrocarbons (HEPH) C19-C32	Non-Volatile	14	312	µg/L		500	250	500	--	--	**Included (no standard available; known to be present)**
Indeno(1,2,3-Cd)pyrene	Non-Volatile	11	124	µg/L		--	0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Iron	Non-Volatile	14	271	mg/L	5	8.98	0.3	8.98	4	--	**Included (Max > Lowest Water Standard)**
Lead	Non-Volatile	14	268	mg/L	0.01	0.004	0.005	0.005	--	--	Excluded (Max ≤ Lowest Water Standard)
Light Extractable Petroleum Hydrocarbons (LEPH) C10-C19	Volatile	14	312	µg/L		540	250	540	--	--	**Included (no standard available; known to be present)**
Lithium	Non-Volatile	14	268	mg/L	0.008	2.69	0.05	2.69	233	8	**Included (Max > Lowest Water Standard)**
Magnesium	Non-Volatile	14	280	mg/L	100	562	--	562	264	--	**Included (Max > Lowest Water Standard)**
Manganese	Non-Volatile	14	271	mg/L	0.2	5.99	0.05	5.99	183	--	**Included (Max > Lowest Water Standard)**
Mercury	Non-Volatile	14	268	mg/L	0.001	0.0001	0.0002	0.0002	--	--	Excluded (Max ≤ Lowest Water Standard)
Methyl tert-butyl ether (MTBE)	Volatile	14	312	µg/L	95	--	5	5	--	--	Excluded (Max ≤ Lowest Water Standard)
Molybdenum	Non-Volatile	14	268	mg/L	0.01	0.01	0.01	0.01	--	--	Excluded (Max ≤ Lowest Water Standard)
Naphthalene	Volatile	14	297	µg/L	80	0.386	0.15	0.386	--	--	Excluded (Max ≤ Lowest Water Standard)
Nickel	Non-Volatile	14	268	mg/L	0.08	0.128	0.005	0.128	12	--	**Included (Max > Lowest Water Standard)**
Nitrate (as N)	Non-Volatile	14	299	mg/L	10	216	0.5	216	20	--	**Included (Max > Lowest Water Standard)**
Nitrate and Nitrite - N	Non-Volatile	14	280	mg/L	10	135	1	135	8	--	**Included (Max > Lowest Water Standard)**
Nitrite (as N)	Non-Volatile	14	261	mg/L	3.2	1.35	1	1.35	--	--	Excluded (Max ≤ Lowest Water Standard)
Phenanthrene	Non-Volatile	14	297	µg/L		0.8	0.15	0.8	--	--	**Included (no standard available; known to be present)**
Phenol	Non-Volatile	14	312	µg/L	1000	6.5	1	6.5	--	--	Excluded (Max ≤ Lowest Water Standard)
Potassium	Non-Volatile	14	280	mg/L		19	4	19	--	--	**Included (no standard available; known to be present)**
Pyrene	Non-Volatile	14	297	µg/L	100	0.243	3.4	3.4	--	--	Excluded (Max ≤ Lowest Water Standard)
Quinoline	Non-Volatile	14	298	µg/L	0.05	--	3.4	3.4	--	77	**Included (Max > Lowest Water Standard)**
Selenium	Non-Volatile	14	268	mg/L	0.01	0.0388	0.01	0.0388	9	--	**Included (Max > Lowest Water Standard)**
Silicon	Non-Volatile	14	268	mg/L		7.45	--	7.45	--	--	**Included (no standard available; known to be present)**
Silver	Non-Volatile	14	268	mg/L	0.02	0.00137	0.005	0.005	--	--	Excluded (Max ≤ Lowest Water Standard)
Sodium	Non-Volatile	14	280	mg/L	200	836	--	836	133	--	**Included (Max > Lowest Water Standard)**
Strontium	Non-Volatile	14	268	mg/L	2.5	6.97	0.05	6.97	147	--	**Included (Max > Lowest Water Standard)**
Styrene	Volatile	14	312	µg/L	800	--	500	500	--	--	Excluded (Max ≤ Lowest Water Standard)
Sulphate	Non-Volatile	14	204	mg/L	500	3530		3530	199	--	**Included (Max > Lowest Water Standard)**
Thallium	Non-Volatile	14	268	mg/L		0.0006	0.05	0.05	--	--	**Included (no standard available; known to be present)**
Tin	Non-Volatile	14	268	mg/L	2.5	--	0.05	0.05	--	--	Excluded (Max ≤ Lowest Water Standard)
Titanium	Non-Volatile	14	268	mg/L		0.14	0.003	0.14	--	--	**Included (no standard available; known to be present)**
Toluene	Volatile	14	312	µg/L	60	2	1	2	--	--	Excluded (Max ≤ Lowest Water Standard)
Uranium	Non-Volatile	14	268	mg/L	0.01	0.092	0.005	0.092	167	--	**Included (Max > Lowest Water Standard)**
Vanadium	Non-Volatile	14	268	mg/L	0.02	0.0081	0.01	0.01	--	--	Excluded (Max ≤ Lowest Water Standard)
Volatile Hydrocarbons (VH)	Volatile	14	312	µg/L	15000	22	100	100	--	--	Excluded (Max ≤ Lowest Water Standard)

Table 3-5. Summary of Chemicals Detected and Maximum Concentrations in Groundwater - Chemical of Concern Screening

SLHRRA, Tervita Silverberry Landfill, BC

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Volatile Petroleum Hydrocarbon (VPH)	Volatile	14	312	µg/L		42	100	100	--	--	**Included (no standard available; known to be present)**
Xylenes, Total	Volatile	14	312	µg/L	90	2.83	100	100	--	6	**Included (Max > Lowest Water Standard)**
Zinc	Non-Volatile	14	268	mg/L	1	0.57	0.05	0.57	--	--	Excluded (Max ≤ Lowest Water Standard)

[a.] Indicates whether the parameter is considered volatile or nonvolatile.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

[c.] Column lists the greater of the maximum concentration between Max Detected Concentration and Max Nondetect Concentration.

Note:

Bold parameters are identified as COCs

Table 3-6a. Summary of Chemicals Detected and Maximum Concentrations in Soil - COC Screening

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

Parameter	Volatility Designation [a.]	No. of Locations	No. of Samples	Units	Lowest Agricultural Soil Standard [b.]	Max Detected Concentration	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Agricultural Soil Standard	Count of Nondetects Exceeding Agricultural Soil Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Arsenic	Non-Volatile	16	18	mg/kg	10	14	--	14	16	--	**Included (Max > Lowest Agricultural Soil Standards)**
Barium	Non-Volatile	16	18	mg/kg	500	830	--	830	2	--	**Included (Max > Lowest Agricultural Soil Standards)**
Benzo(g,h,i)perylene	Non-Volatile	16	18	mg/kg		0.036	0.01	0.036	--	--	**Included (no standard available; known to be present)**
Beryllium	Non-Volatile	16	18	mg/kg	1	1.32	--	1.32	7	--	**Included (Max > Lowest Agricultural Soil Standards)**
Total Phenols	Non-Volatile	16	18	mg/kg		0.11	0.1	0.11	--	--	**Included (no standard available; known to be present)**
1,1,1,2-Tetrachloroethane	Volatile	16	18	mg/kg	250	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1,1-Trichloroethane	Volatile	16	18	mg/kg	85000	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1,2,2-Tetrachloroethane	Volatile	16	18	mg/kg	35	--	0.05	0.05	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1,2-Trichloroethane	Volatile	16	18	mg/kg	150	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1-Dichloroethane	Volatile	16	18	mg/kg	8500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1-Dichloroethene	Volatile	16	18	mg/kg	2000	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,1-Dichloropropene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
1,2,3-Trichlorobenzene	Volatile	16	18	mg/kg	60	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2,3-Trichloropropane	Volatile	16	18	mg/kg	0.05	--	0.02	0.02	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2,4-Trichlorobenzene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
1,2,4-Trimethylbenzene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
1,2-Dibromo-3-chloropropane	Volatile	16	18	mg/kg	2	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2-Dibromoethane	Volatile	16	18	mg/kg	3.5	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2-Dichlorobenzene	Volatile	16	18	mg/kg	3500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2-Dichloroethane	Volatile	16	18	mg/kg	75	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,2-Dichloropropane	Volatile	16	18	mg/kg	600	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,3,5-Trimethylbenzene	Volatile	16	18	mg/kg	150	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,3-Dichlorobenzene	Volatile	16	19	mg/kg	1000	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,3-Dichloropropane	Volatile	15	17	mg/kg	300	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
1,4-Dichlorobenzene	Volatile	16	18	mg/kg	4500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
2,2-Dichloropropane	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
2-Chlorotoluene	Volatile	16	18	mg/kg	300	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
2-Methylnaphthalene	Volatile	16	18	mg/kg	60	0.051	0.01	0.051	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
4-Chlorotoluene	Volatile	16	18	mg/kg	300	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
4-Methyl-2-Pentanone	Volatile	16	18	mg/kg	--	--	0.1	0.1	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Acenaphthene	Non-Volatile	16	18	mg/kg	950	--	0.005	0.005	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Acenaphthylene	Non-Volatile	16	18	mg/kg		--	0.005	0.005	--	--	Excluded (no standard available; not detected, no elevated SDL)
Acetone	Volatile	16	18	mg/kg	15000	1.9	1	1.9	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Anthracene	Non-Volatile	16	18	mg/kg	10000	--	0.004	0.004	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Antimony	Non-Volatile	16	18	mg/kg	250	0.8	--	0.8	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Benzene	Volatile	16	18	mg/kg	0.035	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Benzo(a)anthracene	Non-Volatile	16	18	mg/kg	50	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Benzo(a)pyrene	Non-Volatile	16	18	mg/kg	5	0.012	0.01	0.012	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Benzo(b&j)fluoranthene	Non-Volatile	16	18	mg/kg	50	0.046	0.01	0.046	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Benzo(k)fluoranthene	Non-Volatile	16	18	mg/kg	50	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Boron	Non-Volatile	16	18	mg/kg	8500	14.3	5	14.3	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Bromobenzene	Volatile	16	18	mg/kg	150	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Bromochloromethane	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Bromodichloromethane	Volatile	16	18	mg/kg	100	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Bromoform	Volatile	16	18	mg/kg	300	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Bromomethane	Volatile	16	18	mg/kg	20	--	0.1	0.1	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Cadmium	Non-Volatile	16	18	mg/kg	1	0.707	--	0.707	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Carbon tetrachloride	Volatile	16	18	mg/kg	150	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Chlorobenzene	Volatile	16	18	mg/kg	850	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Chloroethane	Volatile	16	18	mg/kg		--	0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Chloroform	Volatile	16	18	mg/kg	400	0.011	0.01	0.011	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Chloromethane	Volatile	16	18	mg/kg		--	0.1	0.1	--	--	Excluded (no standard available; not detected, no elevated SDL)
Chromium	Non-Volatile	16	18	mg/kg	60	43.2	--	43.2	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Chrysene	Non-Volatile	16	18	mg/kg	200	0.039	0.01	0.039	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
cis-1,2-Dichloroethene	Volatile	15	17	mg/kg	85	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
cis-1,3-Dichloropropene	Volatile	16	19	mg/kg	1000	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Cobalt	Non-Volatile	16	18	mg/kg	25	12.6	--	12.6	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Copper	Non-Volatile	16	18	mg/kg	250	32.3	--	32.3	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)

Table 3-6a. Summary of Chemicals Detected and Maximum Concentrations in Soil - COC Screening

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

Parameter	Volatility Designation [a.]	No. of Locations	No. of Samples	Units	Lowest Agricultural Soil Standard [b.]	Max Detected Concentration	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Agricultural Soil Standard	Count of Nondetects Exceeding Agricultural Soil Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Dibenzo(a,h)anthracene	Non-Volatile	16	18	mg/kg	5	0.0077	0.005	0.0077	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Dibromochloromethane	Volatile	16	18	mg/kg	85	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Dibromomethane	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Ethylbenzene	Volatile	16	18	mg/kg	15	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Fluoranthene	Non-Volatile	16	18	mg/kg	1500	0.011	0.01	0.011	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Fluorene	Non-Volatile	16	18	mg/kg	600	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Heavy Extractable Petroleum Hydrocarbons (HEPH) C19-C32	Non-Volatile	16	18	mg/kg	1000	450	200	450	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Hexachlorobutadiene	Volatile	16	18	mg/kg	15	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Indeno(1,2,3-Cd)pyrene	Non-Volatile	16	18	mg/kg	50	0.012	0.01	0.012	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Isopropylbenzene	Volatile	16	18	mg/kg	1500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Lead	Non-Volatile	16	18	mg/kg	120	17.4	--	17.4	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Light Extractable Petroleum Hydrocarbons (LEPH) C10-C19	Volatile	16	18	mg/kg	1000	--	200	200	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Mercury	Non-Volatile	16	18	mg/kg	10	0.0696	--	0.0696	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Methyl ethyl ketone	Volatile	16	18	mg/kg	9500	--	1	1	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Methyl tert-butyl ether (MTBE)	Volatile	16	18	mg/kg	4000	--	0.02	0.02	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Methylene chloride	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Molybdenum	Non-Volatile	16	18	mg/kg	15	2.21	--	2.21	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Naphthalene	Volatile	16	18	mg/kg	100	0.015	0.01	0.015	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
n-Butylbenzene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Nickel	Non-Volatile	16	18	mg/kg	70	40.5	--	40.5	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Phenanthrene	Non-Volatile	16	18	mg/kg	1500	0.029	0.01	0.029	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
p-Isopropyltoluene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Pyrene	Non-Volatile	16	18	mg/kg	1000	0.02	0.01	0.02	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
sec-Butylbenzene	Volatile	16	18	mg/kg		--	0.01	0.01	--	--	Excluded (no standard available; not detected, no elevated SDL)
Selenium	Non-Volatile	16	18	mg/kg	4	1.64	--	1.64	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Silver	Non-Volatile	16	18	mg/kg	200	0.35	--	0.35	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Styrene	Volatile	16	18	mg/kg	8500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
tert-Butylbenzene	Volatile	16	18	mg/kg	1500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Tetrachloroethene	Volatile	16	18	mg/kg	250	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Tin	Non-Volatile	12	13	mg/kg	25000	--	2	2	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Toluene	Volatile	16	18	mg/kg	6	0.012	0.01	0.012	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Total PCBs	Non-Volatile	16	19	mg/kg	5	--	0.05	0.05	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
trans-1,2-Dichloroethene	Volatile	16	18	mg/kg	850	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
trans-1,3-Dichloropropene	Volatile	16	18	mg/kg	1000	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Trichloroethylene	Volatile	16	18	mg/kg	20	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Trichlorofluoromethane	Volatile	16	18	mg/kg	4500	--	0.01	0.01	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Uranium	Non-Volatile	12	13	mg/kg	30	1.85	--	1.85	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Vanadium	Non-Volatile	16	18	mg/kg	100	89.6	--	89.6	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Volatile Petroleum Hydrocarbon (VPH)	Volatile	16	18	mg/kg	200	--	10	10	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)
Xylenes, Total	Volatile	16	18	mg/kg	6.5	--	0.071	0.071	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)

Table 3-6a. Summary of Chemicals Detected and Maximum Concentrations in Soil - COC Screening

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

Parameter	Volatility Designation [a.]	No. of Locations	No. of Samples	Units	Lowest Agricultural Soil Standard [b.]	Max Detected Concentration	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Agricultural Soil Standard	Count of Nondetects Exceeding Agricultural Soil Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Zinc	Non-Volatile	16	18	mg/kg	200	111	--	111	--	--	Excluded (Max ≤ Lowest Agricultural Soil Standards)

[a.] Indicates whether the parameter is considered volatile or nonvolatile.

[b.] Lowest of the BC Reg. 375/96 Agricultural Standards (Schedule 3.1 - Part 1 and Schedule 3.1 - Part 2) and BC MOE Protocol 4 For Contaminated Sites Background Standards.

[c.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

Notes:

Bold parameters are identified as COCs.

< = less than

> = greater than

Table 3-6b. Summary of Chemicals Detected and Maximum Concentrations in Leachate - COC Screening

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Acenaphthene	Non-Volatile	2	44	µg/L		2050	10000	10000	--	--	**Included (no standard available; known to be present)**
Acenaphthylene	Non-Volatile	2	15	µg/L			10000	10000	--	--	**Included (no standard available; not detected, elevated SDL)**
Acridine	Non-Volatile	2	44	µg/L		855	10000	10000	--	--	**Included (no standard available; known to be present)**
Anthracene	Non-Volatile	2	45	µg/L		771	10000	10000	--	--	**Included (no standard available; known to be present)**
Antimony	Non-Volatile	2	47	mg/L	0.006	0.0025	0.016	0.016	--	5	**Included (Max > Lowest Water Standard)**
Arsenic	Non-Volatile	2	47	mg/L	0.01	0.027	0.01	0.027	11	--	**Included (Max > Lowest Water Standard)**
Barium	Non-Volatile	2	47	mg/L	1	5.56		5.56	12	--	**Included (Max > Lowest Water Standard)**
Benzene	Volatile	2	51	µg/L	5	32.1	4000	4000	12	5	**Included (Max > Lowest Water Standard)**
Benzo(a)anthracene	Non-Volatile	2	44	µg/L		52	10000	10000	--	--	**Included (no standard available; known to be present)**
Benzo(a)pyrene	Non-Volatile	2	44	µg/L	0.01	44.6	10000	10000	9	16	**Included (Max > Lowest Water Standard)**
Benzo(b)fluoranthene	Non-Volatile	2	15	µg/L		10	10000	10000	--	--	**Included (no standard available; known to be present)**
Benzo(g,h,i)perylene	Non-Volatile	2	15	µg/L			10000	10000	--	--	**Included (no standard available; not detected, elevated SDL)**
Benzo(k)fluoranthene	Non-Volatile	2	15	µg/L			10000	10000	--	--	**Included (no standard available; not detected, elevated SDL)**
Beryllium	Non-Volatile	2	47	mg/L	0.008		0.05	0.05	--	6	**Included (Max > Lowest Water Standard)**
Bismuth	Non-Volatile	2	47	mg/L			0.05	0.05	--	--	**Included (no standard available; not detected, elevated SDL)**
Chloride (Cl)	Non-Volatile	2	29	mg/L	100	18300	2.5	18300	16	--	**Included (Max > Lowest Water Standard)**
Chromium	Non-Volatile	2	47	mg/L	0.005	0.011	0.1	0.1	3	6	**Included (Max > Lowest Water Standard)**
Chrysene	Non-Volatile	2	44	µg/L	7	209	10000	10000	4	6	**Included (Max > Lowest Water Standard)**
Cobalt	Non-Volatile	2	47	mg/L	0.001	0.055	0.04	0.055	33	4	**Included (Max > Lowest Water Standard)**
Dibenzo(a,h)anthracene	Non-Volatile	2	15	µg/L	0.01		10000	10000	--	5	**Included (Max > Lowest Water Standard)**
Electrical Conductivity	Non-Volatile	2	61	µS/cm		48000		48000	--	--	**Included (no standard available; known to be present)**
Ethylbenzene	Volatile	2	51	µg/L	140	121	4000	4000	--	4	**Included (Max > Lowest Water Standard)**
Extractable Petroleum Hydrocarbons (EP	Volatile	2	29	mg/L	5	16200	0.25	16200	14	--	**Included (Max > Lowest Water Standard)**
Extractable Petroleum Hydrocarbons (EP	Non-Volatile	2	29	mg/L		3860	0.25	3860	--	--	**Included (no standard available; known to be present)**
Fluoranthene	Non-Volatile	2	44	µg/L	150	416	10000	10000	1	2	**Included (Max > Lowest Water Standard)**
Fluorene	Non-Volatile	2	44	µg/L	150	103000	0.1	103000	9	--	**Included (Max > Lowest Water Standard)**
Fluoride	Non-Volatile	2	29	mg/L	1	1.66	40	40	2	1	**Included (Max > Lowest Water Standard)**
Heavy Extractable Petroleum Hydrocarb	Non-Volatile	2	44	µg/L		236000000	250	236000000	--	--	**Included (no standard available; known to be present)**
Indeno(1,2,3-Cd)pyrene	Non-Volatile	2	15	µg/L			10000	10000	--	--	**Included (no standard available; not detected, elevated SDL)**
Iron	Non-Volatile	2	47	mg/L	5	148	0.15	148	8	--	**Included (Max > Lowest Water Standard)**
Lead	Non-Volatile	2	47	mg/L	0.01	0.0015	0.1	0.1	--	2	**Included (Max > Lowest Water Standard)**
Light Extractable Petroleum Hydrocarbo	Volatile	2	44	µg/L		721000000	250	721000000	--	--	**Included (no standard available; known to be present)**
Lithium	Non-Volatile	2	47	mg/L	0.008	1.96	0.5	1.96	31	3	**Included (Max > Lowest Water Standard)**
Magnesium	Non-Volatile	2	47	mg/L	100	409		409	43	--	**Included (Max > Lowest Water Standard)**
Manganese	Non-Volatile	2	47	mg/L	0.2	10.3		10.3	44	--	**Included (Max > Lowest Water Standard)**
Methyl tert-butyl ether (MTBE)	Volatile	2	44	µg/L	95		4000	4000	--	4	**Included (Max > Lowest Water Standard)**
Molybdenum	Non-Volatile	2	47	mg/L	0.01	0.233	0.1	0.233	6	2	**Included (Max > Lowest Water Standard)**
Naphthalene	Volatile	2	44	µg/L	80	114000	2.6	114000	11	--	**Included (Max > Lowest Water Standard)**
Nickel	Non-Volatile	2	47	mg/L	0.08	0.236		0.236	9	--	**Included (Max > Lowest Water Standard)**
Nitrate (as N)	Non-Volatile	2	47	mg/L	10	214	40	214	4	1	**Included (Max > Lowest Water Standard)**
Nitrate and Nitrite - N	Non-Volatile	2	47	mg/L	10	32.9	45	45	3	1	**Included (Max > Lowest Water Standard)**
Nitrite (as N)	Non-Volatile	2	47	mg/L	3.2	80.8	20	80.8	5	1	**Included (Max > Lowest Water Standard)**
Phenanthrene	Non-Volatile	2	44	µg/L		149000	550	149000	--	--	**Included (no standard available; known to be present)**
Phenol	Non-Volatile	2	44	µg/L	1000	883000	1	883000	12	--	**Included (Max > Lowest Water Standard)**
Potassium	Non-Volatile	2	47	mg/L		1080	4	1080	--	--	**Included (no standard available; known to be present)**
Pyrene	Non-Volatile	2	44	µg/L	100	23300	100	23300	4	--	**Included (Max > Lowest Water Standard)**
Quinoline	Non-Volatile	2	43	µg/L	0.05	935	10000	10000	3	20	**Included (Max > Lowest Water Standard)**
Selenium	Non-Volatile	2	47	mg/L	0.01	0.0295	0.1	0.1	2	4	**Included (Max > Lowest Water Standard)**
Silicon	Non-Volatile	2	47	mg/L		11.3		11.3	--	--	**Included (no standard available; known to be present)**
Sodium	Non-Volatile	2	47	mg/L	200	6370	5	6370	22	--	**Included (Max > Lowest Water Standard)**
Strontium	Non-Volatile	2	47	mg/L	2.5	26.9		26.9	10	--	**Included (Max > Lowest Water Standard)**
Styrene	Volatile	2	44	µg/L	800	1	5000	5000	--	5	**Included (Max > Lowest Water Standard)**
Sulphate	Non-Volatile	2	29	mg/L	500	2130	600	2130	19	1	**Included (Max > Lowest Water Standard)**
Thallium	Non-Volatile	2	47	mg/L			1	1	--	--	**Included (no standard available; not detected, elevated SDL)**
Titanium	Non-Volatile	2	47	mg/L		0.062	0.1	0.1	--	--	**Included (no standard available; known to be present)**
Toluene	Volatile	2	51	µg/L	60	4390	4000	4390	2	3	**Included (Max > Lowest Water Standard)**
Uranium	Non-Volatile	2	47	mg/L	0.01	0.0399	0.0005	0.0399	24	--	**Included (Max > Lowest Water Standard)**
Vanadium	Non-Volatile	2	47	mg/L	0.02	0.067	0.1	0.1	7	2	**Included (Max > Lowest Water Standard)**
Volatile Hydrocarbons (VH)	#N/A	2	44	µg/L	15000	992000	100	992000	4	--	**Included (Max > Lowest Water Standard)**
Volatile Petroleum Hydrocarbon (VPH)	Volatile	2	44	µg/L		1400000	100	1400000	--	--	**Included (no standard available; known to be present)**
Xylenes, Total	Volatile	2	51	µg/L	90	27700	1	27700	5	--	**Included (Max > Lowest Water Standard)**
Zinc	Non-Volatile	2	47	mg/L	1	1.24	0.5	1.24	1	--	**Included (Max > Lowest Water Standard)**
Aluminum	Non-Volatile	2	47	mg/L	5	0.7	0.5	0.7	--	--	Excluded (Max ≤ Lowest Water Standard)
Boron	Non-Volatile	2	47	mg/L	5	1	1	1	--	--	Excluded (Max ≤ Lowest Water Standard)
Cadmium	Non-Volatile	2	47	mg/L	0.005	0.00161	0.005	0.005	--	--	Excluded (Max ≤ Lowest Water Standard)
Copper	Non-Volatile	2	47	mg/L	0.2	0.05	0.025	0.05	--	--	Excluded (Max ≤ Lowest Water Standard)
Mercury	Non-Volatile	2	47	mg/L	0.001		0.0005	0.0005	--	--	Excluded (Max ≤ Lowest Water Standard)
Silver	Non-Volatile	2	47	mg/L	0.02		0.002	0.002	--	--	Excluded (Max ≤ Lowest Water Standard)

Table 3-6b. Summary of Chemicals Detected and Maximum Concentrations in Leachate - COC Screening

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

Parameter	Volatility Designation [a.]	No. of Stations	No. of Samples	Units	Lowest Water Standard [b.]	Max Concentration Detected	Max Nondetect Concentration	Max Concentration [c.]	Count of Detects Exceeding Lowest Water Standard	Count of Nondetects Exceeding Lowest Water Standard (using Max SDL)	Included/Excluded as COC (Rationale)
Tin	Non-Volatile	2	47	mg/L	2.5		1	1	--	--	Excluded (Max ≤ Lowest Water Standard)

[a.] Indicates whether the parameter is considered volatile or nonvolatile.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

[c.] Column lists the greater of the maximum concentration between Max Detected Concentration and Max Nondetect Concentration.

Notes:

Bold parameters are identified as COCs

F = fraction

3.2.1.4 Country Foods

No data were available for plant or animal tissue. Health Canada (2010c) lists several questions to consider when determining whether the country foods pathway is feasible and should be evaluated. These questions, along with responses outlining the applicability to the Facility and proposed Project are provided as follows:

1. **Does a contaminated site represent a significant source of chemical contamination to potentially harvestable plant or animal species?**
   - A landfill, by nature, represents a source of chemical contamination but the landfill is meant to contain the contamination and prevent it from being released to the surrounding environment.
2. **Is there a transport mechanism for contaminants from the contaminated soil, groundwater, surface water and/or sediment at the site to reach potential harvestable species onsite or offsite?**
   - Dust from the expanded landfill may be transported (during a very short window, when landfilling takes place and before waste is covered) via wind to downwind land areas and deposited onto the soil surface or on the leaves of harvestable vegetation. The COPCs identified for soil are applicable to this pathway.
   - Leachate may reach groundwater via a spill or leak in the existing liner and containment system, which will also be implemented as part of the proposed Project. Impacted groundwater may reach harvestable species via migration of groundwater with subsequent uptake from vegetation from a shallow water table or discharge to a downgradient water body. The COPCs identified in groundwater are applicable to this pathway.
   - Surface water (that is, overland flow) is collected in onsite berms and either reused onsite for dust control or sampled prior to being discharged to the ground beyond the Facility. Harvestable vegetation may contact surface water discharged to the ground. The COPCs identified in surface water are applicable to this pathway.
3. **Can the chemicals of potential concern bioaccumulate or bioconcentrate in the edible tissue of harvestable species?**
   - MacDonald and Ingersoll (2003) identifies the following chemicals as bioaccumulative:
     - Metals
     - Methyl mercury
     - PAHs
     - PCBs
     - Organochlorine pesticides
     - Chlorophenols
     - Dioxins and furans
   - As shown in Tables 3-4, 3-5, and 3-6a, metals have been identified as COPCs in surface water, soil, and groundwater and PAHs have been identified as COPCs in groundwater. Therefore, COPCs with the potential to bioaccumulate in the tissue of harvestable species are associated with the Facility and the proposed Project.
   - NORMs are not considered a COPC for the country foods pathway via dust based on the dust monitoring reports (Tervita, 2014b, 2016b) which concluded that there is no loose NORM contaminants or evidence of NORM-contaminated dust leaving the property.

4. Are local plants and animals being harvested, and if so, what tissues are being consumed?

- Local plants and animals are reported to be harvested from the land in proximity to the Facility and the proposed Project by members of the Blueberry River First Nation. Specifics regarding the tissues being consumed are currently unknown. No data were available for plant or animal tissue. It is assumed that plant, fish, and mammal tissues are being consumed.

5. What are the consumption patterns and characteristics of the consumers (people), with respect to those harvested plants or animals?

- Specifics regarding consumption patterns and receptor characteristics with respect to consumption are currently unknown. However, it is very unlikely that country foods collected in the vicinity of the proposed Project are the primary food sources for the consumers of country foods.

Based on these considerations, a qualitative assessment of the country foods pathway will be undertaken using currently available information.

3.2.1.5 Air

Ambient air quality in BC is managed through provincial acts and regulations, with input from federal, regional, and municipal governments. The BC *EMA* is the main provincial legislation for air quality and other environmental issues, and the Waste Discharge Regulation under the Act regulates the release and disposal of wastes to land, water, and air in BC.

Ambient Air Quality Objectives (AAQOs) are pollutant concentration thresholds that are set to protect human and environmental health across Canada. These limits provide regulatory benchmarks against which pollutant concentrations of CACs can be measured and assessed. Air quality criteria used to inform decisions on the management of CACs in BC are from a variety of provincial and federal objectives, depending on the contaminant. For example, BC has developed its own AAQOs for PM, carbon monoxide (CO) and SO_2. For other CACs, BC uses the National Ambient Air Quality Objectives or the Canadian Ambient Air Quality Standards (BC MOE, 2016b).

Table 3-7 presents a summary of BC AAQOs.

Table 3-7. Summary of British Columbia Ambient Air Quality Objectives

Contaminant	Averaging Period	Air Quality Objective	
		µg/m³	ppb
NO_2	1-hour	188	100
	Annual	60	32
O_3	1-hour	160	82
	8-hour	123	63
$PM_{2.5}$	24-hour	25	--
	Annual	8	--
PM_{10}	24-hour	50	--
SO_2	1-hour	183	70
	Annual	13	5
TSP	24-hour	120	--
	Annual	60	--

Table 3-7. Summary of British Columbia Ambient Air Quality Objectives

Contaminant	Averaging Period	Air Quality Objective	
		µg/m³	ppb

Note:

TSP = total suspended particulate

The ambient air quality in the proposed Project area in northeast BC, as measured at the Key Learning Center Monitoring Station (refer to Section 3.1.5.1), is well below provincial criteria for all contaminants measured. This monitoring station is in central Fort St John and is likely a conservative estimate of actual air quality concentrations at the proposed Project site, which is more remote with fewer nearby emission sources.

Greenhouse gases are expected to be released as a result of proposed Project activities. These emissions are expected to be primarily from combustion sources such as construction equipment tailpipe emissions and generator use. As described in Section 3.1.5.2, all construction equipment will adhere to low-emission Tier 4 engine specifications.

Due to the nature of the waste accepted at the Facility, generation of methane is not expected to be significant although some biodegradation of hydrocarbon materials will contribute to CO_2 emissions.

Based on the VOC sampling results (CH2M, 2016b) described in Section 3.1.5, VOCs in ambient air are less than or equal to relevant provincial ambient air quality criteria (Alberta and Ontario). Therefore, no COPCs related to landfill gases have been identified from this potential source.

Based on this screening evaluation for combustion sources and waste materials, greenhouse gas emissions from the proposed Project will not be significant.

3.2.1.6 Noise

Noise levels during the operations stage are estimated to be the same as baseline (existing) conditions since the proposed Project will use similar equipment in the same quantities as what is currently being used at the Facility. The existing cells at the Facility will no longer be used once the proposed Project is in operation and minimal noise is expected from periodic maintenance vehicles and equipment. Therefore, it is not expected that there will be a noticeable increase in noise at off-property receptors associated with the use of equipment and vehicles during the operations phase of the proposed Project.

To screen the potential for adverse noise impacts during the construction stage, noise levels have been estimated from the equipment list (Section 3.1.6.1) and compared to Permissible Sound Levels (PSLs). The BC Oil and Gas Commission (BC OGC) *British Columbia Noise Control Best Practices Guideline* (BC OGC, 2009) were designed to control noise levels for activities under BC OGC jurisdiction and have also been applied to assess noise levels that may disturb local residents. The guidelines compare predicted noise levels to PSLs for day and night.

If it is conservatively assumed that dozers, excavators, and compactors will be on-site, with any two of these pieces of equipment working in the same area simultaneously (the remaining vehicles/equipment will likely be travelling to and from other areas at the construction site), and the predicted total sound level at 50 feet will be 90 dBA. This noise level will attenuate to less than 55 dBA (BC noise guidelines for daytime operations with less than 60 days or operations [Class B] adjustment) at a distance of less than 1 km. This estimate conservatively assumes only distance attenuation and no other attenuation due to foliage, terrain, and so forth. Therefore, based on the noise screening, these temporary construction noise levels will not significantly affect off-site sensitive receptors in the area.

3.2.1.7 Naturally Occurring Radioactive Materials

The *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials* (Health Canada, 2011) were developed by the Federal Provincial Territorial Radiation Protection Committee to regulate and ensure appropriate control of NORMs throughout the country.

Part 7, Division 3 of the *Workers Compensation Act*, *Occupational Health and Safety Regulation* (B.C. Reg. 296/97, as amended by B.C. Reg. 142/2017) is administered by WorkSafe BC, and contains the legal requirements that must be met in all workplaces for ionizing radiation (WorkSafe BC, 2017).

The *Canadian Guidelines for the Management of NORMs* and the *Occupational Health and Safety Regulation* provide the regulatory framework for exposure to NORMs in BC workplaces and incidentally exposed members of the public. The *Occupational Health and Safety Regulation* provides the effective dose to a worker's entire body for 1 year, based on the *Canadian Guidelines for the Management of NORMs.* In addition, the *Occupational Health and Safety Regulation* has guidelines for the annual equivalent doses to specific body parts including the eyes, skin, hands, and feet. The *Canadian Guidelines for the Management of NORMs* also outlines annual exposure limits for incidentally exposed members of the public. The guidelines are used to set annual exposure limits for radiation health risks to people from work and general exposure.

Table 3-8 presents the Annual Effective Dose Limits for those who may be exposed to NORMs as part of their occupational duties (workers) and the public. A Dose Constraint value of 0.3 millisieverts per annum (mSv/a) is also provided for the public which allows "exposure from other sources without the annual limit being exceeded" (Health Canada, 2011). These values are protective of exposures that are incrementally greater than the typical Canadian background exposure, which is cited to range from 1.2 mSv/a to 3.2 mSv/a, with an average of 2.0 mSv/a (Health Canada, 2011).

Table 3-8. Summary of Health Canada Radiation Dose Limits

Receptor Type	Effective Dose Limit (mSv/a)	Dose Constraint (mSv/a)
Worker	20	--
Public	1	0.3

The Canadian Nuclear Safety Commission (CNSC) provides background radiation dose data for specific geographies across the country (CNSC, 2017). Table 3-9 presents the Canadian average and value for the closest major city to the Facility (that is, Edmonton, Alberta).

Table 3-9. Selected Background Radiation Dose Data

Geography	Dose (mSv/a)
Canada - Average	1.8
Edmonton, Alberta	2.4

To screen the Facility NORM data described in Section 3.1.7 against regulatory limits, the data needed to be converted to annual doses representing the receptor groups for which regulatory limits have been derived:

- Worker – exposure dose based on 40 hours per week for 50 weeks per year (equivalent to 2,000 hours per annum [h/a])
- Public – exposure dose based on 24 hours per day for 52 weeks per year (equivalent to 8,760 h/a)

As the public would not be expected to be exposed to NORM radiation from inside the Facility's fenceline, only survey data from locations denoted as "corners" or "fenceline" were considered relevant to the public. Workers could be exposed to NORM radiation at any location; therefore, the entire dataset was considered for workers.

Table 3-10 provides the summary statistics relevant to each receptor group, the calculated estimated annual dose, and a comparison of the estimates to the regulatory Effective Dose Limit and Dose Constraint for each receptor group.

Table 3-10. Estimated Annual Radiation Doses from the Existing Facility for Workers and the Public

Statistic	Radiation Level (mSv/h)	Relevant Receptor	Estimated Exposure (h/a)	Estimated Annual Dose (mSv/a)
Entire Site - Maximum	5.0E-04	Worker	2000	1.0E+00
Entire Site - Minimum	2.0E-05	Worker	2000	4.0E-02
Entire Site - Median	9.5E-05	Worker	2000	1.9E-01
Fenceline - Maximum	1.5E-04	Public	8760	**1.3E+00**
Fenceline - Minimum	2.0E-05	Public	8760	1.8E-01
Fenceline - Median	9.0E-05	Public	8760	7.9E-01

Notes:

mSv/h = millisievert(s) per hour

Bold = value greater than Effective Dose Limit

Underline = value greater than Dose Constraint

Estimated Annual Dose (mSv/a) = Radiation Level (mSv/h) x Estimated Exposure (h/a)

The estimated annual dose for workers is below the Health Canada limits for that receptor group. The annual dose from NORM waste at the Facility for workers, based on the maximum radiation level, is similar to the background dose for Canada (average) and the City of Edmonton.

For the public, the maximum radiation level at the Facility fenceline is estimated to result in an annual dose greater than the Effective Dose Limit; the maximum, minimum, and median radiation levels at the Facility fenceline are also estimated to result in an annual dose greater than the Dose Constraint. The annual dose from NORM waste at the Facility for the public, based on the maximum radiation level at the Facility fenceline, is similar to the background dose for Canada (average) and the City of Edmonton.

As radiation dose is based on lifetime exposure, the median radiation levels measured at the Facility are considered the most "typical" exposure level. At the median level, the estimated annual dose is predicted to be greater than the Dose Constraint, but less than the Effective Dose Limit.

Based on this screening process, worker exposure is anticipated to fall within the allowable regulatory guideline limits. Estimated exposure to the public may be greater than regulatory guideline limits and will be assessed further in this SLHHRA.

3.2.2 Screening Process – Soil, Groundwater, Surface Water, and Leachate

The list of COPCs for initial consideration in the SLHHRA was determined according to the following three-step screening process, where data were available.

1. A maximum concentration was identified for each parameter. The maximum concentration in each media was determined as either the maximum measured value or the highest detection limit (if greater than the maximum measured value).
2. Parameters were retained for further consideration under the screening process in each media, if the identified maximum concentration exceeded either the Lowest AL Soil Standard for soil or the Lowest Water Standard for surface water, groundwater, and leachate. Tables 3-4 through 3-6a-b show the detailed screening process, including the measured concentrations, number of samples, and number of detects greater than the applicable criteria, for COPCs in surface water, groundwater, soil, and leachate, respectively.
3. Chemicals with no applicable BC CSR Standard were treated as follows:
    - Chemicals that were 100 percent nondetect were examined further to determine whether the reported maximum was based on an elevated SDL. Chemicals that were 100 percent nondetect with nonelevated SDLs were not considered COPCs, as they have not been detected based on the supporting data. The reported SDLs for each nondetect chemical without an applicable BC CSR standard were examined compared to other sample results. If all SDLs reported for the same chemical were equal in value, the SDLs were considered to be nonelevated. If one or more SDLs was greater than those from the same chemical, the maximum SDLs were considered to be elevated and the chemical was retained as a COPC.
    - Chemicals that were detected and had no applicable BC CSR standard, or that were nondetect with elevated SDLs (determined per Step 3), were retained as COPCs.

SECTION 4

Screening Level Human Health Risk Assessment

4.1 Problem Formulation

The problem formulation step is an important information-gathering and interpretation stage that serves to plan and focus the approach of the SLHHRA. The data evaluated in this stage focus on proposed Project information that is relevant to the SLHHRA in order to identify human receptors, possible exposure pathways, and other specific areas or issues of concern. The general problem formulation process involves:

- Describing the environmental setting
- Identifying receptors of concern
- Identifying sources of potential risks of adverse effects to the Human Health VC
- Using a CSM to summarize the potential links between contaminant sources and receptor groups

The environmental setting is described in Section 2.4 as part of the existing conditions in the proposed Project area pertaining to drinking water quality, soil quality, country foods quality, noise levels, air quality, and NORMs. Potential receptors and COPCs are characterized in Section 4.1.4. The CSM is used to establish plausible interaction pathways between the potential adverse effects of the proposed Project on the Human Health VC. The CSM is explained in Section 4.1.1 in the discussion of the risk assessment paradigm.

In a standard or typical SLHHRA, the quality of the environment (for example, chemical concentrations in environmental media) is screened against appropriate soil, water, or air standards, guidelines, or objectives that are in effect in the jurisdiction where a project is located. For the purpose of this assessment, available studies for the Facility and the proposed Project were used to identify COPCs and other potential stressors for human receptors.

4.1.1 Risk Assessment Paradigm

For a risk of adverse effects to the Human Health VC to be plausible, three components are required:

- A stressor (that is, a COPC in environmental media or other hazard, such as noise) must be present at a concentration or magnitude that can present a hazard
- An exposure pathway for the stressor to contact the receptor must be present
- A human receptor must be present

When all three components are present, the potential risk of adverse effects to the Human Health VC can be assessed. If one component is missing, there is no human health risk. While the presence of all three components is required for a potential risk of adverse effects to the Human Health VC to exist, it does not indicate that an adverse health effect will be the certain outcome, only that risk of adverse effect is possible. An exposure to a stressor must be of substantial magnitude and duration in order to elicit an adverse effect on the Human Health VC. Where a potential risk is identified, the risk can then be managed and mitigated by affecting a change to any one of the three risk components. Figure 4-1 illustrates the risk assessment paradigm.

Potential health concerns were assessed using a CSM to determine if potential risks of adverse effects could exist in relation to the Human Health VC. The CSM integrates and assembles the risk components

illustrated in Figure 4-1 and schematically illustrates the relationships of COPCs and their release, transport pathways, and exposure routes to receptors of concern. The risk components (COPCs detected, pathways and receptors, as well as the proposed Project) are combined to synthesize the CSM for the potential adverse effects to the Human Health VC. The CSM is used to direct the qualitative health assessment.

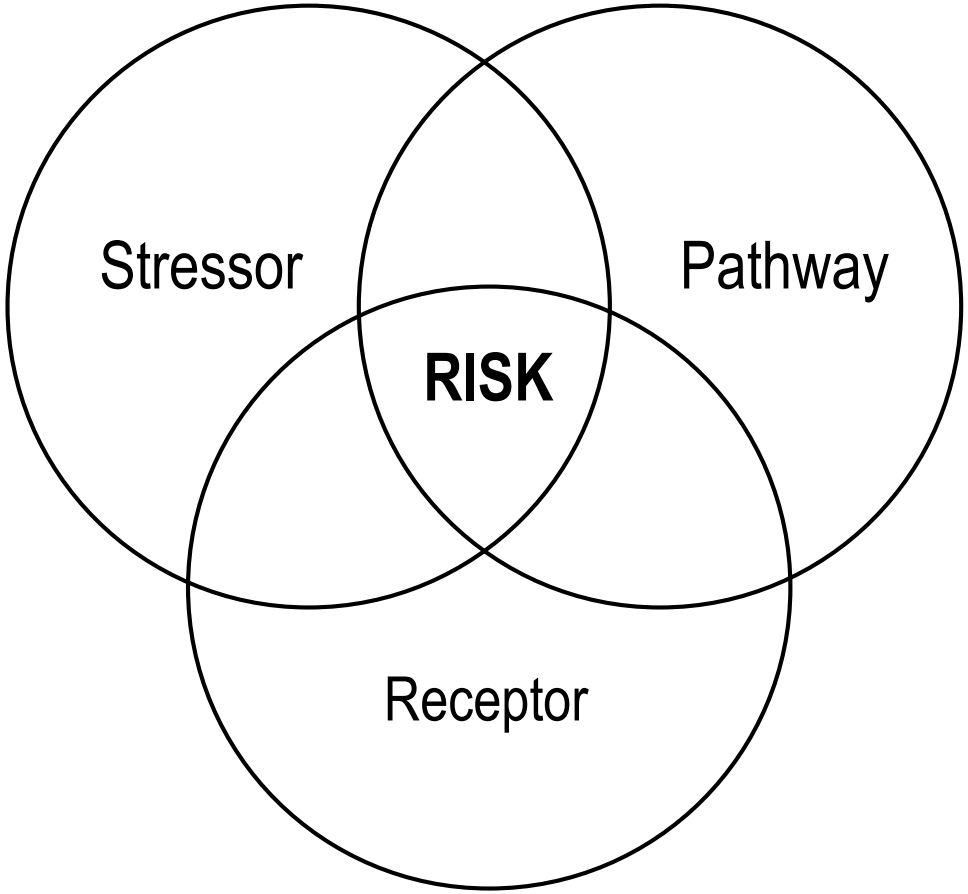

FIGURE 4-1
Risk Assessment Paradigm
Screening Level Human Health Risk Assessment
Silverberry Secure Landfill

The typical SLHHRA process is not designed to evaluate other nonchemical stressors, such as noise; however, noise as a stressor is carried through this desktop SLHHRA to qualitatively evaluate the human health risk from increased noise levels due to the proposed Project.

In the following sections, the CSM identifies those complete exposure pathways where receptors may be directly exposed to noise or COPCs in air, soil, and water, or may be indirectly exposed to COPCs from soil and water via vapour transport or other pathways. With respect to COPCs, an exposure pathway is complete if a receptor takes in (to their body) chemical constituents through ingestion, inhalation, or dermal absorption (that is, contact with the skin). The CSM also identifies that some pathways were considered to be negligible since the pathway could be interrupted (that is, incomplete, blocked, or not present). The CSM is the basis for the qualitative risk assessment through the identification of sources of COPCs, pathways or potential pathways, and receptor combinations that appear to be plausible and, therefore, require an evaluation of the magnitude of risk present. Detail is provided in Section 4.1.4 regarding the receptors and pathways included in the qualitative assessment as well as justification for the inclusion or exclusion of receptors and pathways.

For each potential stressor, a CSM was developed to identify the pathway of exposure from the COPC in the source media, through release mechanism and finally exposure routes into human receptors. Where an expected hazard and level of exposure were identified, the potential risks were qualitatively assessed using the hazard-exposure interaction matrix in Figure 4-2. For the purposes of this assessment, risks of adverse effects to the Human Health VC will be qualitatively characterized as low risk, medium risk, or high risk based on the hazard level of the stressor and the level of exposure.

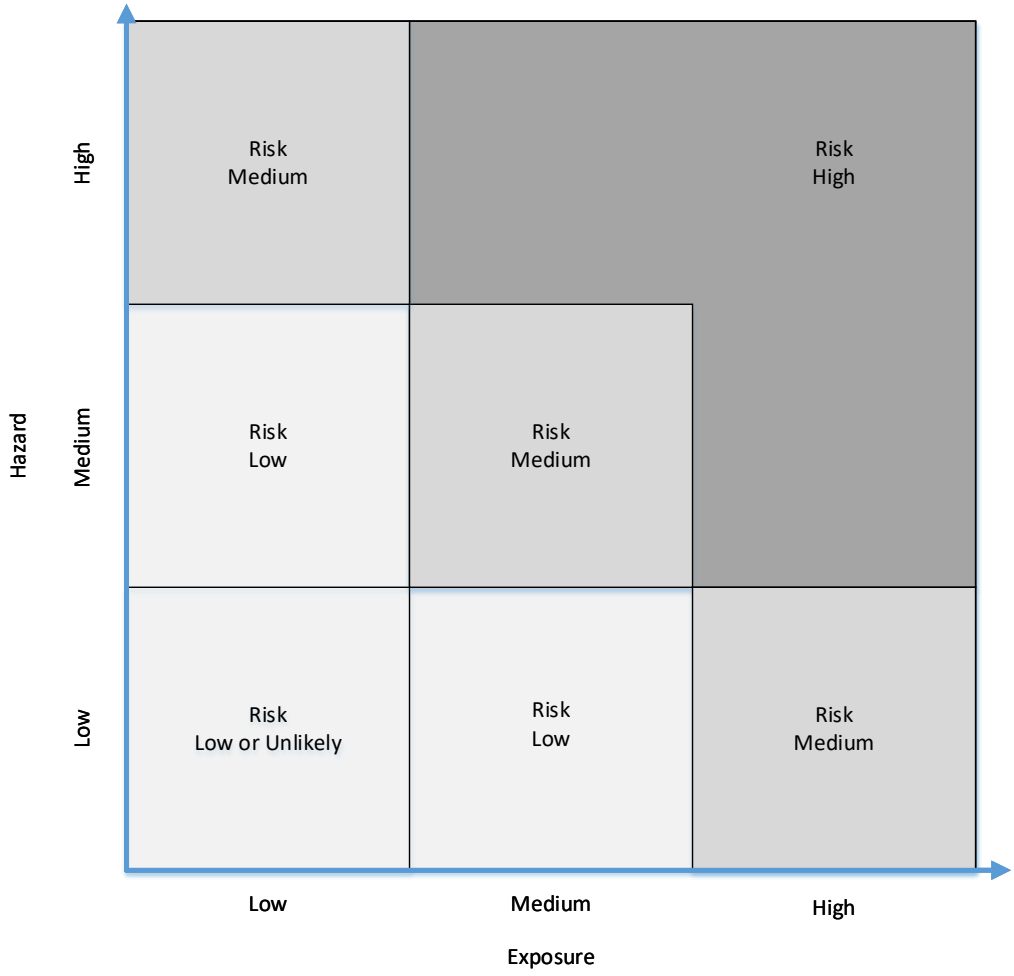

Figure 4-2. Hazard-Exposure Interaction Matrix

4.1.2 Risk Management Considerations

The risk assessment paradigm facilitates risk management through the identification of hazards (that is, safety risk or COPC exposure risk) and the pathways of exposure to human receptors. Where possible, during the lifetime of the proposed Project, the risks of adverse effects to the Human Health VC can be mitigated through risk management measures, such as:

- Reducing hazards (such as., reducing the number of hazardous situations, reducing dust concentrations, reducing COPC concentrations, reducing noise)
- Reducing the frequency and duration of exposure by reducing the pathway (such as, preventing human access to the proposed Project area, reducing consumption of water, vegetation, wildlife, and fish)
- Preventing exposure by introducing barriers (such as, capping contaminated soil)
- Changing the behaviour of receptors (such as, restricting certain land use, changing worker schedules)

The approach to risk management may include changing the stressor, receptor or pathway, as follows:

- Stressor: the reduction or elimination of noise via abatement technologies, reduction or elimination of COPCs in air, soil, and water via management, treatment, or abatement technologies (such as, air filters, catalytic converters for air emissions, and soil treatment).
- Pathways: implementing engineered barriers to environmental media and requiring the use of personal protective equipment (PPE) such as gloves and protective clothing.
- Receptors: preventing access to contaminated land, encouraging land use during seasons where exposure to environmental media is limited and imposing restrictions or limits on the consumption of vegetation, fish, or wildlife.

In the event that this SLHHRA identifies any unacceptable risk to human health, risk management plans may be recommended to control exposure and risk.

4.1.3 Study Area Boundaries

The spatial boundaries used in this SLHHRA include the Project Footprint, a Local Assessment Area (LAA), and a Regional Assessment Area (RAA).

The assessment boundaries match the AAIR for the proposed Project and include the boundaries defined for the Human Health VC, which consists of the following subcomponents:

- Soil quality
- Air quality
- Water quality
- Leachate quality
- Noise
- NORMs
- Country foods quality (such as, quality of vegetation, fish, wildlife, and water consumed as country foods, including consumption of First Nation-specific foods)

The Project Footprint is the land area that will be directly disturbed by proposed Project construction and clean-up activities, including associated physical works and activities.

The LAA includes the area in which all or most of the potential adverse health effects would be expected to occur. The LAA for this SLHHRA includes the LAA of the Human Health VC, which is the maximum extent of the area encompassed by the Acoustic Environment LAA, the Surface Water LAA, and the Groundwater LAA, and also includes the LAA of the Land and Resource Use VC to account for potential adverse health effects from country foods.

A larger RAA can be used to provide additional context in the assessment of potential adverse effects, including cumulative effects. The RAA for this SLHHRA includes the RAA for the Human Health VC, which is the maximum extent of the area encompassed by the Acoustic Environment RAA, the Air Quality RAA, the Surface Water RAA, and the Groundwater RAA, and also includes the RAA of the Land and Resource Use VC to account for potential adverse health effects from country foods.

Table 4-1 describes the assessment area boundaries that apply to each subcomponent under the Human Health VC (CH2M, 2016a).

The water quality subcomponent is encompassed by the assessment boundaries for the Surface Water and Groundwater VCs. The Terrain and Soils LAA (that is, the Project Footprint) is the only assessment boundary for the leachate quality subcomponent. The LAA and RAA for the NORMs subcomponent is the maximum extent of the area encompassed by the Terrain and Soils, Air Quality, Surface Water, and Groundwater LAAs and RAAs. The LAA and RAA for the country foods subcomponent is equivalent to the assessment boundaries for the Land and Resource Use VC.

Table 4-1. Spatial Boundaries for the SLHHRA

Subcomponents	Assessment Boundaries
Terrain and Soils	• LAA – same as Project Footprint. • RAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities.
Air Quality	• RAA – A 10-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities.
Surface Water	• LAA – A 500-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities. • RAA – The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site.
Groundwater	• LAA – A 500-m radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities. • RAA – The watershed of Monnery Creek from the headwaters of its main branch, including the watersheds of all tributaries, downstream from the headwater of Monnery Creek for a distance of 15 km, and the watershed of the Blueberry River and its tributaries for a distance of 15 km upstream and downstream of the confluence with the Blueberry River, of the unnamed creek located immediately west of the Project site.
Acoustic Environment (Noise)	• LAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities. • RAA – A 5-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities.
NORMs	• Refer to the assessment boundaries for Terrain and Soils, Air, Surface Water, and Groundwater.

Table 4-1. Spatial Boundaries for the SLHHRA

Subcomponents	Assessment Boundaries
Country Foods	• LAA – A 1-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities. • RAA – A 5-km radius extending outwards from the proposed Project Footprint boundary, including associated physical works and activities.

4.1.4 Receptor Identification

The following human receptors were considered in the assessment.

- **Construction and operational workers** for the proposed Project include adult workers employed in facility construction activities, operations phase workers at proposed Project facilities or engaged in periodic site-specific maintenance activities, and workers engaged in decommissioning or abandonment activities after the operational life of the proposed Project.

  Construction workers will be present in all areas of the Project Footprint and will be subject to *Occupational Health and Safety Regulation* requirements as legislated in BC for the protection of workers. Construction workers may be exposed to noise and may come into contact with COPCs released to air, water, or soil. Given the nature of the facility (that is, a landfill), it is unlikely that construction personnel would consume country foods (for example, consumption of berries or other flora or fauna). Finally, construction workers are the most likely receptor group to be exposed to COPCs or increased noise in the event of an accident or malfunction related to the proposed Project.

  Workers employed for the operations phase and in any decommissioning or abandonment activities of the proposed Project are not included as a separate receptor group for the purposes of this assessment. The risk for these types of workers is conservatively grouped with the risk for workers engaged in facility construction activities.

- **Residents of local communities and recreational users** include children and adults in the LAAs and RAAs described in Table 4-1. Receptors include sensitive subpopulations such as residents of care homes, hospitals, schools and daycares, as well as recreational users. The duration may vary: residents are considered to be present throughout the life of the proposed Project; however, recreational users may visit the area for a short period of time. Residents and recreational users may come in contact with COPCs released to the air, soil, or water or may be exposed to noise in the vicinity of the facility.

  Exposure to air-borne COPCs from the proposed Project will likely be restricted to the Project Footprint; however, may be influenced by air dispersion and wind effects. Human receptors may be exposed to noise in the Project Footprint and Acoustic Environment LAA; however, exposure would diminish rapidly within a short distance from noise sources. Potential exposure to COPCs in water or soil, if present, is also possible, which could potentially impact country foods quality. In the event of an accident or malfunction, residents could be exposed to increased noise or COPCs in the RAA. If no health effects are expected for the residential receptor due to proposed Project activities, then recreational receptors are also protected, since it is expected that opportunities for exposure to proposed Project-related effects are much less frequent.

- **First Nations members** include children and adults in the LAAs and RAAs described in Table 4-1 making use of the land and resources for cultural, sustenance, social, economic, and traditional land use. The proposed Project occurs in the traditional territories of the Blueberry River First Nation and Doig River First Nation and is in proximity to areas important for a variety of traditional land uses, which are assumed to be conducted year-round including hunting, trapping, fishing, gathering, and cultural pursuits.

These receptors will be present throughout the lifetime of the proposed Project and may be present in the Project Footprint, LAAs, or RAAs, as described in Table 4-1. First Nations members may be exposed to noise from the proposed Project and may come into contact with COPCs released to the air, water, and soil. It is possible that country foods quality may be affected by the proposed Project and First Nations members are considered the most likely receptor group to consume country foods. In the event of an accident or malfunction, First Nations members could be exposed to increased noise or COPCs.

4.1.5 Pathway Analysis

In order for chemicals to cause a health effect, some form of exposure or contact between the contaminant and the person must occur. The route by which this occurs is referred to as an exposure pathway. The potential exposure pathways are dictated primarily by the nature of the contaminants and the potential human receptors identified. Typically, individuals are exposed to contaminants in the environment via three basic pathways:

1. Ingestion of contaminated water, food, or soil, or a combination thereof.
2. Inhalation of chemical vapours or particulates, or both.
3. Dermal contact with contaminated water, soil, or a combination thereof.
4. Hearing of transmitted noise via the auditory pathway.

In assessing potential exposures of the identified receptors to contaminants in environmental media at the proposed Project, possible exposure pathways were evaluated in order to identify those that are potentially complete. The following subsections present the potential exposure pathways for the proposed Project and the rationale for including or eliminating them from the SLHHRA.

4.1.5.2 Surface Water – Ingestion and Dermal Contact

Drainage at the Facility is presently controlled by ditches and berms, and is directed towards the storm water retention pond. Surface water quality is currently, and will continue to be, assessed using provincial guidelines before being discharged, which is away from wetlands in the area. As surface water is discharged to the ground (after testing) away from existing surface water bodies, it is unlikely that COPCs would be transported away from the Facility via creeks or streams to a downstream user of surface water. It is possible that vegetation in the discharge area would uptake the discharged surface water via root systems. This vegetation may subsequently be consumed by wildlife which in turn may be consumed by land users and First Nations receptors. Refer to Section 4.1.5.5 for a discussion of the country foods pathway.

Human exposure to COPCs in surface water is possible for construction and operation workers during the construction, maintenance, sampling, or decommissioning of the storm water management system. However, this exposure will be mitigated through the use of PPE during these activities.

The CSM for surface water exposure is presented in Figure 4-3.

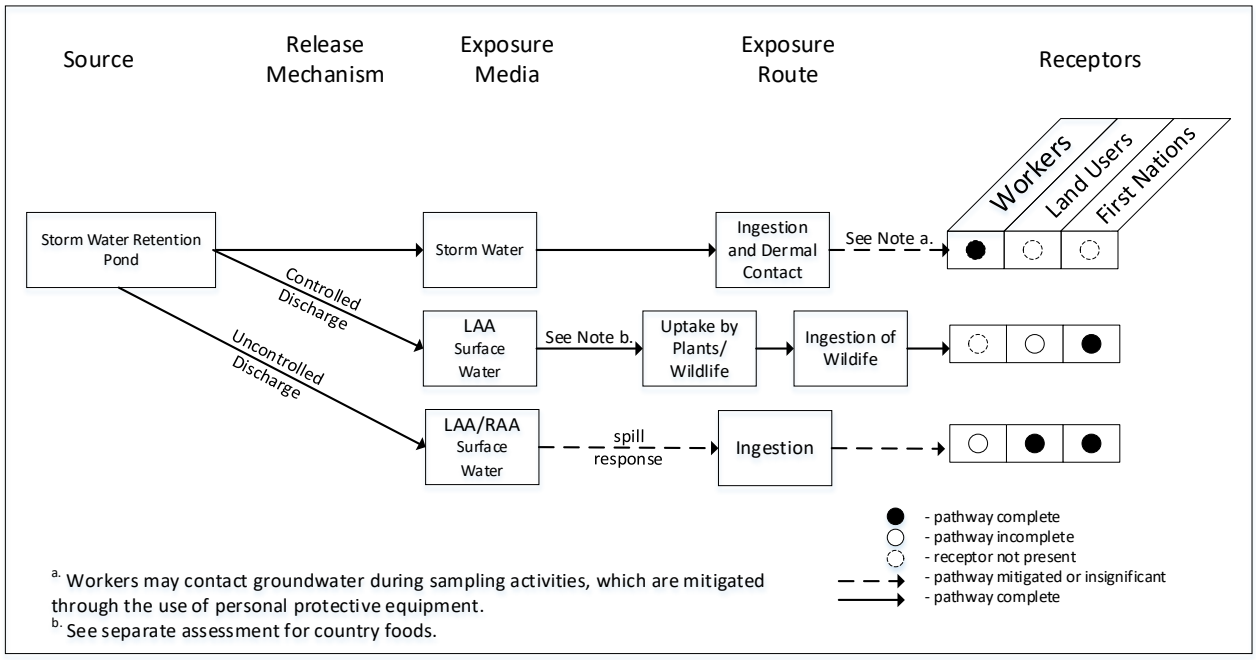

Figure 4-3. Conceptual Site Model – Surface Water

4.1.5.3 Groundwater – Ingestion and Dermal Contact

COPCs could migrate to groundwater if groundwater contacts the landfill waste. Groundwater contamination may occur during facility pumping of a high-water table. Although the landfill is lined to prevent contamination, accidental contamination during operation may occur and could affect downstream surface water or drinking water if leachate migrates through the soil to groundwater or aquifers. Groundwater monitoring occurs and will continue to occur as mitigation in the event of groundwater contamination. Potential receptors in the area include trappers and First Nations. If contaminated groundwater is ingested, pathways will be complete; there are no known uses of groundwater in the Groundwater LAA, but it is possible that groundwater is used for drinking water purposes in the Groundwater RAA.

Therefore, human exposure to COPCs in groundwater is possible for construction and operation workers during the maintenance, sampling, or decommissioning of the monitoring well network. However, this exposure will be mitigated by the use of PPE during these activities.

The CSM for groundwater exposure is presented in Figure 4-4.

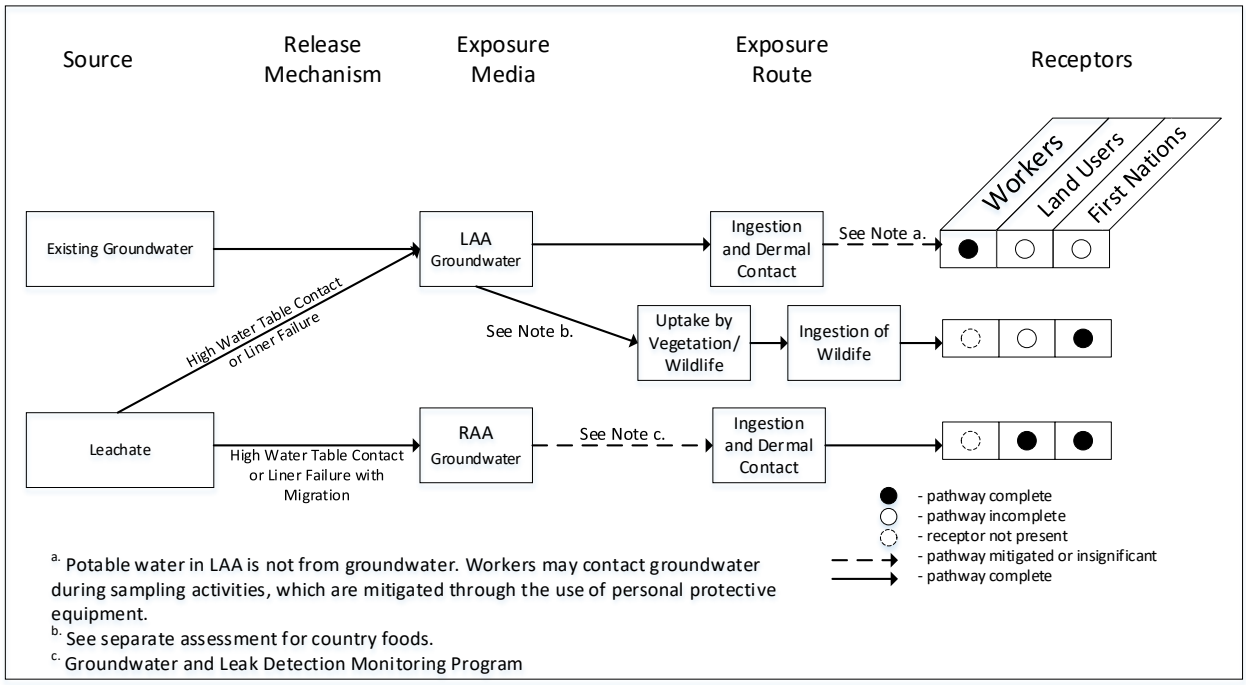

Figure 4-4. Conceptual Site Model – Groundwater

4.1.5.4 Soil - Ingestion, Inhalation, and Dermal Contact

COPCs can be transported to other areas within the Terrain and Soils LAA or RAA via wind erosion of landfill wastes or soil salvaged for capping materials that may have contacted waste. These soils may be inhaled as dust by construction or operation workers. Dust may also be deposited to the surface or on vegetation in the Air Quality RAA. Vegetation may be consumed by wildlife in the area, which could travel to human receptors through hunting or trapping.

Surface water is discharged to soil in the Terrain and Soils RAA. Soil quality is unlikely to be impacted by these activities as surface water is sampled and compared to provincial and federal guidelines prior to discharge. However, the vegetation growing in this area may uptake COPCs from dust and surface water. This vegetation may subsequently be consumed by wildlife, which, in turn, may be consumed by land users and First Nations receptors. Refer to Section 4.1.5.5 for a discussion of the country foods pathway.

Therefore, human exposure to COPCs in soil is possible for construction and operation workers via dust inhalation or direct contact with soil, where dust containing COPCs has been deposited. However, this exposure will be mitigated by measures such as dust suppression activities.

The CSM for soil exposure is presented in Figure 4-5a.

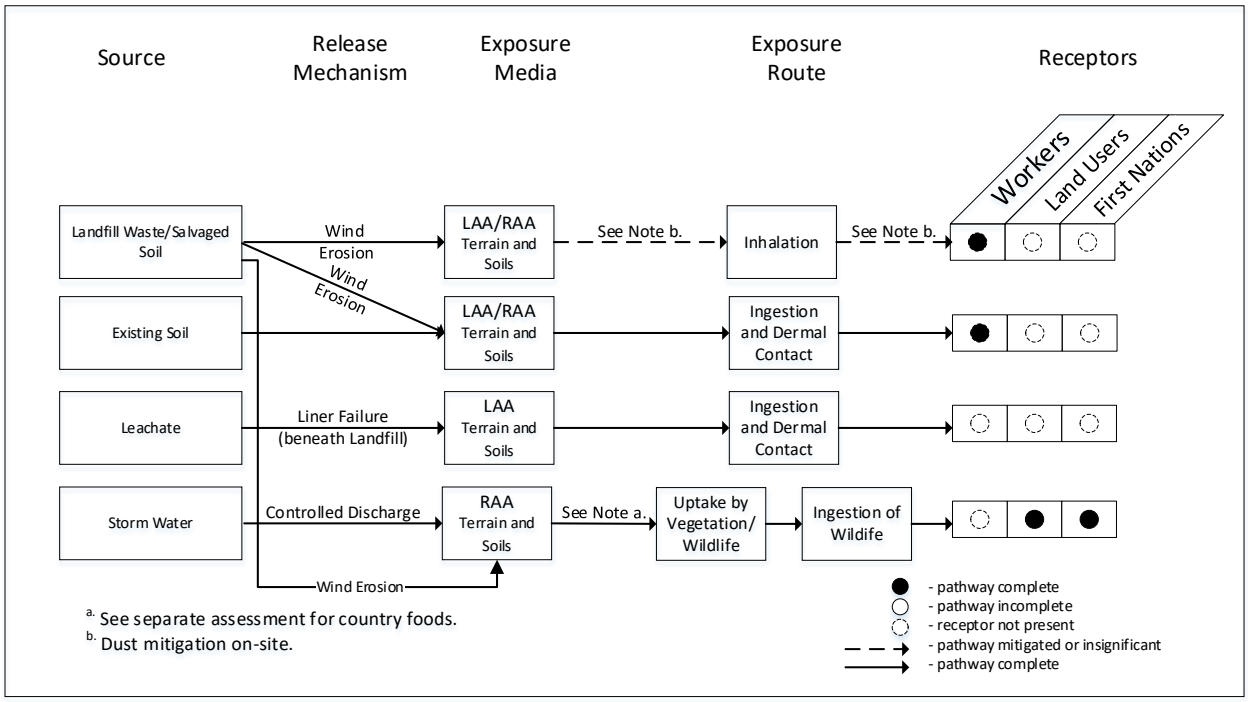

Figure 4-5a. Conceptual Site Model – Soil

Leachate is generated by the wastes accepted at the landfill and collected via a leachate collection system. Leachate is stored in a holding tank, which is subsequently pumped out and disposed of in an offsite licenced disposal well (Golder, 2008).

Dermal contact with leachate is possible, but unlikely for construction and operation workers during the construction, maintenance, sampling, or decommissioning of the leachate collection system or leachate holding tank due to use of PPE.

The CSM for leachate exposure is presented in Figure 4-5b.

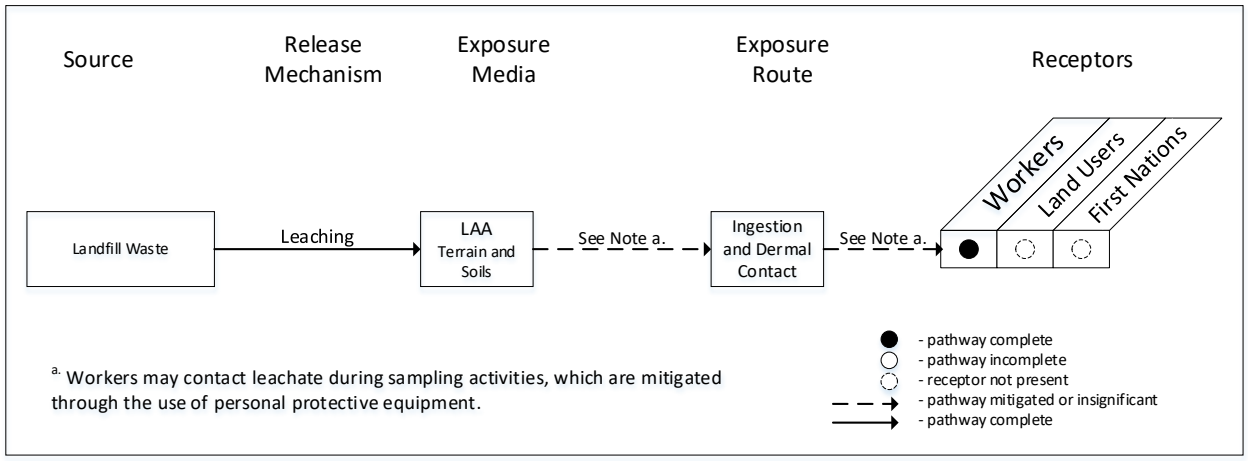

Figure 4-5b. Conceptual Site Model – Leachate

4.1.5.5 Country Foods – Ingestion

No additional assessment for country foods is necessary if any of the following criteria are met:

- No COPCs are identified
- No feasible, operable transport pathways into country foods exist
- No country foods are harvested from the areas, or
- No human receptors are identified during the proposed Project lifespan, or after the proposed Project lifespan if there are any residual contaminants (Health Canada, 2010b)

The Project Footprint is located on private land which is not currently used for traditional purposes (Tervita, 2016a); however, land in the Land and Resource Use LAA and RAA is used by First Nations for traditional activities such as hunting, trapping, fishing, and gathering. Therefore, the country foods pathway may be considered complete. COPCs have been identified in soil, groundwater, and surface water that may have an impact on country foods.

The BC CSR AW standards for groundwater were derived to protect surface water from groundwater discharge (where fish may be impacted). This transport pathway is therefore relevant to country foods (that is, human ingestion of fish). The BC MOE (2017) *Protocol No. 21 for Contaminated Sites, Water Use Determination* document was consulted to determine the applicability of this pathway in the context of the BC CSR. This document states that the AW standards are applicable to groundwater located within 500 m of an aquatic receiving environment, or to groundwater located greater than 500 m of an aquatic environment where COPCs are present and have the potential to migrate to within 500 m of the water body. Section 2.4.1 indicates that the nearest surface water bodies to the Facility and proposed project (unnamed creeks) are located approximately 1.4 km away and Section 2.3 indicates that the hydraulic conductivity of the groundwater in the vicinity of the Facility and proposed Project is approximately 40 cm/y. Based on this information, the groundwater discharge to surface water pathway is considered incomplete, because of the combination of low hydraulic conductivity paired with a large distance to the nearest water bodies. Therefore, the only complete pathways for country food are from soil sources and terrestrial plant uptake from groundwater or directly discharged surface water.

The CSM for country food exposure is presented in Figure 4-6.

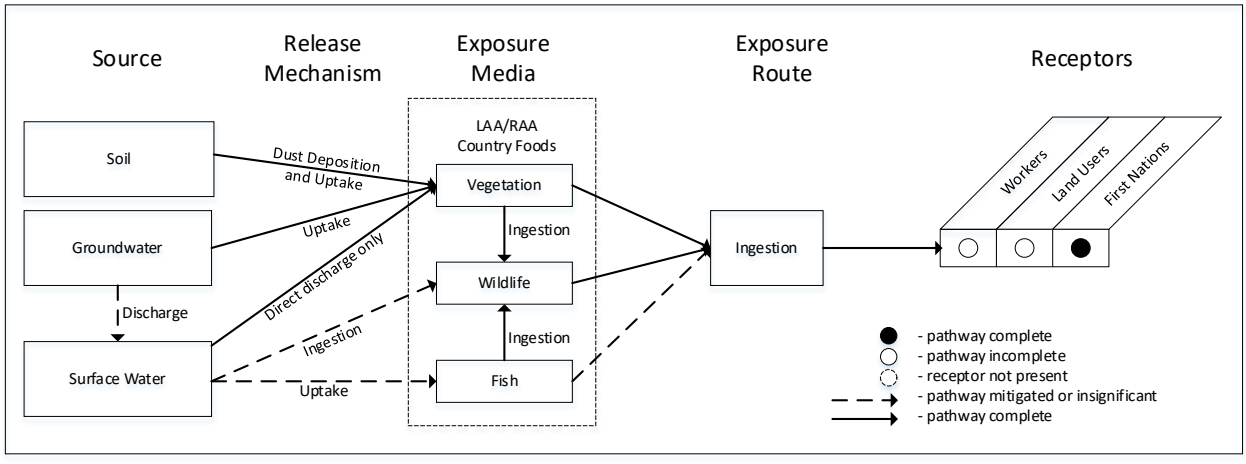

Figure 4-6. Conceptual Site Model – Country Foods

4.1.5.6 Air – Inhalation

Possible receptors to air emissions include construction workers and facility operators, although best management practices such as the use of PPE and engineering controls (on equipment) will mitigate the potential for air contaminants to be conveyed to receptors. Furthermore, air concentrations of contaminants will diminish rapidly with increasing distance from the proposed Project and, therefore, land use receptors, including First Nations, are not likely to experience exposure. However, inhalation of air-borne contaminants is possible by these receptor groups and was considered in the CSM.

The CSM for air inhalation exposure is presented in Figure 4-7.

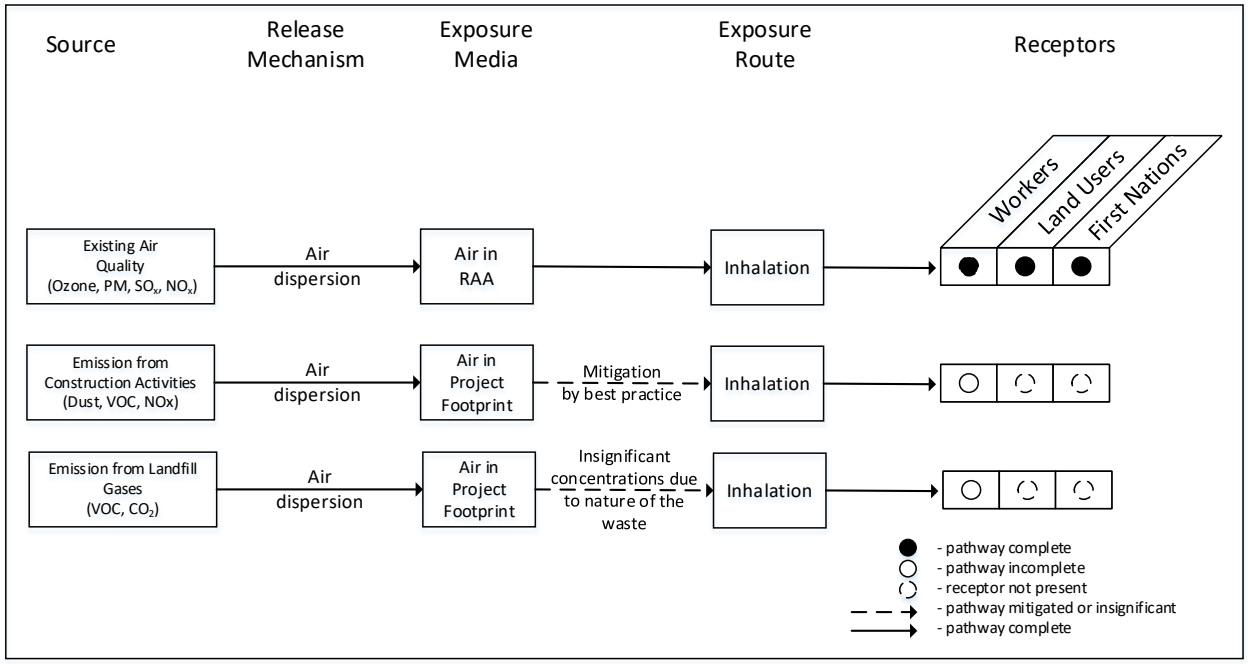

Figure 4-7. Conceptual Site Model - Air

4.1.5.7 Noise – Hearing

Human receptor exposure to noise is a complete pathway for construction workers; however, it will be reduced to acceptable levels using industry-accepted best practices such as requiring PPE during construction activities. Workers may be exposed to noise levels over 80 dBA during construction activities; however, workers will use mandatory hearing protection per BC OGC guidelines. Temporary noise exposures exist during construction activities for nearby land users, including First Nations; however, noise is expected to be within the BC OGC PSL within 1 km of the proposed Project and this pathway is considered mitigated.

The CSM for noise exposure is presented in Figure 4-8.

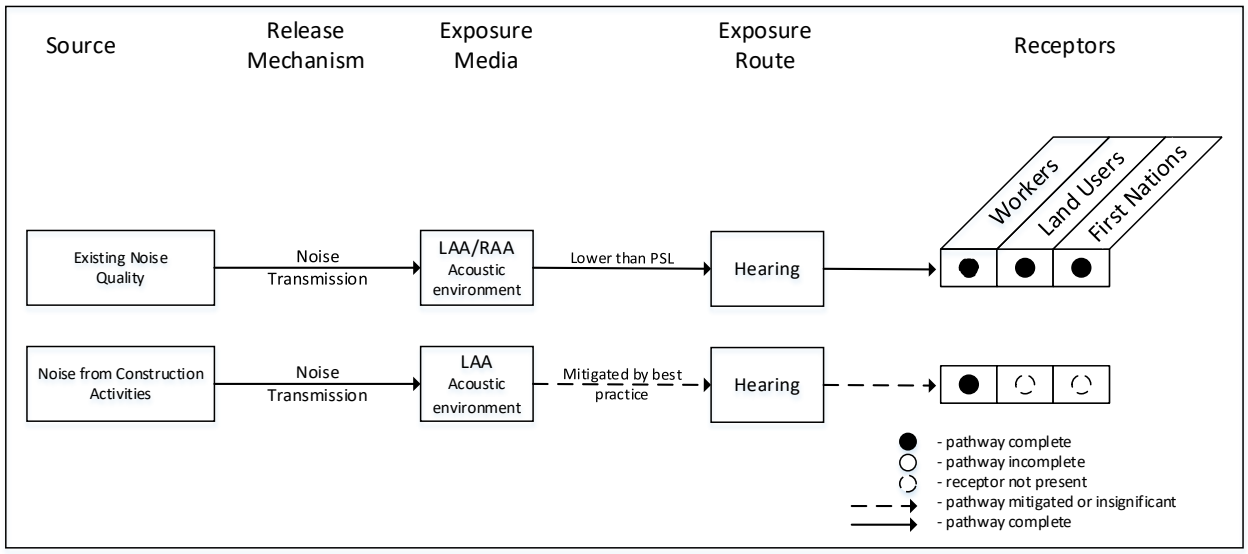

Figure 4-8. Conceptual Site Model - Noise

4.1.5.8 NORMs – Internal Exposure (Ingestion, Dermal Contact, and Inhalation) and External Exposure

Possible receptors to NORMs include construction workers and facility operators. Concentrations of NORMs will diminish rapidly with increasing distance from the proposed Project and, therefore, land use receptors, including First Nations, are not likely to experience exposure. Best management practices such as the use of personal dosimeters for on-site staff and air monitoring for NORMs in dust will mitigate receptor exposure.

The CSM for NORM exposure is presented in Figure 4-9.

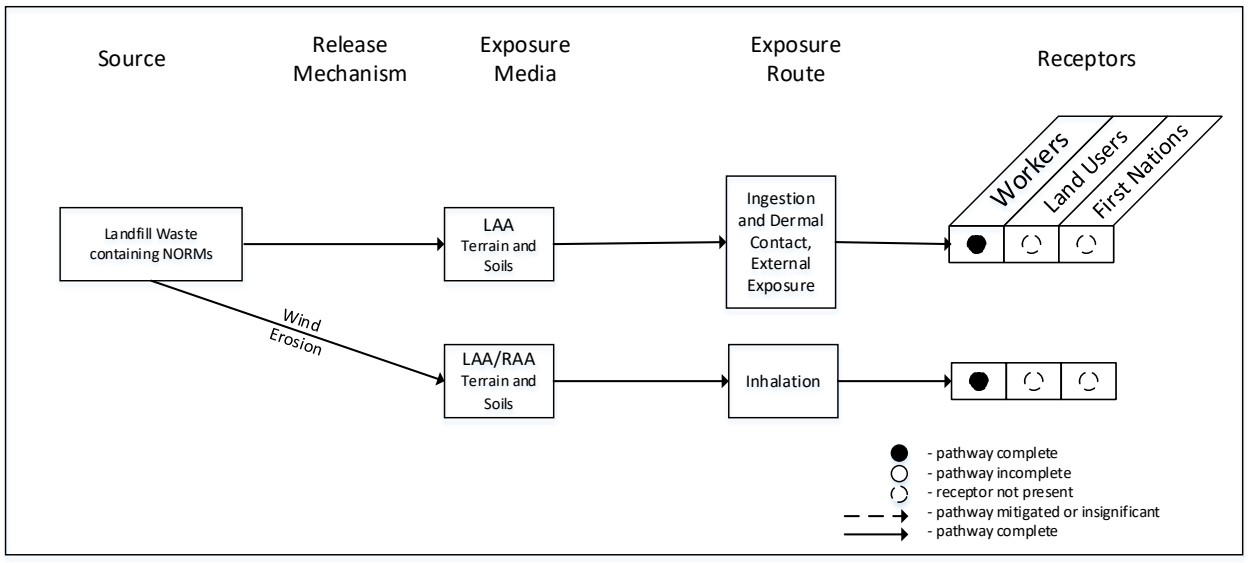

Figure 4-9. Conceptual Site Model – Naturally Occurring Radioactive Material

4.2 Exposure Assessment and Risk Characterization

This step analyzes the likelihood and magnitude of the risk based on the CSM developed in the problem formulation step. A risk matrix may be used to describe the potential risks to human health (see example risk matrix below) or a risk index may be used to identify the potential quantity and quality of the risk. An example risk index is a hazard index (HI) expressed as:

$$HI = (\text{estimated exposure point concentration})/(\text{benchmark concentration})$$

This step also examines the assumptions used in the assessment and discusses the various sources of uncertainty.

The COPC, receptor, and pathway combinations identified above form the basis for the CSM used to assess potential exposures and risk of adverse health effects to human receptors.

The SLRA is the qualitative assessment of risk of adverse health effects from the proposed Project. This analysis integrates the information about the known or predicted hazards with the potential magnitude for exposure for those COPC-receptor-pathway combinations identified. Receptor behaviour and hazard duration also has an effect on the qualitative assessment and characterization of risk. The hazard-exposure interaction matrix shown in Figure 4-2 was used to qualitatively characterize the risk of adverse effects from the proposed Project on the Human Health VCs.

The following subsections outline the qualitatively risk outcomes for the identified exposure scenarios in each of the CSMs described in Section 4.1.5.

4.2.1 Surface Water

Table 4-2 compares the concentrations of the retained COPCs in surface water (based on existing studies) to human health-specific criteria and calculates a hazard index for each COPC. Table 4-2 provides details regarding the potential for risk for each identified COPC in surface water. Based on the assessment, surface water is unlikely to be affected by the proposed Project construction or operations. The Facility has existing mitigation measures in place that will be applied to the proposed Project, which ensure that surface water leaving the Facility has either not been in contact with waste materials or has been collected, sampled, tested, and evaluated against regulatory criteria prior to discharge to the environment from the storm water retention pond. Accidental spills (for example, leaks from equipment), would require an immediate response, thereby limiting the effect of any spill and subsequent effects on surface water.

Table 4-2. Human Health Secondary Screening - Direct Contact with Surface Water

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

		Human-Health Specific Screening Values						
			Direct Contact					
COC	Units	Max Concentration [a.]	Lowest Water Standard [b.]	Health Canada [c.]	AEP [d.]	ON MOECC [e.]	Average Hazard Index [f.]	Comment
Ammonia	µg/L	50	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Bismuth	µg/L	200	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Manganese	µg/L	210	200	50	50	--	**1.05**	HI >1, based on anomalous concentration from 2014, concentrations typically less than BC Sch. 3.2 or non-detect.
Oil & Grease	µg/L	5000	--	--	--	--	nc	Elevated SDL only.
Silicon	µg/L	7490	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Silver	µg/L	0.05	--	--	--	100	0.001	HI ≤ 1. Elevated SDL only.
Thallium	µg/L	2	--	--	--	2	1	HI ≤ 1
Titanium	µg/L	129	--	--	--	--	nc	Naturally occurring, low toxicity to human health.

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

[c.] Health Canada. 2017b. *Guidelines for Canadian Drinking Water Quality - Summary Table.* Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Table 2. Chemical and Physical Parameters.

[d.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* . Table B-2, Groundwater Remediation Guideline Values for Agricultural Land Use - All Water Uses. Potable.

[e.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Groundwater Components for Potable Water Scenario; All Land Uses; Coarse Textured Soil; GW1.

[f.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

nc = not calculated

VI = vapour intrusion

Workers

- Hazard is low; the COPCs identified present a low risk to human receptors.
- Exposure is low; workers do not use surface water from the Facility as potable water. Workers must comply with occupational health and safety requirements (for example, the use of PPE).
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-3).

Land Users, including First Nations

- Hazard is low; the COPCs identified present a low risk to human receptors. No COPCs in surface water were identified as being both persistent and bioaccumulative (via food chain).
- Exposure is low; the proposed Project will be tied into the existing storm water management system where surface water is discharged to the land (not an existing surface water body) following sampling, analysis, and evaluation against regulatory criteria.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-3).

Table 4-3. Risk Evaluation for Surface Water

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Surface Water – Construction and Operation Stages			
Workers	Low	Low	Low or Unlikely
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.2 Groundwater

Table 4-4 compares the concentrations of the retained COPCs in groundwater (based on existing studies) to human health-specific criteria and calculates a hazard index for each COPC. Table 4-4 provides details regarding the potential for risk for each identified COPC in groundwater. Based on the assessment, groundwater is unlikely to be affected by the proposed Project construction or operations. The Facility has existing mitigation measures in place that will be applied to the proposed Project to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). Accidental spills (for example, leaks from equipment), would require an immediate response, thereby limiting the effect of any spill and subsequent effects on groundwater. The existing low hydraulic conductivity of the soils beneath the Facility and the proposed Project limits groundwater migration and therefore, exposure, to receptors within the Groundwater LAA and RAA.

Table 4-4. Human Health Secondary Screening - Direct Contact with Groundwater and Potable Use

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Human-Health Specific Screening Values					
			Direct Contact/Potable Use					
COC	Max Concentration [a.]	Units	Lowest Water Standard [b.]	Health Canada [c.]	AEP [d.]	ON MOECC [e.]	Average Hazard Index [f.]	Comment
Chromium	0.025	mg/L	0.005	0.05	0.05	0.05	**5.0**	HI >1. Sporadic exceedances on 4 occassions between 2002 and 2007. No exceedances since 2007.
Cobalt	0.0435	mg/L	0.001	--	--	0.003	**43.5**	HI >1. Potentially naturally occurring, but relationship to background is not discussed in GW monitoring reports. Exceedances are based on updated CSR drinking water standard as of November 1, 2017.
Nickel	0.128	mg/L	0.08	--	--	0.1	**1.6**	HI >1. Potentially naturally occurring, but relationship to background is not discussed in GW monitoring reports. Exceedances are based on updated CSR drinking water standard as of November 1, 2017.
Strontium	6.97	mg/L	2.5	--	--	--	**2.8**	HI >1. Potentially naturally occurring, but relationship to background is not discussed in GW monitoring reports. Exceedances are based on updated CSR drinking water standard as of November 1, 2017.
Xylenes, Total	100	µg/L	90	90	20	300	**1.1**	HI >1. Elevated SDL only.
Acenaphthene	0.15	µg/L	--	--	1400	4.1	0.0002	HI ≤ 1
Acridine	0.2	µg/L	--	--	--	--	nc	Elevated SDL only.
Anthracene	0.15	µg/L	--	--	--	890	0.0002	HI ≤ 1
Benzo(a)anthracene	0.15	µg/L	--	--	--	1	0.15	HI ≤ 1
Benzo(a)pyrene	0.068	µg/L	0.01	0.04	--	0.01	**6.8**	HI > 1, Presence possibly related to sediments entrained in groundwater samples (Matrix, 2017).
Benzo(b)fluoranthene	0.02	µg/L	--	--	--	0.1	0.2	HI ≤ 1
Cadmium	0.0135	mg/L	0.005	0.005	0.005	0.005	**2.7**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Chloride (Cl)	166	mg/L	100	250	250	25	**1.7**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Electrical Conductivity	14840	µS/cm	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Extractable Petroleum Hydrocarbons (EPH) C19-C32 [g]	0.32	mg/L	--	--	--	0.5	0.64	HI ≤ 1
Heavy Extractable Petroleum Hydrocarbons (HEPH) C19-C32 [g]	500	µg/L	--	--	--	500	1	HI ≤ 1
Iron	8.98	mg/L	5	3	0.3	--	**1.8**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Light Extractable Petroleum Hydrocarbons (LEPH) C10-C19 [h]	540	µg/L	--	--	--	150	**3.6**	HI > 1, sporadic detections of hydrocarbons noted in annual reports. No increasing or
Lithium	2.69	mg/L	0.73	--	--	--	**3.7**	HI > 1, no exceedances since 2007.
Magnesium	562	mg/L	100	--	--	--	**5.6**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Manganese	5.99	mg/L	0.2	0.05	0.05	--	**30.0**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Nitrate (as N)	216	mg/L	10	10	10	--	**21.6**	HI > 1, localized, potentially related to till oxidation (Matrix, 2017)
Nitrate and Nitrite - N	135	mg/L	10	--	--	--	**13.5**	HI > 1, localized, potentially related to till oxidation (Matrix, 2017)
Phenanthrene	0.8	µg/L	--	--	--	1	0.8	HI ≤ 1
Potassium	19	mg/L	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Quinoline	3.4	µg/L	--	--	--	--	nc	Elevated SDL only.
Selenium	0.0388	mg/L	0.01	0.05	0.05	0.01	**3.9**	HI > 1, sporadic detections noted in annual report. No increasing or decreasing trend (Matrix, 2017).
Silicon	7.45	mg/L	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Sodium	836	mg/L	200	200	200	200	**4.2**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Sulphate	3530	mg/L	500	500	500	--	**7.1**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Thallium	0.05	mg/L	--	--	--	0.002	**25.0**	HI > 1, Elevated SDL, Max detected less than ON MOECC.
Titanium	0.14	mg/L	--	--	--	--	nc	Naturally occurring, low toxicity to human health.
Uranium	0.092	mg/L	0.01	0.02	0.02	0.02	**9.2**	HI >1, Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matı
Volatile Petroleum Hydrocarbon (VPH) [i]	100	µg/L	--	--	--	820	0.12	HI ≤ 1

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

c. Health Canada. 2017b. Guidelines for Canadian Drinking Water Quality - Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Table 2. Chemical and Physical Parameters.

[d.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* . Table B-3, Groundwater Remediation Guideline Values for Residential/Parkland Land Use - All Water Uses. Potable.

[e.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Groundwater Components for Potable Water Scenario; All Land Uses; Coarse Textured Soil; GW1.

[f.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values.

[g.] Carbon range (C) C19-C32 spans the carbon range associated with CCME PHC F3. PHC F3 values selected as an approximation of EPH C19-32 and LEPH C19-C32.

[h.] Carbon range (C) C10-C19 spans the carbon range associated with CCME PHC F1, F2, and F3. Lowest value of PHC F1, F2, and F3 selected as an approximation of EPH C10-C19 and LEPH C10-C19.

[i.] Carbon range (C) C5-C9 spans the carbon range associated with CCME PHC F1. PHC F1 values selected as an approximation of VPH.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

Bold indicates HI greater than 1.

≤ = less than or equal to

CCME = Canadian Council of Ministers of the Environment

Workers

- Hazard is medium; the COPCs identified present a low to medium risk to human receptors.
- Exposure is low; workers do not use groundwater from the Facility as potable water. Workers must comply with occupational health and safety requirements (for example, the use of PPE).
- Therefore, risk is low, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-5).

Land Users, including First Nations

- Hazard is low; the COPCs identified present a low to medium risk to human receptors.
- Exposure is low; existing quarterly groundwater monitoring program will be applied to the proposed Project to detect any impacts to groundwater (and potential migration, if applicable). No aquifers identified as a groundwater resource are located below or within several kilometres of the Facility, therefore exposure via potable water use is unlikely.
- Therefore, risk is low, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-5).

Table 4-5. Risk Evaluation for Groundwater

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Groundwater – Construction and Operation Stages			
Workers	Low to Medium	Low	Low
Land Users/First Nations	Low to Medium	Low	Low

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.3 Soil

Table 4-6 compares the concentrations of the retained COPCs in soil (based on existing studies) to human health-specific criteria and calculates a hazard index for each COPC. Table 4-6a provides details regarding the potential for risk for each identified COPC in groundwater. Based on the assessment, soil is unlikely to be affected by the proposed Project construction or operations. The Facility has existing mitigation measures in place that will be applied to the proposed Project to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). Accidental spills (for example, leaks from equipment), would require an immediate response, thereby limiting the effect of any spill and subsequent effects on soil. Dust suppression measures will be employed to minimize the dust generated from vehicular traffic.

Table 4-6. Human Health Secondary Screening - Direct Contact with Soil

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Human Health-specific Screening Values						
			Soil Direct Contact						
COC	**Max Concentration [a.]**	**Units**	**B.C. Standards [b.]**	**CCME Criteria**	**AEP [c.]**	**ON MOECC [d.]**	**USEPA Regional Screening Levels [e.]**	**Average Hazard Index [f.]**	**Comment**
Arsenic [g]	14	mg/kg	20	12	21	*9.5*	*6.8*	0.7	HI ≤ 1
Barium [h]	830	mg/kg	500	500	10000	3800	3000	**1.7**	HI > 1, potentially naturally occurring (barite) (CH2M, 2017)
Benzo(g,h,i)perylene	0.036	mg/kg	--	--	--	*78*	--	0.0005	HI ≤ 1
Beryllium [i]	1.32	mg/kg	85	75	--	38	32	0.016	HI ≤ 1
Total Phenols	0.11	mg/kg	--	--	--	--	--	nc	Detection considered anomalous (CH2M, 2017)

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] Lowest of the BC Reg. 375/96 Agricultural Standards (Schedule 3.1 - Part 1 [Direct Contact] or Schedule 3.1 - Part 2) and BC MOE Protocol 4 For Contaminated Sites Background Standards.

[c.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines.* Table A-2, Surface Soil Remediation Guideline Values for Agricultural Land Use - All Exposure Pathways. Human - Direct Soil Contact. Barium-barite value selected for barium.

[d.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Soil Components for Table 2 - Full Depth, Potable Water Scenario; Agricultural Land Use; Coarse Textured Soil; Soil Contact, S1 Risk.

[e.] U.S. Environmental Protection Agency (USEPA). 2017. *Regional Screening Levels (RSLs) - Generic Tables - Resident Soil* . Lowest Carcinogenic SL or Noncarcinogenic Child SL value. November. Accessed December 18, 2017: https://semspub.epa.gov/work/HQ/197029.pdf.

[f.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values

[g.] Canadian Council of Ministers of the Environment (CCME). 2001a. *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Arsenic* . In Canadian Environmental Quality Guidelines (1999). Table 2; Soil Ingestion; Agricultural.

[h.] Canadian Council of Ministers of the Environment (CCME). 2004. *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Barium* . In Canadian Environmental Quality Guidelines (1999). Table 2a; Lowest of Soil Ingestion and Soil Dermal Contact; Agricultural; Coarse.

[i.] Canadian Council of Ministers of the Environment (CCME). 2001b. *Canadian Soil Quality Guidelines for the Protection of Environmental and Human Health: Beryllium* . In Canadian Environmental Quality Guidelines (1999). Table 2; Soil Direct Contact; Agricultural.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

Bold indicates HI greater than 1.

Italics values adjusted from source indicated. Values representing a cancer risk of 10^{-6} were adjusted to align with BC MECCS's acceptable cancer risk of 10^{-5} for human health (carcinogenic chemicals only).

Underlined values adjusted from source indicated. Values representing a hazard quotient (HQ) (that is, noncancer risk) of 1, were adjusted to an HQ of 0.2 (per pathway) to align with BC MECCS's acceptable HQ of 1 for total exposure for human health (noncarcinogenic chemicals only).

Workers

- Hazard is low; the COPCs identified present a low risk to human receptors.
- Exposure is low; workers must comply with occupational health and safety requirements (for example, the use of PPE). Mitigation measures such as dust suppression are currently in place at the Facility and will be implemented for the proposed Project.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-7).

Land Users, including First Nations

- Hazard is low; the COPCs identified present a low risk to human receptors.
- Exposure is low; there are no land users, including First Nation land users, within the Project Footprint, however, First Nation traditional land use may occur within the Terrain and Soils RAA (that is, a 1-km radius extending outwards from the Project Footprint boundary).
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-7).

Table 4-7. Risk Evaluation for Soil

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Soil – Construction and Operation Stages			
Workers	Low	Low	Low or Unlikely
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

Table 4-8 compares the concentrations of the retained COPCs in leachate (based on existing studies) to human health-specific criteria and calculates a hazard index for each COPC. Leachate is unlikely to affect surface water, groundwater, or soil as part of the proposed Project construction or operations. The Facility has existing mitigation measures in place that will be applied to the proposed Project to prevent waste materials or leachate from being released to the subsurface (for example, landfill liner, leachate collection system, and leak detection system). Accidental spills (for example, leaks from equipment), would require an immediate response, thereby limiting the effect of any spill and subsequent effects on surface water, groundwater, or soil. Land users, including First Nations receptors, will not be present within the Terrain and Soils LAA (that is, the Project Footprint), as the perimeter of the proposed Project will be fenced.

Workers

- Hazard is low to high; the COPCs identified present a range of risks (from low to high) to human receptors. Leachate is only expected to be present during the operations stage. Leachate would not be present during the construction stage; therefore, the hazard is considered low.
- Exposure is low; workers must comply with occupational health and safety requirements (for example, the use of PPE). Leachate would not be present during the construction stage; therefore, the exposure is considered low.
- Therefore, risk is low/unlikely and medium for the construction and operation stages, respectively, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-9).

Table 4-8. Human Health Secondary Screening - Direct Contact with Leachate

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Human-Health Specific Screening Values					
			Direct Contact					
COC	Max Concentration [a.]	Units	Lowest Water Standard [b.]	Health Canada [c.]	AEP [d.]	ON MOECC [e.]	Average Hazard Index [f.]	Comment
Acenaphthylene	10000	µg/L	--	--	--	0.45	**22222**	HI > 1. Elevated SDL only.
Acenaphthene	10000	µg/L	--	--	1400	4.1	**14**	HI > 1
Acridine	10000	µg/L	--	--	--	--	nc	
Anthracene	10000	µg/L	--	--	--	890	**11**	HI > 1
Antimony	0.016	mg/L	0.006	0.006	0.006	0.006	**3**	HI > 1
Arsenic	0.027	mg/L	0.01	0.01	0.01	0.025	**3**	HI > 1
Barium	5.56	mg/L	1	1	1	1	**6**	HI > 1
Benzene	4000	µg/L	5	5	5	5	**800**	HI > 1
Benzo(a)anthracene	10000	µg/L	--	--	--	1	**10000**	HI > 1
Benzo(a)pyrene	10000	µg/L	0.01	0.04	--	0.01	**1000000**	HI > 1
Benzo(b)fluoranthene	10000	µg/L	--	--	--	0.1	**100000**	HI > 1
Benzo(g,h,i)perylene	10000	µg/L	--	--	--	1	**10000**	HI > 1. Elevated SDL only.
Benzo(k)fluoranthene	10000	µg/L	--	--	--	0.1	**100000**	HI > 1. Elevated SDL only.
Beryllium	0.05	mg/L	0.008	--	--	0.004	**6**	HI > 1. Elevated SDL only.
Bismuth	0.05	mg/L	--	--	--	--	nc	Elevated SDL only.
Chloride (Cl)	18300	mg/L	100	250	250	25	**183**	HI > 1
Chromium	0.1	mg/L	0.005	0.05	0.05	0.05	**20**	HI > 1
Chrysene	10000	µg/L	7	--	--	0.1	**1429**	HI > 1
Cobalt	0.055	mg/L	0.001	--	--	0.003	**55**	HI > 1
Dibenzo(a,h)anthracene	10000	µg/L	0.01	--	--	0.01	**1000000**	HI > 1. Elevated SDL only.
Electrical Conductivity	48000	µS/cm	--	--	--	--	nc	
Ethylbenzene	4000	µg/L	140	1.6	1.6	2.4	**29**	HI > 1
Extractable Petroleum Hydrocarbons (EPH) C10-C19	16200	mg/L	5	--	--	--	**3240**	HI > 1
Extractable Petroleum Hydrocarbons (EPH) C19-C32 [g]	3860	mg/L	--	--	--	500	**8**	HI > 1
Fluoranthene	10000	µg/L	150	--	--	0.41	**67**	HI > 1
Fluorene	103000	µg/L	150	--	940	120	**687**	HI > 1
Fluoride	40	mg/L	1	1.5	1.5	--	**40**	HI > 1
Heavy Extractable Petroleum Hydrocarbons (HEPH) C19-C32 [g]	236000000	µg/L	--	--	--	500	**472000**	HI > 1
Indeno(1,2,3-Cd)pyrene	10000	µg/L	--	--	--	0.1	**100000**	HI > 1. Elevated SDL only.
Iron	148	mg/L	5	3	0.3	--	**30**	HI > 1
Lead	0.1	mg/L	0.01	0.01	--	0.01	**10**	HI > 1
Light Extractable Petroleum Hydrocarbons (LEPH) C10-C19 [h]	721000000	µg/L	--	--	--	150	**4806667**	HI > 1
Lithium	1.96	mg/L	0.008	--	--	--	**245**	HI > 1
Magnesium	409	mg/L	100	--	--	--	**4**	HI > 1
Manganese	10.3	mg/L	0.2	0.05	0.05	--	**52**	HI > 1
Methyl tert-butyl ether (MTBE)	4000	µg/L	95	--	15	15	**42**	HI > 1. Elevated SDL only.
Molybdenum	0.233	mg/L	0.01	--	--	0.07	**23**	HI > 1
Naphthalene	114000	µg/L	80	--	470	59	**1425**	HI > 1
Nickel	0.236	mg/L	0.08	--	--	0.1	**3**	HI > 1
Nitrate (as N)	214	mg/L	10	10	10	--	**21**	HI > 1
Nitrate and Nitrite - N	45	mg/L	10	--	--	--	**5**	HI > 1
Nitrite (as N)	80.8	mg/L	3.2	1	1	--	**25**	HI > 1
Phenanthrene	149000	µg/L	--	--	--	1	**149000**	HI > 1
Phenol	883000	µg/L	1000	--	570	890	**883**	HI > 1
Potassium	1080	mg/L	--	--	--	--	nc	
Pyrene	23300	µg/L	100	--	710	4.1	**233**	HI > 1
Quinoline	10000	µg/L	0.05	--	--	--	**200000**	HI > 1
Selenium	0.1	mg/L	0.01	0.05	0.05	0.01	**10**	HI > 1
Silicon	11.3	mg/L	--	--	--	--	nc	
Sodium	6370	mg/L	200	200	200	200	**32**	HI > 1
Strontium	26.9	mg/L	2.5	--	--	0.1	**11**	HI > 1
Styrene	5000	µg/L	800	--	--	100	**6**	HI > 1
Sulphate	2130	mg/L	500	500	500	--	**4**	HI > 1
Thallium	1	mg/L	--	--	--	0.002	**500**	HI > 1. Elevated SDL only.
Titanium	0.1	mg/L	--	--	--	--	nc	
Toluene	4390	µg/L	60	24	24	24	**73**	HI > 1
Uranium	0.0399	mg/L	0.01	0.02	0.02	0.02	**4**	HI > 1
Vanadium	0.1	mg/L	0.02	--	--	0.0062	**5**	HI > 1
Volatile Hydrocarbons (VH)	992000	µg/L	15000	--	--	--	**66**	HI > 1
Volatile Petroleum Hydrocarbon (VPH) [i]	1400000	µg/L	--	--	--	820	**1707**	HI > 1
Xylenes, Total	27700	µg/L	90	20	20	300	**308**	HI > 1

Table 4-8. Human Health Secondary Screening - Direct Contact with Leachate

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Human-Health Specific Screening Values						
			Direct Contact						
COC	**Max Concentration [a.]**	**Units**	**Lowest Water Standard [b.]**	**Health Canada [c.]**	**AEP [d.]**	**ON MOECC [e.]**	**Average Hazard Index [f.]**		**Comment**
Zinc	1.24	mg/L	1	--	5	5	**1**	HI > 1	

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] Lowest of the BC CSR Reg. 375/96 Schedule 3.2 Standards for Irrigation, Livestock, and Drinking Water Generic Numerical Water Standards.

[c.] Health Canada. 2017b. *Guidelines for Canadian Drinking Water Quality - Summary Table.* Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Table 2. Chemical and Physical Parameters.

[d.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* . Table B-3, Groundwater Remediation Guideline Values for Residential/Parkland Land Use - All Water Uses. Potable.

[e.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Groundwater Components for Potable Water Scenario; All Land Uses; Coarse Textured Soil; GW1.

[f.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values.

[g.] Carbon range (C) C19-C32 spans the carbon range associated with CCME PHC F3. PHC F3 values selected as an approximation of EPH C19-32 and LEPH C19-C32.

[h.] Carbon range (C) C10-C19 spans the carbon range associated with CCME PHC F1, F2, and F3. Lowest value of PHC F1, F2, and F3 selected as an approximation of EPH C10-C19 and LEPH C10-C19.

i. Carbon range (C) C5-C9 spans the carbon range associated with CCME PHC F1. PHC F1 values selected as an approximation of VPH.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

Bold indicates HI greater than 1.

Table 4-9. Risk Evaluation for Leachate

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Leachate – Construction Stage			
Workers	Low	Low	Low or Unlikely
Leachate – Operation Stage			
Workers	High	Low	Medium

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.4 Country Foods

The following subsections evaluate the potential risks from the proposed Project to country foods for the following pathways:

- Soil Source - dust from the expanded landfill may be transported via wind to downwind areas and deposited into the soil surface or on the leaves of harvestable vegetation.
- Groundwater Source - impacted groundwater from the proposed Project may reach harvestable species via migration of groundwater with subsequent uptake from vegetation from a shallow water table.
- Surface Water Source – impacted surface water (that is, overland flow) is discharged directly to the ground with subsequent uptake from vegetation.

4.2.4.1 Soil Source

As shown in the CSM for country foods (Figure 4-6), the transport mechanism for soil from the Facility and proposed Project to the Country Foods LAA and RAA would be via dust deposition in downwind areas. Dusts containing COPCs in soil from the proposed Project could be deposited on the foliage of plants which are in turn ingested by animals or humans. Five COPCs were identified in soil based on the preliminary screening, including three metals and one PAH. The PAH analyte was retained because it does not have a BS CSR Standards. The following qualitatively evaluates the soil COPCs with respect to the country foods pathway:

- Arsenic – This COPC may be naturally occurring. BC MOE recently reduced the background concentration of arsenic in the Omineca/Peace Region from 15 to 10 mg/kg (BC MOE, 2010; BC MECCS, 2017b). The range of arsenic concentrations encountered during the soil study (CH2M, 2017) were 9.5 to 14 mg/kg, which is within the previous range of background concentrations.
- Barium – This COPC may be naturally occurring. Adriano (2001) indicates that while barium “can be passed through the food chain, evidence suggests that it is not concentrated in either aquatic or terrestrial organisms and should generally be considered to have low toxicity.” Based on this information, the risks to human receptors from this COPC in vegetation or animal tissue via soil from the proposed Project is considered low.
- Beryllium - This COPC may be naturally occurring. BC MOE recently reduced the background concentration of beryllium in the Omineca/Peace Region from 2.0 to 1.0 mg/kg (BC MOE, 2010; BC MECCS, 2017b). The range of beryllium concentrations encountered during the soil study (CH2M, 2017) were 0.48 to 1.32 mg/kg, which is within the previous range of background concentrations.

- PAHs (specifically, benzo[g,h,i]perylene) – PAHs were detected in the soil samples collected from within the Facility; however, PAHs were nondetect in soil samples collected from the downwind area of the Facility (CH2M, 2017). Concentrations in soil of benzo(g,h,i)perylene within the Facility ranged from less than 0.01 to 0.036 mg/kg (CH2M, 2017); this PAH was identified as COPC because there is no BC CSR Standard for this chemical. Other PAHs, which were detected at similar concentrations, were found at levels less than the Lowest AL Soil Standard and were not identified as COPCs, indicating a low potential for risk from PAHs in general. PAHs are considered bioaccumulative, but have low soil to plant uptake factors (University of Tennessee, 2018), meaning that the uptake by plants from soil is typically several orders of magnitude lower than the concentration present in soil. Considering the low detected concentrations occurring within the Facility which were not detected within the downwind area, the lack of other PAHs retained as COPCs when compared to BC CSR Standards, and low plant uptake factors, risks to human receptors from benzo[g,h,i]perylene in vegetation or animal tissue via soil from the proposed Project is considered low.
- Total Phenols – The detection of total phenols marginally greater than the detection limit in the downwind area was determined to be anomalous based on the soil data set (CH2M, 2017); this result does not appear to be associated with the Facility or the proposed Project. Total phenols refers to nonchlorinated phenols (therefore, are not bioaccumulative) and does not have a BC CSR Standard. Therefore, risks to human receptors from this COPC in vegetation or animal tissue via soil from the proposed Project is considered negligible.

Land Users, including First Nations

- Hazard is low; based on the data provided, the COPCs measured in soil in areas downwind of the Facility do not appear to be present at levels which would be of concern for the country foods pathway. COPCs present at concentrations similar to background would not be expected to present risks in excess of background levels.
- Exposure is low; mitigation measures such as dust suppression are currently in place at the Facility and will be implemented for the proposed Project. Dust impacts would only be expected on the downwind side of the proposed Project; therefore, the extent of dust deposition is likely limited compared to the area in which country foods would be harvested from. Concentrations of COPCs in dust diminish rapidly with dispersion and dilution in air and with distance (USEPA, 2002).
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-10).

Table 4-10. Risk Evaluation for Country Foods – Soil Source

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Country Foods (Soil Source) - Construction Stage			
Land Users/First Nations	Low	Low	Low or Unlikely
Country Foods (Soil Source) - Operation Stage			
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.4.2 Groundwater Source

As shown in the CSM for country foods (Figure 4-6), the transport mechanism for groundwater from the Facility and proposed Project to the Country Foods LAA and RAA would be via groundwater migration, in the event of a spill or a leak in the existing liner and containment system, which will also be implemented as part of the proposed Project. Thirty-four COPCs were identified in groundwater based on the preliminary screening, of these, there are 8 PAHs and 13 metals COPCs, which have the potential to bioaccumulate in the environment. Concentrations of these COPCs were compared to the BC CSR Schedule 3.2 Freshwater Aquatic Life Standard and similar criteria from other jurisdictions (Table 4-11) to provide a preliminary evaluation of the potential risks to human receptors from ingestion of terrestrial vegetation. Based on the assumption made by the Ontario MOECC in the derivation of Ontario's generic soil and groundwater standards, the groundwater to surface water values were "assumed to provide a sufficient degree of protection to plants, soil organisms, mammals and birds such that separate calculations for these receptors for ingestion of exposure to shallow groundwater or groundwater seeps is not needed" (ON MOECC, 2011). For this qualitative assessment, it has been assumed that since the standards are considered to be protective of plant and animal health, foods derived from these sources are unlikely to be significant sources of COPCs, moreover if the COPCs are not considered to bioaccumulate. If COPCs were to affect the health of plants or animals, the appearance of such items would unlikely be favoured as country foods and therefore likely be avoided for harvesting. This assumption has been applied, in the absence of plant tissue data, to qualitatively assess the potential for risks to human health from ingestion of terrestrial plants or wildlife that has ingested terrestrial plants near the Facility and proposed Project.

Based on using groundwater standards as comparators for health risks, nine COPCs have HQs greater than 1. However, of these:

- One COPC (thallium) was retained for assessment based on elevated detection limits only. Risks from this COPC would not be expected as it has not been positively identified as being present in groundwater.
- Four COPCs (cadmium, iron, manganese, and uranium) have been noted to be associated with naturally occurring background based on the historical groundwater monitoring activities (Matrix, 2017). Risks, if any, would not be expected to exceed risks associated with background exposure.
- Four COPCs (chromium, cobalt, LEPH, and selenium) have only had sporadic detections greater than the screening criteria over the monitoring period; since elevated concentrations are not consistently present and available for plant uptake, these COPCs pose a low risk to human receptors.

The COPCs with HQs less than 1, but which have the potential to bioaccumulate (that is, PAHs and some metals) were also reviewed as the potential risk from bioaccumulation is not considered in the selected screening criteria. Potentially bioaccumulative COPCs with HQs less than 1 include nine PAHs analytes and two metals:

- The nine PAHs with HQs less than 1 were retained for assessment as COPCs in country foods based on sporadic detections or elevated detection limits in groundwater. PAHs tend to sorb strongly to soils and exhibit very low solubility in water, therefore, their occasional presence in groundwater samples is likely attributed to suspended sediments in the groundwater sample (which are not mobile during groundwater migration), and not representative of dissolved concentrations which would be available for plant uptake. Since elevated concentrations of PAHs in groundwater are not consistently present or in a form available for plant uptake (that is, dissolved), the presence of these COPCs in groundwater pose a low risk for plant uptake located some distance from the facility and therefore low risk to human receptors through country foods exposure.

- Metals retained with HQs less than 1 include nickel and titanium. Nickel concentrations greater than the lowest water standard appear in less than 5 percent of groundwater samples analyzed as part of the facility's monitoring program. Elevated concentrations of nickel are not consistently present and therefore not available for plant uptake. Nickel poses a low risk to human receptors through the country foods pathway. Titanium is naturally occurring and generally regarded to be nonbioaccumulating and of low toxicity to humans through the ingestion pathway.

Land Users, including First Nations

- Hazard is low; based on the data provided, the COPCs measured in groundwater near Facility do not appear to be present at levels which would be of concern for the country foods pathway or are not consistently present to be available for plant uptake.
- Exposure is low; the existing quarterly groundwater monitoring program will be applied to the proposed Project to detect any impacts to groundwater (and potential migration, if applicable). The foraging range of wildlife and of humans consuming country foods is much larger than the areas where COPCs have been historically detected in groundwater (and includes areas which currently are and will be fenced in the future). Therefore, vegetation in the vicinity of the Facility and proposed Project which may intermittently be exposed to low concentrations of COPCs in groundwater are unlikely to contribute to significant proportion of an individual's diet.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-12).

Table 4-11. Human Health Secondary Screening - Country Foods Groundwater Source

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Groundwater Protective of Terrestrial Plants and Wildlife Contact (Assumed Protection from Aquatic Life Standards)				
COC	**Max Concentration [a.]**	**Units**	**BC Schedule 3.2 Standard - AW [b.]**	**AEP [c.]**	**ON MOECC [d.]**	**Average Hazard Index [e.]**	**Comment**
Acenaphthene	0.15	µg/L	60	5.8	6600	0.0025	HI ≤ 1. PAHs generally not considered mobile. Sporadic detections, likely related to sediments in the groundwater sample.
Acridine	0.2	µg/L	0.5	--	--	0.4	HI ≤ 1. Elevated SDL only.
Anthracene	0.15	µg/L	1	0.0012	2.4	0.15	HI ≤ 1. Elevated SDL only.
Benzo(a)anthracene	0.15	µg/L	1	0.018	1.6E+11	0.15	HI ≤ 1. PAHs generally not considered mobile. Sporadic detections, likely related to sediments in the groundwater sample.
Benzo(a)pyrene	0.068	µg/L	0.1	0.015	3.4E+12	0.68	HI ≤ 1. PAHs generally not considered mobile. Sporadic detections, likely related to sediments in the groundwater sample.
Benzo(b)fluoranthene	0.02	µg/L	--	--	6.9E+12	2.9E-15	HI ≤ 1. PAHs generally not considered mobile. Sporadic detections, likely related to sediments in the groundwater sample.
Cadmium	0.0135	mg/L	0.004	0.00037	0.0027	**3.4**	HI >1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Chloride (Cl)	166	mg/L	1500	120	2300	0.11	HI ≤ 1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Chromium	0.025	mg/L	0.01	0.001	0.14	**2.5**	HI >1. Sporadic exceedances on 4 occassions between 2002 and 2007. No exceedances since 2007.Criteria presented is the more stringent of hexavalent and trivalent chromium, however, chromium (total) was reported. Therefore, there is low potential for uptake of elevated concentrations considering the overall data set for chromium.
Cobalt	0.0435	mg/L	0.04	--	0.066	**1.1**	HI > 1. Cobalt detected at concentrations greater than the BC Sch. 3.2 AW Standard in 1 of 259 samples (less than 1 percent of samples). Therefore, there is low potential for uptake of elevated concentrations considering the overall data set for cobalt.
Electrical Conductivity	14840	µS/cm	--	--	--	nc	Naturally occurring, low toxicity.
Extractable Petroleum Hydrocarbons (EPH) C19-C32 [f]	0.32	mg/L	--	--	--	nc	Not considered mobile.
Heavy Extractable Petroleum Hydrocarbons (HEPH) C19-C32 [f]	500	µg/L	--	--	--	nc	Not considered mobile.
Iron	8.98	mg/L	--	0.3	--	**30**	HI >1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Light Extractable Petroleum Hydrocarbons (LEPH) C10-C19 [g]	540	µg/L	500	1300	750	**1.1**	HI > 1. Sporadic detections of hydrocarbons noted in annual reports. No increasing or decreasing trend (Matrix, 2017). LEPH detected at concentrations greater than the BC Sch. 3.2 criteria in 1 of 312 samples (less than 1 percent of samples). Exceedance is anomalous, as was preceeded by 8 samples with nondetect concentrations and followed by 17 samples with nondetect concentrations. Therefore, there is low potential for uptake of elevated concentrations considering the overall data set for LEPH.
Lithium	2.69	mg/L	--	--	--	nc	Naturally occurring, low toxicity.
Magnesium	562	mg/L	--	--	--	nc	Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Manganese	5.99	mg/L	--	0.05	--	**120**	HI >1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Nickel	0.128	mg/L	1.5	0.17	0.49	0.09	HI ≤ 1. Average concentrations less than the Lowest Water Standard.
Nitrate (as N)	216	mg/L	400	3	--	0.54	HI ≤ 1. Average detected concentration (8.1 mg/L) less than the Lowest Water Standard of 10 mg/L.
Nitrate and Nitrite - N	135	mg/L	400	--	--	0.34	HI ≤ 1. Average detected concentration (2.1 mg/L) less than BC MOE Lowest BC Schedule 3.2 Standard of 10 mg/L
Phenanthrene	0.8	µg/L	3	0.4	920	0.27	HI ≤ 1. PAHs generally not considered mobile. Sporadic detections, likely related to sediments in the groundwater sample.
Potassium	19	mg/L	--	--	--	nc	Naturally occurring, low toxicity.
Quinoline	3.4	µg/L	34	--	--	0.1	HI ≤ 1. Elevated SDL only.
Selenium	0.0388	mg/L	0.02	0.000001	0.063	**1.9**	HI > 1, sporadic detections noted in annual report. No increasing or decreasing trend (Matrix, 2017). Concentrations greater than BC Sch. 3.2 in only 2 of 268 samples (less than 1 percent of samples). Both samples were collected from wells located immediately west of the existing landfill cells. Subsequent sampling events in both wells (total of 5 samples) indicates concentrations less than the BC Sch. 3.2 criteria. Therefore, there is low potential for uptake of elevated concentrations considering the overall data set for selenium.
Silicon	7.45	mg/L	--	--	--	nc	Naturally occurring, low toxicity.
Sodium	836	mg/L	--	--	2300	0.36	HI ≤ 1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Strontium	6.97	mg/L	--	--	--	nc	Naturally occurring, low toxicity.
Sulphate	3530	mg/L	4290	--	--	0.82	HI ≤ 1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Thallium	0.05	mg/L	0.003	--	0.51	**16.7**	HI > 1. Elevated SDL only. Max detected less than ON MOECC.
Titanium	0.14	mg/L	1	--	--	0.14	Naturally occurring, low toxicity.
Uranium	0.092	mg/L	0.085	0.015	0.42	**1.1**	HI >1. Naturally occurring (background) (Golder, 2007; EBA, 2009; NLR/AE, 2012; Matrix, 2014)
Volatile Petroleum Hydrocarbon (VPH) [h]	100	µg/L	1500	9800	750	0.067	HI ≤ 1

Table 4-11. Human Health Secondary Screening - Country Foods Groundwater Source

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Groundwater Protective of Terrestrial Plants and Wildlife Contact (Assumed Protection from Aquatic Life Standards)				
COC	**Max Concentration [a.]**	**Units**	**BC Schedule 3.2 Standard - AW [b.]**	**AEP [c.]**	**ON MOECC [d.]**	**Average Hazard Index [e.]**	**Comment**
Xylenes, Total	100	µg/L	300	2900	4200	0.33	HI ≤ 1. Elevated SDL only.

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] BC CSR Reg. 375/96 Schedule 3.2 Standards for Aquatic Life.

[c.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* . Table B-3, Groundwater Remediation Guideline Values for Residential/Parkland Land Use - All Water Uses. Aquatic Life, Coarse.

[d.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Groundwater Components for Potable Water Scenario; All Land Uses; Coarse Textured Soil; GW3.

[e.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values.

[f.] Carbon range (C) C19-C32 spans the carbon range associated with CCME PHC F3. PHC F3 values selected as an approximation of EPH C19-32 and LEPH C19-C32.

[g.] Carbon range (C) C10-C19 spans the carbon range associated with CCME PHC F1, F2, and F3. Lowest value of PHC F1, F2, and F3 selected as an approximation of EPH C10-C19 and LEPH C10-C19.

[h.] Carbon range (C) C5-C9 spans the carbon range associated with CCME PHC F1. PHC F1 values selected as an approximation of VPH.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

Bold indicates HI greater than 1.

Table 4-12. Risk Evaluation for Country Foods – Groundwater Source

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Country Foods (Groundwater Source) - Construction Stage			
Land Users/First Nations	Low	Low	Low or Unlikely
Country Foods (Groundwater Source) - Operation Stage			
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.4.3 Surface Water Source

As shown in the CSM for country foods (Figure 4-6), it is possible that vegetation in the surface water discharge area would uptake the discharged surface water via root systems. This vegetation may subsequently be consumed by wildlife which in turn may be consumed by land users and First Nations receptors. Eight COPCs were identified in surface water based on the preliminary screening, of these, there are 5 metals COPCs, which have the potential to bioaccumulate in pant and wildlife tissue. Similar to the approach taken for groundwater (Section 4.2.4.2), concentrations of these COPCs were compared to the BC CSR Schedule 3.2 Freshwater Aquatic Life Standard and similar criteria from other jurisdictions (Table 4-13) to provide a preliminary evaluation of the potential risks to human receptors from ingestion of terrestrial vegetation in contact with discharged surface water.

Based on this assessment, one COPC (manganese) has an HQ greater than 1. However, this chemical is surface water was retained on the basis of a single anomalous value from 2014. Concentrations of manganese have typically been lower or nondetect based on the surface water monitoring program. Since elevated concentrations of manganese in overland flow (surface water) are not consistently present and available for plant update, this COPC poses a low risk to human receptors from this pathway.

The COPCs with HQs less than 1, but which have the potential to bioaccumulate (that is, metals) were also assessed as the potential risk from bioaccumulation is not considered in the selected screening criteria:

- Silver was retained as a COPC based on elevated detection limits in surface water. Risks from this COPC would not be expected as it has not been positively identified as being present in groundwater.
- Thallium was retained on the basis of a single anomalous value from 2014. Concentrations of thallium are typically non-detect based on the surface water monitoring program. Since elevated concentrations of thallium in overland flow (surface water) are not consistently present and available for plant update, this COPC poses a low risk to human receptors from this pathway.
- Titanium is naturally occurring and generally regarded to be non-bioaccumulating and of low toxicity to humans through the ingestion pathway.

Land Users, including First Nations

- Hazard is low; based on the data provided, the COPCs measured in surface water (from overland flow) not appear to be present at levels which would be of concern for the country foods pathway.
- Exposure is low; the existing surface water monitoring program will be applied to the proposed Project to detect any impacts to water before it is discharge to the ground. The foraging range of wildlife and of humans consuming country foods is much larger than the areas where water is discharged and water is not discharged unless it meets the BC CSR Schedule 3.2 Standards.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-14).

Table 4-13. Human Health Secondary Screening - Country Foods Surface Water Source

Screening Level Human Health Risk Assessment, Tervita Silverberry Landfill, British Columbia

			Groundwater Protective of Terrestrial Plants and Wildlife Contact (Assumed protection from Aquatic Life Standards)				
COC	**Units**	**Max Concentration [a.]**	**BC Schedule 3.2 Standard - AW [b.]**	**AEP [d.]**	**ON MOECC [e.]**	**Average Hazard Index [f.]**	**Comment**
Ammonia	µg/L	50	3700	--	--	0.01	HI ≤ 1
Bismuth	µg/L	200	--	--	--	nc	Naturally occurring, low toxicity.
Manganese	µg/L	210	--	50	--	**4.20**	HI >1. Retained based on an anomalous concentration from 2014, concentrations typically less than BC Sch. 3.2 or non-detect.
Oil & Grease	µg/L	5000	--	--	--	nc	Elevated SDL only.
Silicon	µg/L	7490	--	--	--	nc	Naturally occurring, low toxicity.
Silver	µg/L	0.05	--	--	100	0.001	HI ≤ 1. Elevated SDL only.
Thallium	µg/L	2	3	--	510	0.7	HI ≤ 1
Titanium	µg/L	129	1000	--	--	0.13	HI ≤ 1. Low toxicity.

[a.] Column lists the greater of the Maximum Detected Concentration and the Maximum Nondetect Concentration.

[b.] BC CSR Reg. 375/96 Schedule 3.2 Standards for Aquatic Life.

[c.] Health Canada. 2017b. *Guidelines for Canadian Drinking Water Quality - Summary Table.* Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch. Table 2. Chemical and Physical Parameters.

[d.] Alberta Environment and Parks (AEP). 2016. *Alberta Tier 1 Soil and Groundwater Remediation Guidelines* . Table B-2, Groundwater Remediation Guideline Values for Agricultural Land Use - All Water Uses. Potable.

[e.] Ontario Ministry of the Environment and Climate Change (ON MOECC). 2011. *Rationale for the Development of Soil and Ground Water Standards for Use at Contaminated Sites in Ontario* . Groundwater Components for Potable Water Scenario; All Land Uses; Coarse Textured Soil; GW1.

[f.] Average Hazard Index is equal to Max Concentration/BC Standards. If a BC Standard was not available the Average Hazard Index is equal to Max Concentration/Average of Available Screening Values.

Notes:

Shading indicates Max Concentration is greater than the screening criteria identified.

Table 4-14. Risk Evaluation for Country Foods – Surface Water Source

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Country Foods (Surface Water Source) - Construction Stage			
Land Users/First Nations	Low	Low	Low or Unlikely
Country Foods (Surface Water Source) - Operation Stage			
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.5 Air

Tail-pipe emissions of contaminants such as NO_x, PM, SO_2, and CO are expected during construction of the proposed Project due to the temporary use of dozers, trucks, excavators, and compactors. Additionally, dust can be generated through movement and handling of soils and gravel, resuspension of dust from unpaved roadways, and dust suspended to air though wind erosion of open storage piles. The air quality effects of construction emissions are expected to be temporary, localized, and reversible, meaning that when the construction work stops, ambient concentrations in the area are expected to return to pre-construction levels. It is not anticipated that levels of CACs will exceed BC AAQOs at the property line or at any sensitive receptors further downwind. It is not expected that future operational emissions from equipment required to maintain the proposed Project will be significantly different than emissions currently released at the Facility.

Workers

- Hazard is low to medium; inhalation of polluted air can cause adverse health effects. Emissions and generation of dust are expected to be greater during the construction stage (medium) compared to the operations stage (low).
- Exposure is low; elevated emissions are expected to be short-term during the construction stage and localized to the immediate vicinity of heavy equipment. All construction equipment will adhere to low-emission Tier 4 engine specifications. Emissions will return to pre-construction limits during the operations stage.
- Therefore, risk is low/unlikely and low, for the construction and operation stages, respectively, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-15).

Land Users, including First Nations

- Hazard is low; based on the data provided, CAC levels will be within the BC ambient air quality guidelines at the property line during both the construction and operation stages.
- Exposure is low; since CAC levels will be within the BC ambient air quality guidelines at the property line, air quality within the Air Quality RAA will be expected to be similar to existing regional conditions.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-15).

Table 4-15. Risk Evaluation for Air

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Air Quality - Construction Stage			
Workers	Medium	Low	Low

Table 4-15. Risk Evaluation for Air

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Land Users/First Nations	Low	Low	Low or Unlikely
Air Quality - Operation Stage			
Workers	Low	Low	Low or Unlikely
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.6 Noise

Construction noise levels were estimated based on simultaneous operation of several pieces of equipment expected to be used during cell preparation. This equipment is only expected to be used during daytime hours. The noise levels are conservatively expected to attenuate to less than 55 dBA within 1 km of the Project Footprint and will not affect sensitive receptors to levels greater than BC noise guidelines. The noise effects of construction are expected to be temporary, localized, and reversible.

Workers

- Hazard is low to medium; excessive noise can cause hearing loss or nuisance. Noise is expected to be louder during the construction stage (medium) compared to the operations stage (low).
- Exposure is low; workers must comply with occupational health and safety requirements (for example, the use of PPE).
- Therefore, risk is low/unlikely and low, for the construction and operation stages, respectively, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-16).

Land Users, including First Nations

- Hazard is low; noise levels are expected to be less than 55 dBA within the Acoustic Environment LAA (that is, a 1-km radius extending outwards from the Project Footprint boundary).
- Exposure is low; there may be land users, including First Nations, within the Acoustic Environment LAA on an intermittent basis and a limited number of users within the Acoustic Environment RAA (that is, a 5-km radius extending outwards from the Project Footprint boundary). The noise levels within the Acoustic Environment LAA during the construction stage are expected to be within BC noise guideline acceptable levels; therefore, the levels within the RAA will also be acceptable.
- Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-16).

Table 4-16. Risk Evaluation for Noise

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Noise - Construction Stage			
Workers	Low	Medium	Low
Land Users/First Nations	Low	Low	Low or Unlikely
Noise - Operation Stage			
Workers	Low	Low	Low or Unlikely

Table 4-16. Risk Evaluation for Noise

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.2.7 Naturally Occurring Radioactive Materials

Based on the screening process for NORMs completed in Section 3.2.3, comparisons of estimated annual worker doses to Health Canada limits indicated a low risk to workers. A potential risk to the public was identified; however, the screening process in Section 3.2.3 assumed that receptors are present at the Facility fenceline for 24 hours per day and 365 days per year, which is not the case. To assess a more reasonable exposure level for the public (that is, land users and First Nations) based on existing/future conditions, it was assumed that a receptor is present at the Facility fenceline for approximately 1 hour per month (equivalent to 12 h/a). Table 4-17 presents the re-evaluation of the public for this scenario.

Table 4-17. Revised Estimated Annual Radiation Doses from the Existing Facility for the Public

Statistic	Radiation Level (mSv/h)	Relevant Receptor	Estimated Exposure (h/a)	Estimated Annual Dose (mSv/a)
Fenceline - Maximum	1.5E-04	Public	12	1.8E-03
Fenceline - Minimum	2.0E-05	Public	12	2.4E-04
Fenceline - Median	9.0E-05	Public	12	1.1E-03

Notes:

Bold = value greater than Effective Dose Limit of 1 mSv/a for the Public

Underline = value greater than Dose Constraint of 0.3 mSv/a for the Public

Estimated Annual Dose (mSv/a) = Radiation Level (mSv/h) x Estimated Exposure (h/a)

Considering this exposure scenario, the estimated annual dose to the public is well below the Effective Dose Limit and Dose Constraint levels set by Health Canada (2011).

The Facility has existing mitigation measures in place that will be applied to the proposed Project to prevent NORMs from impacting human receptors. These measures include: dust suppression measures to minimize the dust generated from vehicular traffic; air filter monitoring at the perimeter to evaluate whether NORMs are present in dust and, if so, if the dust is leaving the Facility; screening of incoming waste streams to ensure that the maximum radioactive NORM concentrations per the *EMA* Permit are not exceeded; radiation level surveys conducted on a monthly basis from select interior and perimeter fence locations; and employees wear dosimeter badges to track exposure.

Workers

- Hazard is low; the radiation levels of the NORMs accepted at the Facility are relatively low compared to other sources of radiation, but a hazard is still present when exposure is possible at levels greater than background. Hazard is considered low during both the construction and the operations stages.
- Exposure is low; workers must comply with occupational health and safety requirements (for example, the use of PPE and wearing dosimeters). Mitigation measures such as dust suppression and various monitoring programs for NORMs are in place. Exposure is low during both the construction and operations stages.

- Therefore, risk is low or unlikely considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-18).

Land Users, including First Nations

- Hazard is low; radiation levels are lower near the perimeter of the Facility and will be similar for the proposed Project.
- Exposure is low; there are no land users, including First Nations within the Terrain and Soils LAA (that is, Project Footprint); however, there may be First Nation traditional land use within the Terrain and Soils RAA (that is, a 1-km radius extending outwards from the Project Footprint boundary). Therefore, risk is low or unlikely, considering the hazard-exposure interaction matrix (Figure 4-2 and Table 4-18).

Table 4-18. Risk Evaluation for Naturally Occurring Radioactive Material

Exposure Pathway[a]	Hazard Level	Exposure Level	Predicted Risk
NORMs - Construction and Operation Stages			
Workers	Low	Low	Low or Unlikely
Land Users/First Nations	Low	Low	Low or Unlikely

[a] Decommissioning or abandonment is considered equivalent to the construction pathway for this assessment.

4.3 Occupational Health and Safety Risk Assessment

The use of legislated requirements and industry-accepted best practices are key components for maintaining construction worker health and safety during the various construction and operations activities. Strict adherence to safety regulations, safety protocols and industry-accepted best practices (for example, the use of task hazard analysis, implementation of programs for confined spaces, site access, site and building security, traffic control, waste management, use of PPE, or industrial hygiene) is key to reducing exposures and controlling worker health and safety risks.

Mitigation implemented during construction activities such as noise mitigation, dust mitigation, spill prevention and proper storage and management of fuels and chemicals are considered to be sufficient to protect human health during proposed Project construction in the Project Footprint.

4.4 Uncertainty Assessment

This qualitative assessment of the risk of adverse effects of the proposed Project on the Human Health VC is based on an understanding of how the proposed Project would affect the three components of risk. Where information was available for environmental concentrations of COPCs, assumptions about the nature of the potential hazard and potential receptor exposure were made to qualitatively estimate the level of risk from proposed Project activities. However, data gaps exist and additional data would reduce the uncertainties inherent in the assumptions selected in this assessment. Additional data may also support a quantitative assessment of the health risks using the same assessment framework of examining hazards and exposure levels. The following assumptions influence the assessed potential for risks:

- Industry-accepted best practices will reduce or eliminate potential releases of COPCs to the environmental media, thus eliminating sources in media for exposure. If reduction or elimination of potential releases is not effective then risks could be higher.

- Health and safety requirements during construction will reduce or prevent exposure to COPCs already present or potentially released into the environment. If reduction or prevention of exposure is not effective then risks could be higher.
- The nature, type and magnitude of identified COPCs released during the operations phase of the proposed Project meet the regulatory requirements for emissions. If COPCs are different or if releases are higher than expected, new potential risks may be present or the risks to identified COPCs could be higher.
- The proposed Project is unlikely to affect the nature, type and magnitude of COPCs in soil, water, or country foods.

SECTION 5

Conclusions

Based on the CSMs and data and information available, this qualitative SLHHRA predicts that there are not significant risks of adverse health effects to human receptors from the proposed Project. All pathways are predicted to have risks that are low or unlikely.

SECTION 6

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James Sprenger, QPRA, CCEP CChem

HUMAN HEALTH RISK ASSESSMENT

James specializes in conducting human health and ecological risk assessments (HHERA) and guides and implements strategic monitoring and management plans leading to closure. He routinely prepares risk assessments for both regulatory acceptance and due diligence, and collects, analyzes, and reviews site-specific data. On the Gas Plus Project in Alberta, he assessed risk factors for the LNAPL-contaminated site and helped implement a risk-based RAP. Additionally, he performs defined risk assessments, most notably for hydrocarbon-impacted soils, and uses scientifically defensible measures to address hydrogeological issues, including developing toxicological exposure models and databases and incorporating biostatistics and quantitative bioassay (toxicity tests), to implement effective alternative cleanup objectives. James applies this experience to help prepare an RMP that meets NEB guidelines for your Site.

EDUCATION/QUALIFICATIONS

MS, Courses in Occupational and Environmental Health/Biostatistics, University of Toronto

BS, Biochemistry, University of Waterloo

REGISTRATIONS/CERTIFICATES

Canadian Certified Environmental Practitioner (CCEP), Specializations: Site Assessment, Reclamation, and Environmental Manager

Chartered Chemist (CChem), Ontario Association of the Chemical Profession in Ontario (ACPO)

Qualified Person for Risk Assessment (QPRA), Ontario Regulation (O.Reg.) 153/04, Ontario Ministry of the Environment, Conservation, and Parks (MECP), 2004

QPRA, Saskatchewan

OTHER

- Years of Experience: 27
- Office Location: Toronto, Ontario

Relevant Project Experience

Risk-based Soil and Groundwater Remediation, Edmonton, Alberta

Client: Confidential Client

Title: Senior Risk Assessor

Scope/Description: Performed remedial investigation, risk assessment, risk management, remedy selection, and design and construction activities at an industrial site containing chlorinated hydrocarbons. Managed site-specific risks and used new Alberta Environment Tier 1 and Tier 2 guidance to establish cleanup goals based on industrial land use.

West Don Lands, Toronto, Ontario

Client: Ontario Infrastructure and Lands Corporation (IO)

Title: Lead Risk Assessor (QPRA) and Human Health Risk Assessment (HHRA) Lead

Scope/Description: Revitalizing the largest brownfield site currently under development at a former industrial and commercial site serving as the Pan American Athletes' Village (PAAV). Conducting scope on an aggressive schedule to secure environmental approvals required prior to infrastructure construction by development partners. Performing site characterization, risk assessment (RA), remedial option feasibility studies (ROFSs), remediation, and risk mitigation measures (RMMs). Developed risk-based concentrations for each parcel to support development of soil barriers as an RMM. Conducted field investigations and prepared multiple Phase I and Phase II environmental site assessment (ESA), ROFS, and RA reports in parallel to meet development schedule. Reports complied with Ontario Regulation (O. Reg.) 153/04 under the *Environmental Protection Act*, as amended by O. Reg. 511/09, to obtain Records of Site Condition (RSCs) for

properties prior to development. Coordinated a team of 20 HHRA staff to complete 8 RA reports on an accelerated schedule while engaging with multiple stakeholders on numerous technical issues. Additionally, serving as key RA contact for ecological risk assessment (ERA), ESA, and Risk Management teams, liaising with teams to confirm consistency across concurrent development of multiple report sections. Currently, acting as the third-party Ontario Ministry of the Environment (MOE) Qualified Person (QP) to audit compliance with Certificates of Property Use (CPUs) and RAs during RMMs implementation. Selected by the Canadian Urban Institute for the 2011 Brownie Award due to brownfield project redevelopment innovation and environmental sustainability.

Closure Plans of NAPL Sites, Northern Manitoba and Saskatchewan

Client: Canadian National Rail

Title: Senior Technical Consultant and Peer Reviewer

Scope/Description: Peer reviewed risk management plans associated with risk-based closure of former rail yard sites located in northern geographies with non-aqueous phase liquid (NAPL) present on historical sites. Other consultants had previously assessed permafrost and other geological characteristics. Supported assessment by providing review and feedback on technical and regulatory aspects of due diligence assessments under Manitoba's *Contaminated Sites Remediation Act* and Saskatchewan's *Environmental Management and Protection Act*.

Gas Plus Remediation Project, Bow River, Calgary, Alberta

Client: Alberta Environment and Parks

Title: Senior Technical Consultant and Human Health Risk Assessor

Scope/Description: Remediated soil, bedrock/groundwater, and LNAPL-contaminated hydrocarbon plumes on commercial and residential properties contaminated due to a leak at former service station. Performed senior technical consultancy for HHRA/vapour intrusion to develop and review soil vapour and indoor air sampling at residential properties affected by a gasoline and diesel petroleum hydrocarbon plume. Peer reviewed site-specific, risk-based guidelines developed for use at site. Reviewed reports prepared to document pilot tests and vapour sampling results. Interpreted health of hydrocarbon concentrations in vapour and indoor air samples. Also supplied human health risk assessment guidance related to soil, groundwater, soil vapour, and indoor air sampling programs. Interpreted field data (soil structure, hydrogeology, geology, contaminant fate and transport mechanisms) and supported site remedial action plan implementation.

Enhanced Brownfield Screening Level Risk Assessment, Whitehorse, Yukon

Client: Government of Yukon

Title: Senior Risk Assessor

Scope/Description: Prepared a screening level human health and ecological risk assessment of metals and hydrocarbons in soil and groundwater on a site historically contaminated with hydrocarbons from former storage tanks. Screened direct and indirect exposure pathways using risk-based criteria. Assessed soil and groundwater to indoor air pathway for potential (human) residential receptors through an enhanced approach using probabilistic risk assessment methods in advance of designing buildings for future use at site. Quantified site-specific data concentrations, depths, and other parameters to assess potential need for vapour intrusion mitigation measures to manage risk.

Water Vulnerability Assessments, 22 Wing North Bay, Ontario, and 17 Wing Detachment Dundurn, Saskatchewan

Client: Canadian Department of National Defence

Title: Senior Technical Consultant

Scope/Description: Used risk-based (human and ecological health risk) approach to review interpretation of hydrogeological, hydrological, and contaminant of concern (COC) information to determine source water vulnerability. Assessed site COC, including Per- and Polyfluoroalkyl Substances (PFAS), hydrocarbons, metals, VOCs, PAHs, and nutrients. Applied statistical analysis to environmental chemistry data to characterize background surface water and groundwater chemistry, to delineate well head protection areas and intake protection zones, to determine and rank threats to water supply quantity and quality, and to develop monitoring and management plans for ongoing source water protection.

Port Lands Community-based Risk Assessment, Toronto, Ontario

Client: Waterfront Toronto

Title: Senior Consultant, Senior Reviewer, and Risk Assessor

Scope/Description: Performing senior consultancy, senior review, strategy, risk assessment, statistics, and modelling for the Port Lands, a 356-hectare (880-acre) urban area. Re-establishing historical wetlands and re-constructing mouth of the Don River. Preparing an area-wide risk assessment and interacting with various agencies, public and private (Toronto Port Lands Company, Ontario MOE, City of Toronto, Toronto Conservation Authorities), and the public. Site COCs are comprehensive, including VOCs, PAHs, PHCs, metals, and inorganics. Conducting mobility and exposure assessment, including for free-phase hydrocarbon presence. Assessing human and ecological risks associated with exposure to soil and groundwater during and following river mouth reconstruction process. Performing significant soil reuse via options analysis for remediation and other sustainability metrics. Employing risk-based intervention values as trigger values to support soil management and risk management decisions. Interpreted historical and recent large-scale Phase II data spatially and statistically for exposure and risk assessment of various pathways, including vapour intrusion and indoor air. Also, performed bioassays (toxicity tests) to support hydrocarbon aquatic reference values development.

Appendix 12
British Columbia Environmental Assessment Office Working Group Government Agency Comments during Pre-Application Stage for the Proposed Project Expansion

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Table 1. Government Agency Comments Table

ID #	Comment Date (i.e. 22-May-16)	Reviewer Name / Agency	Reviewer agency/organization	Subject (See "instructions" tab)	Document	Document section	Comment (Include Memo reference as applicable)	Proponent Response/Change/Action (include memo reference if applicable)	Memo number (if applicable)	Response Date
NH-1	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please indicate in which section traffic-related injuries will be captured.	Traffic-related accidents will be captured when there is transportation/mobilization of workers to site. Transportation of workers to site occurs during the construction, operation and closure/reclamation project activities. Traffic-related injuries will be captured via the Accidents and Malfunctions section.	N/A	23-Jan-16
NH-2	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document	Section 4.2	The "Subcomponent" section includes "dust, odours, and emissions from combustion." This should also include landfill gas and air contaminants from non-combustion sources, or provide justification for their exclusion.	Rationale for their exclusion will be included in Table 3 of Section 4.2 of the Valued Components Document. Silverberry does not accept municipal solid waste therefore landfill gas generation is minimal. Hydrocarbons associated with the waste tend to be heavier end and do not rapidly volatilize. To prevent dust roads and waste will be wetted.	N/A	23-Jan-16
NH-3	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document	Section 4.2	The "Rationale" section noted that "landfill gas generation is expected to be minimal." Northern Health inquires what the justification is for this. An exposure pathway should not be excluded without justification.	Rationale for exclusion will be elaborated on in Table 3 of Section 4.2 of the Valued Components Document. Silverberry does not accept municipal solid waste therefore landfill gas generation is minimal. Hydrocarbons associated with the waste tend to be heavier end and do not rapidly volatilize.	N/A	23-Jan-16
NH-4	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document	Section 4.2	Please assess the potential for volatilization of chemicals from soil and surface water into the air, or provide justification for exclusion of this from assessment.	Rationale for exclusion will be elaborated on in Table 3 of Section 4.2 of the Valued Components Document. Silverberry does not accept municipal solid waste therefore landfill gas generation is minimal. Hydrocarbons associated with the waste tend to be heavier end and do not rapidly volatilize.	N/A	23-Jan-16
NH-4a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please provide further clarification on the specific constituents of waste that will be accepted at the site (with consideration of volatility). We recognize that the hydrocarbons accepted may tend to be heavier, but also note that VOCs may be contained in oil and gas waste (e.g. BTEX) and we would expect further justification that there would be no vapour emissions associated with waste (with consideration of reaction/degradation by-products). We are encouraged by Tervita's commitment to developing an air quality study proposal; Northern Health looks forward to further discussions and collaborative efforts.	The types of waste accepted at the Silverberry landfill include hydrocarbon contaminated soils and sands, sulphur contaminated soil, salt contaminated soils, and other wastes associated with the oil and gas industry. Examples of other waste that may be accepted include construction and demolition materials such as cement, absorbents and desiccants, and drill cuttings and other sources of industrial waste. There may be VOCs such as BTEX emitted from the site in minor quantities based on the nature of the waste accepted. The scope of work presented to the Working Group for the landfill gas emissions study is designed to quantify a full suite of VOCs including BTEX through a summa canister collection and analysis through appropriate lab methods designed for identification and quantification of petroleum fuel and waste emissions. The use of a portable monitor will aid in the identification of emission hotspots and help focus the location(s) the lab samples will be taken.	N/A	3-Mar-16
NH-5	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Key indicators listed are ambient air concentrations of PM and NOx. Please provide a rational on how these were selected; other contaminants should not be excluded without justification. Northern Health expects the HHRA to be completed in accordance with Health Canada's guidelines.	Emissions from site will largely be from internal (diesel) combustion engines. According to BC Air Quality - Pollutant Vehicles Emit, Nitrogen Oxides (NO_x) and Fine Particulate Matter ($PM_{2.5}$) are found in larger amounts in emissions from diesel engines than gasoline engines. Most of the combustion at site will be associated with the diesel engines of Silverberry's heavy equipment.	N/A	23-Jan-16

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ID #	Comment Date (i.e. 22-May-16)	Reviewer Name / Agency	Reviewer agency/organization	Subject (See "instructions" tab)	Document	Document section	Comment (Include Memo reference as applicable)	Proponent Response/Change/Action (include memo reference if applicable)	Memo number (if applicable)	Response Date
NH-5a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please clarify whether PM10 emissions will be assessed. Also, please provide further justification as to why the potential for SO2 emissions was excluded from the assessment.	PM10 emissions will not assessed, but are represented by the PM2.5 indicator. The equipment will use low sulfur diesel and therefore, it is not expected that SO2 will be a substantial source of emissions from the on-site equipment. Further the ambient air quality criteria for another combustion source contaminant NO2 is more stringent than that for SO2 (188 ug/m3 for NO2 versus 200 ug/m3 over a 1-hour average), therefore focusing the impact assessment to NO2 will still provide a good indication of air quality effects based on equipment tailpipe emissions. No SO2 emissions are expected from the landfill itself.	N/A	3-Mar-16
NH-6	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please consider health service impacts under the community services VC.	Tervita will incorporate health service impacts under the community services VC.	N/A	23-Jan-16
NH-6a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Thank you; Northern Health is satisfied with this response.	Tervita appreciates the positive feedback and looks forward to a continuing relationship with Northern Health.	N/A	3-Mar-16
NH-7	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		As noted previously, the HHRA should follow Health Canada's guidance documents and the documents included as attachments. The HHRA technical report should be a stand-alone section of the Application. The HHRA should begin with a qualitative screening level risk assessment that describes the potential hazards, human receptors and exposure pathways and determines the presence of complete exposure pathways that will require further assessment in the quantitative HHRA. For exposure pathways to be deemed incomplete, a rationale for exclusion must be included.	The facility is undergoing an amendment to the existing Environmental Assessment Certificate. Health risks have not changed since the original application, except a permit amendment to accept NORM material. Health risks will be addressed under the Health Pillar of the Valued Components. All regulatory guidance will be reviewed and considered when drafting the application.	N/A	23-Jan-16
NH-7a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Given that the proposed increase in waste capacity is substantial, we maintain that the proposed amendments require further assessment of potential impacts to health. Further, human health risk assessment methodologies, standards and guidelines, and expectations have changed substantially since the original assessment was completed (in 2002), as has the availability of toxicity data. We look forward to further discussions with Tervita regarding the human health risk assessment to be completed.	Information on human health receptors and pathways was given to the EAO for circulation to the Working Group. Tervita looks forward to working with Northern Health on refining scope for a Human Health Risk Assessment through the dAAIR process.	N/A	3-Mar-16
NH-8	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document	Section 4.2	According to Health Canada's guidelines, HHRAs should consider the potential for the volatilization of chemicals from contaminated groundwater, surface water and soils and consider inhalation exposures. Otherwise, justification should be provided for the exclusion of this pathway from the assessment.	Rational for exclusion will be elaborated on in Table 3 of Section 4.2 of the Valued Components. Silverberry does not accept municipal solid waste therefore landfill gas generation is minimal. Hydrocarbons associated with the waste tend to be heavier end and do not rapidly volatilize. Surface water and groundwater monitoring since incorporation of the site hasn't indicated the presence of potentially volatile compounds present in the water.	N/A	23-Jan-16

Table 1. Government Agency Comments Table

ID #	Comment Date (i.e. 22-May-16)	Reviewer Name / Agency	Reviewer agency/organization	Subject (See "instructions" tab)	Document	Document section	Comment (Include Memo reference as applicable)	Proponent Response/Change/Action (include memo reference if applicable)	Memo number (if applicable)	Response Date
NH-8a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		See previous response (to row 2, 3 and 4 comments). The fact that surface and groundwater monitoring data has not indicated the presence of potentially volatile compounds in water does not indicate the absence of these compounds (compounds that readily volatilize may have evaporated from surface water/groundwater and soils such that they are not detected when sampling these media). We are encouraged by Tervita's commitment to developing an air quality study proposal; Northern Health looks forward to further discussions and collaborative efforts.	Comment acknowledged. Tervita has given an air study and soil study scope, human health receptor information and vegetation tissue sampling to the EAO for circulation to Working Group members. Tervita looks forward to Working Group member comments on the submitted documents.	N/A	3-Mar-16
NH-9	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		According to Health Canada's guidelines, HHRAs should also assess potential for impacts on human health due to the ingestion of produce, livestock, country foods or fish that has been contaminated from soil, water or air. Otherwise please provide justification for the exclusion of these pathways from assessment.	Rational for exclusion will be elaborated on in Table 3 of Section 4.2 of the Valued Components. Due to the lack of agriculture and food sources in the vicinity of the project and the low volatilization of accepted landfill materials there will be limited impact on human health due to the ingestion of produce, livestock, country foods or fish.	N/A	23-Jan-16
NH-9a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		See previous comments; we would expect further rationale that the potential for the volatilization of accepted landfill materials will be low. As per our correspondence, we also ask for more detail on the types of agriculture, hunting and trapping in the area. Please provide further justification that there are no pathways for human consumption of contaminated foods. We look forward to further discussion around the tissue collection studies that may be completed (and encourage the completion of such a study), and ask that linkages be made to the human health section (with reference to health-based criteria).	Comment acknowledged. Tervita has given an air study and soil study scope, human health receptor information and vegetation tissue sampling to the EAO for circulation to Working Group members. Tervita looks forward to Working Group member comments on the submitted documents.	N/A	3-Mar-16
NH-10	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Northern Health notes that other indicators for the HHRA should include hazard quotients and incremental lifetime cancer risk.	See Row 7 for a discussion of the HHRA.	N/A	23-Jan-16
NH-11	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		The health risk assessment should include both 'toxicity-based', and 'persistence and bio-accumulation-based' criteria.	See Row 7 for a discussion of the HHRA.	N/A	23-Jan-16
NH-11a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We would expect the AIR to provide more detail on the HHRA methodology to be utilized. We look forward to further discussions with Tervita regarding the human health risk assessment methodologies that will be used.	Comment acknowledged. Tervita will provide detail on HHRA methodology in the dAAIR and will work with Northern Health on human health risk assessment methodologies.	N/A	3-Mar-16
NH-12	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Potential for traffic related injuries, impacts to public health in the case of malfunctions or emergencies and other public health risks should be included in the assessment.	See Row 7 for a discussion of the HHRA.	N/A	23-Jan-16
NH-13	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		The potential for traffic related injuries should be also considered as part of the assessment and should encompass the traffic corridors associated with the project.	Traffic-related injuries will be captured via the Health Pillar under Human Health.	N/A	23-Jan-16
NH-13a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please clarify if traffic-related injuries will be captured under both sections indicated: the “Health Pillar under Human Health” and “Accidents and Malfunctions” sections?	Traffic related injuries will be captured in the Application under "Accidents and Malfunctions", and will be linked back to the Health pillar in the assessment.		

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ID #	Comment Date (i.e. 22-May-16)	Reviewer Name / Agency	Reviewer agency/organization	Subject (See "instructions" tab)	Document	Document section	Comment (Include Memo reference as applicable)	Proponent Response/Change/Action (include memo reference if applicable)	Memo number (if applicable)	Response Date
NH-14	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Northern Health questions the described air quality RSA will allow potential impacts to health to be sufficiently assessed. Please provide justification for the selection of the 5km radius.	The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (particulate matter), and to a lesser extent various minor combustion tailpipe emissions. This choice of study area dimensions is expected to be sufficient to capture the area of maximum impact for such low lying releases. Also, although no modeling is planned for the proposed Project, the extent of the study area is consistent with current British Columbia Air Dispersion Modelling Guidance (see Section 6.1 of Guideline for Air Quality Dispersion Modelling in British Columbia, BC MOE, October 2006).	N/A	23-Jan-16
NH-14a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Thank you; Northern Health is satisfied with this response. We ask that if the air quality study identifies potential impacts beyond this boundary, consideration be given to extending the LSA/RSA for this VC. Additionally, please clarify whether traffic corridors will be included (with respect to dust emissions), or provide a rationale (either in the VC document or application) for excluding this from the assessment.	Comment acknowledged. Traffic corridors within the RSA will be considered for their impact to dust emissions. Traffic volumes are not expected to increase along local traffic corridors due to the expansion, therefore dust emissions are expected to remain consistent.	N/A	3-Mar-16
NH-15	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Northern Health questions the described surface water/groundwater RSA will allow potential impacts to health to be sufficiently addressed. Provide justification for the selection of the 15km radius/bounded by the Blueberry River. What about the potential for persistent chemicals to have health impacts downstream? The Blueberry River is part of the Beaton River drainage and flows into the Peace River (which is a common drinking water source).	Potential effects of the Project on surface water and groundwater are considered within the context of the Local Study Area (LSA) and the Regional Study Area (RSA). The LSA is the geographic area in which direct interaction of the Project with surface water and groundwater is expected. The RSA is a larger area that provides context for the assessment of direct and cumulative adverse effects of the proposed Project, and is not the area within which direct Project effects are expected. Cumulative effects of the proposed Project with existing and reasonably foreseeable projects on surface water and groundwater are considered within the boundary of the RSA. The 15 km radius of the RSA is delimited by the Blueberry River, as the Project is not expected to act cumulatively on surface and groundwater with other existing or reasonable foreseeable projects beyond the Blueberry River. The LSA is considered to be the extent in which direct potential effects could occur (i.e., the geographic area in which direct interaction of the Project with surface water and groundwater may occur). The LSA boundary is defined as a 30 m radius extending outwards from the Project Footprint, including associated physical works and activities. Management measures to contain contaminated water within the facility will ensure that no effects to surface or groundwater occur beyond the LSA, therefore, effects on the Blueberry River, or other watercourses beyond the LSA, are not anticipated. Ongoing management measures include surface and groundwater collection and monitoring to ensure potential waterborne contaminants do not enter the environment.	N/A	23-Jan-16

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NH-15a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Either in the VC document or in the application, please clarify why the project "is not expected to act cumulatively on surface and groundwater with other existing or reasonable foreseeable projects beyond the Blueberry River". Given that surface water runoff is discharged outside of the secure landfill area, we would ask that the LSA for surface water include downstream watersheds, or that justification be provided that contaminants would not be carried downstream (with consideration of the persistence of all constituents). We note that highly persistent contaminants may have health impacts far downstream from emission sources, and that some contaminants can cause health effects even at very low concentrations. Please provide further justification that "ongoing management measures" would be sufficient to "ensure potential waterborne contaminants do not enter the environment" (into groundwater), or consider extending the groundwater LSA. We would ask that historical groundwater monitoring data be referenced (either in the VC document or application) to support the conclusion that there will be no impacts to groundwater outside of the project footprint.	The application will provide information on the spatial boundary of each potential cumulative effect to surface water and groundwater, with rationale. Comment acknowledged. Tervita will provide justification and clarification on the impacts of discharged surface water on downstream watersheds. Tervita has committed to soils testing in the surface water discharge area to determine if contamination is present. Surface water is tested prior to discharge and is not discharged into a high water table or in the vicinity of surface water drainage. Comment acknowledged. Tervita will provide further justification in the application that mitigation measures prevent waterborne contaminants from entering the environment. Mitigation measures include a liner that will be constructed to prevent connectivity from landfill waste to groundwater. Historical groundwater monitoring data will be referenced in the application to support that there have been no groundwater impacts outside of the Project footprint, and groundwater monitoring will be continued during and after Project construction.	N/A	3-Mar-16
NH-16	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Description of baseline conditions should also characterize potential receptors, nearby water sources and historic usage of land.	The description of baseline conditions in the Application will include potential receptors, nearby water sources and historic usage of land.	N/A	23-Jan-16
NH-17	15-Dec-15	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Data collection appears to focus only on baseline information. How will potential effects be assessed and estimated using standard health risk assessment protocols.	The methodology for assessing potential effects will be captured in the draft Amendment Application Information Requirements document and reviewed by the EAO and Working Group at that time.	N/A	23-Jan-16
NH-17a	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We are aware of a document outlining Health Canada's guidelines for radiological risk assessment: Federal Contaminated Site Risk Assessment in Canada, Part VI: Guidance on Human Health Detailed Quantitative Radiological Risk Assessment (DQRARad). If this is found to be applicable, would ask that it be referenced in terms of evaluating risks to human health.	The MoE is going to review Tervita's Radiation Protection Plan (RPP) and then propose a scope for a Radiological Risk Assessment. In working with the MoE on a scope the *Federal Contaminated Site Risk Assessment in Canada, Part VI: Guidance on Human Health Detailed Quantitative Radiological Risk Assessment* (DQRARad) will be reviewed.	N/A	3-Mar-16
NH-18	10-Feb-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We are aware of a document outlining Health Canada's guidelines for radiological risk assessment: Federal Contaminated Site Risk Assessment in Canada, Part VI: Guidance on Human Health Detailed Quantitative Radiological Risk Assessment (DQRARad). If this is found to be applicable, would ask that it be referenced in terms of evaluating risks to human health.	The MoE is going to review Tervita's Radiation Protection Plan (RPP) and then propose a scope for a Radiological Risk Assessment. In working with the MoE on a scope the *Federal Contaminated Site Risk Assessment in Canada, Part VI: Guidance on Human Health Detailed Quantitative Radiological Risk Assessment* (DQRARad) will be reviewed.	N/A	3-Mar-16
NH-19	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We ask that this information is carried forward to the application as a Screening Level Risk Assessment and is expanded upon based on the findings of the soil, water, air and other assessments contained within the application.	Comment acknowledged.	N/A	6-Apr-16

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NH-20	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please confirm that the “provincial and federal guidelines” that will be used to assess surface water, air and soil quality will be health-based and will be clearly identified in the Health pillar.	Guidelines referenced will include, but not be limited to the following: • Canadian Environmental Quality Guidelines • Guidelines for Canadian Drinking Water Quality • British Columbia Contaminated Sites Regulation • British Columbia Waste Discharge Regulation • Guidance will be identified in the Amendment Application	N/A	6-Apr-16
NH-21	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We also note that it is stated in the Project Description that the project site will be “reclaimed to agricultural land”. Accordingly, we ask whether there is a potential for human consumption of contaminated foods during the closure and post-closure periods. Please include detail on the proposed timeline for reclamation (i.e. time before agricultural usage is initiated). Please identify any persistent contaminants that could accumulate in these agricultural products. We ask that this information is carried forward into the application.	Tervita would like to clarify this point in the Project Description. The landfill waste itself will not be reclaimed however, final cover upon closure will meet agricultural standards as provided in the Contaminated Sites Regulation. During closure and post-closure there is no intention to use the land for agriculture thus there should be low potential for consumption of contaminated food. After Tervita's closure and post closure commitments are complete (~25 years), the title of the property will be transferred to the crown as stipulated in Section 27(10)(b) of the Hazardous Waste Regulation. Tervita is not sure what the British Columbia government's intentions are after transfer of title.	N/A	6-Apr-16
NH-22	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Similarly, we ask that all potential future land uses are considered.	Comment acknowledged. Tervita will work with the Ministry of Environment to consider future land uses upon closure.	N/A	6-Apr-16
NH-23	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We ask that either here, or in the Application, further information is provided to justify that there are “no registered wells, aquifers or community watersheds near the proposed Project Area”. It should also be recognized that not all existing wells are registered; please ensure that any ground or surface water intakes in the vicinity of the site are identified. Information on receptor locations should be carried forward to the application.	Comment acknowledged. Tervita will ensure that any groundwater or surface water intakes and receptors in the vicinity of the site are identified in the application.	N/A	6-Apr-16
NH-24	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Similarly to the potential for surface water NORM contamination, it should be recognized that surface water could be contaminated by metals contained in dust which also could “settle into surface water”.	Comment acknowledged. Rational under the VC component surface water will modified to acknowledge this concern.	N/A	6-Apr-16
NH-25	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		How were Potential Contaminants of Concern identified? Please include this information in the application. Accordingly, we ask that the application include a Screening Level Risk Assessment, that includes the screening of all potential contaminants (e.g. dioxins, furans, PCBs, VOCs, asbestos, etc.).	Potential contaminants of concern are chosen by reviewing historical waste profiles and its related chemical contamination, and through regulatory guidance. This information will be included in the application.	N/A	6-Apr-16

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NH-26	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		It is stated that a “potential, low probability pathway includes uptake of contaminated water by wildlife or vegetation, which is then consumed by land users and First Nations receptors”. We ask that the potential for the uptake of contaminants into the food chain (from soil, air and water) is further discussed based upon the findings of the surface water and soil quality assessments (as well as other relevant assessments). Please ensure that this information is carried forward to the application.	Comment acknowledged. The information will be included in the application.	N/A	6-Apr-16
NH-27	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		We ask that the Screening Level Risk Assessment in the application includes the potential for wildlife to enter the project vicinity (e.g. floating on ponds or grazing). We ask that information is also provided in the application on the controls that will be implemented to prevent wildlife, birds, and people from entering the waste storage areas (to prevent direct contaminant exposures or uptake into the food chain).	Comment acknowledged. This information will be included in the application.	N/A	6-Apr-16
NH-28	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		The information provided indicates how baselines will be collected. How will the effects assessment on these VCs be conducted and will there be consideration of follow-up monitoring?	After results of the initial studies are reviewed, the possibility of follow up monitoring can be discussed with the EAO and working group members. The assessment of effects will be detailed in the dAAIR document and sent for Working Group review.	N/A	6-Apr-16
NH-29	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		How will potential dust impacts be captured in the air quality study, considering that the Site may be a source of contaminant laden dust? Would soil sampling methodology be able to capture dust impacts or would this require specific sampling methodology? Please clarify if these study results are intended to not only form the baseline, but also to inform the project effects assessment (i.e. considering current risk to be representative of future risk)? If so, we note that any limitations in the study methodology may be of added concern.	Dust is not captured in the air quality study. The air quality study focuses on landfill gas emissions. However, particulate matter (PM) is captured under the Air Quality VC and will be looked at during the application as having the potential to impact air quality. Soil sampling will give an indication of any off-site impacts. If impacts are found, Tervita will have to do further investigation to determine what the source of the impact is (air versus surface water). The study results are intended to inform the project effects assessment as current condition information. The potential effects of the current facility are one factor that will feed into the determination of potential effects of the capacity replacement.	N/A	6-Apr-16
NH-30	16-Mar-16	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		It is noted that the soil data will be compared to the BC CSR Schedule 4 Standards. We ask that other applicable CSR Schedules (e.g. Schedule 5) are also included in the assessment.	Comment acknowledged. Applicable criteria from Schedule 5 will also be reviewed.	N/A	6-Apr-16

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NH-31	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		Please provide further clarification on how the results of the studies will be used to inform the baseline and effects assessments. Will there be consideration of follow-up monitoring? It is not clear how the Proponent intends to integrate these studies into the broader dAAIR and Environmental Assessment work plan. We ask that detail is provided on how the results of these studies will be used to inform further assessment, and in particular, to inform the Human Health Risk Assessment (HHRA) work plan.	The results of the air and soil studies will be used as a reference to assess the effects of the capacity replacement of the Silverberry Landfill. For example, if soil monitoring at the discharge area indicates that no contamination is present, the probability and magnitude of the potential effect of soil contamination from water discharge in the Amendment Application may be labelled low. However, since Silverberry Landfill operates under a current Environmental Assessment Certificate, no follow-up monitoring of the existing landfill is required at this time. Follow-up monitoring of the capacity replacement project will be discussed in the mitigation presented in the Amendment Application. The HHRA is considered to be a Screening Level Human Health Risk Assessment (SLHHRA). The current information under review is the scope of the Air and Soil studies and therefore, more information around the SLHHRA will be presented to the Working Group in the draft Amendment Application Information Requirements. However, the SLHHRA is expected to include all available information around current conditions, including information collected during Project field work.	N/A	25-Jul-16
NH-32	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		We ask that detail is provided on how the results of these studies will be used to inform further assessment, and in particular, to inform the Human Health Risk Assessment (HHRA) work plan. Specifically, we have questions around water quality, and how the results of the soil study of the Surface Water Drainage Area will be used to inform the assessment of potential effects from the Project on surface water.	The current information under review is the scope of the Air and Soil studies and therefore, more information around the SLHHRA will be presented to the Working Group in the draft Amendment Application Information Requirements. In addition, the scope of the assessment to air and soils will be determined during the Amendment Application Information Requirements stage. The information collected around the potential effects of the current Silverberry Landfill will be used to inform the effects assessment in the Amendment Application with regard to the prediction of potential effects that the capacity replacement project may have. Tervita acknowledges that soil contamination, if present, may travel to surface water and the assessment of potential effects to the Surface Water Valued Component will consider the Water Quality Parameters Key Indicator for the activities associated with the capacity replacement. In addition, mitigation will be provided based on the level of potential effects predicted.	N/A	25-Jul-16
NH-33	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		If the results of these studies will be incorporated into the HHRA, we expect that Health Canada's Guidance Documents1 on HHRAs are adhered to in the development of sampling methodologies and the assessment of risk. We suggest that a similar work plan be developed for the HHRA to ensure that our understanding and expectations for the HHRA are aligned.	The SLHHRA is expected to include all available information around current conditions, including information collected during Project field work. The current information under review is the scope of the Air and Soil studies and the Project is currently in the draft Valued Components review stage. More information around the SLHHRA will be presented to the Working Group in the draft Amendment Application Information Requirements and the work plan will be reviewed and revised at that time.	N/A	25-Jul-16

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NH-34	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		Please clarify how radiological contaminants will be assessed (including those contained in dust, deposited in soil and emitted to air). Will these contaminants be captured in separate studies?	As a part of the Radiological Protection Plan (RPP) at Silverberry, NORM air monitoring occurs. Historical results can also be shared with Northern Health upon request. Information regarding results of NORM air monitoring will be provided in the application, and the scope of the SLHHRA will be developed during the draft Amendment Application Information Requirements phase. NORMs will be assessed as a subcomponent under the Human Health Valued Component in the Amendment Application.	N/A	25-Jul-16
NH-35	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		Given that contaminant air emissions may vary over time, please provide justification that the sampling time point can be expected to be representative of worst case emissions. How do the waste loads received at the site vary throughout the year? Please provide a rationale that “maximum emissions from the site are expected” in July. For example, what if the days used to sample in July are cold, resulting in reduced air emissions? Further, considering the current slowdown of oil and gas activity in the region, please provide detail on how current waste loads compare to those when oil and gas development is operating at full capacity in the region. Will follow-up monitoring be completed if the rate of waste deposition increases?	Historically, July is the hottest month in the Fort St. John area. Temperature will vary throughout the month but the monitoring will provide a sufficient snapshot to determine the gases being produced at Silverberry Landfill. The temperature of the air survey will be logged and reported so it can be compared against historical mean temperatures in the region. Waste loads are fairly consistent throughout the year, produced from the exploration of oil and gas (drilling muds and inverts). Depending on spills in the area, waste may see some variability. However, most spill material is crude oil/hydrocarbon impacted. Follow-up monitoring is not expected as waste deposition increases. As waste deposition increases, capacity is used, which results in progressive capping of the landfill. Capping reduces generated gas from reaching the surrounding environment.	N/A	25-Jul-16
NH-36	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		Please provide a detailed rationale for the use of only 1 ambient air sample to test the landfill gas composition, and justification that this can be considered representative of worst case emissions. It should be recognized that reviewers would likely be more comfortable in the study results with an increased number of samples and sampling frequency.	The purpose of the air sampling plan submitted is to characterize the chemical nature of the gases being emitted from the landfill using a standard laboratory TO-15 VOC scan. One sample taken at a “hotspot” location (as described in the proposal) should provide adequate information about the nature of the contaminants emitted. The purpose of the sampling plan is not to quantify the emission rates from the landfill.	N/A	25-Jul-16
NH-37	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		It is stated that “VOCs will be compared to ambient air standards and guidelines”. How will the results of this study be applied in the HHRA? Please clarify whether and which health-based guidelines will be utilized. We ask that in the HHRA it is recognized that the BC Ambient Air Quality Objectives may not be safe thresholds for health effects (e.g. for PM) and that some sensitive individuals may still be affected below these objectives.	The SLHHRA is expected to include all available information around current conditions, including information collected during Project field work. The current information under review is the scope of the Air and Soil studies and the Project is currently in the draft Valued Components review stage. More information around the SLHHRA will be presented to the Working Group in the draft Amendment Application Information Requirements and the work plan will be reviewed and revised at that time.	N/A	25-Jul-16

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NH-38	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		It is stated that measured contaminant concentrations will be compared to "British Columbia (if available) and federal regulatory guidance". Please clarify how the results of these studies will be applied to the HHRA, and ensure that health-based guidelines are used to account for all potential exposure pathways.	The SLHHRA is expected to include all available information around current conditions, including information collected during Project field work. The current information under review is the scope of the Air and Soil studies and the Project is currently in the draft Valued Components review stage. More information around the SLHHRA will be presented to the Working Group in the draft Amendment Application Information Requirements and the work plan will be reviewed and revised at that time.	N/A	25-Jul-16
NH-39	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		Please include additional detail on how Potential Contaminants of Concern were identified.	For the air study, the contaminants of concern for the portable gas monitor were selected as being typical of a landfill site. However, the portable measurements are primarily being used to identify an emissions "hotspot", where a canister collection will then be done. The lab analysis will use a US EPA TO-15 method that will provide an assessment of a large number of VOC contaminants including BTEX, chlorinated compounds, alkanes, and alkenes, and others. Since the purpose of the study was to determine the chemical nature of the emissions, it was decided to use the TO-15 method, which can identify a large number of compounds. For soil, potential contaminants of concern were identified based on previous site investigations of surface water on site (Nichols Environmental, 2016) and chemical characteristics of hazardous and non-hazardous waste streams accepted at the facility.	N/A	25-Jul-16
NH-40	7-Jul-16	Melisa Aalhus	Northern Health	Human Health	Air/Soil Study Scope		We ask for a rationale that the proposed soil sampling depths will adequately capture Project impacts.	Soil sampling depths were selected based on expectation of event-based rather than continuous surface water runoff as source for potential contaminants. Impacts to vegetation were a concern, so sampling within the rooting zone was also a consideration in determining sampling depths.	N/A	25-Jul-16

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NH-41	4-Nov-16	Melisa Aalhus	Northern Health	Human Health	Air Study		It was our understanding that the study methodology was designed to assess the constituents of landfill gas (in particular, to test for the presence VOCs). Please refer to responses received from the Proponent to NH comments on the study proposal: • Since the purpose of the study was to determine the chemical nature of the emissions, it was decided to use the TO-15 method, which can identify a large number of compounds" • The purpose of the air sampling plan submitted is to characterize the chemical nature of the gases being emitted from the landfill using a standard laboratory TO-15 VOC scan. One sample taken at a "hotspot" location (as described in the proposal) should provide adequate information about the nature of the contaminants emitted. The purpose of the sampling plan is not to quantify the emission rates from the landfill." Accordingly, the reviewer is confused as to why the report drew conclusions about contaminant concentrations as compared to objectives, and as to why it was concluded that additional monitoring is not warranted. It is our understanding that the methodology was designed to analyze the chemical composition of landfill gas, and not to draw conclusions about emission rates. We feel that an important conclusion of the study is the presence of a number of VOCs at detectable levels in the landfill gas.	Additional monitoring is not needed as the monitoring event provided an adequate snapshot to understand the chemical composition of landfill gas, collected during a warm summer day and at a location when/where emissions would be expected to be near maximum. The intent of the study was not to quantify emission rates for various VOCs, but it is important to understand its composition at facility boundaries.	N/A	21-Nov-16
NH-42	4-Nov-16	Melisa Aalhus	Northern Health	Human Health	Air Study		Recognizing that the 1-hour average Alberta AAQO for benzene is 30 ug/m^3 based on hematological effects, we note that the Alberta annual average AAQO is 3 ug/m^3 as based on carcinogenic effects. The benzene concentration could be lower than 30ug/m^3 outside of the project footprint "due to dispersion that would occur as the landfill gas migrates off-property". However, it is not clear how benzene concentrations are expected to vary over time, and it is of concern that the annual average AAQO (3ug/m^3) might be exceeded at public receptor locations. Why was the potential for chronic effects not considered?	The purpose of the study was to characterize the VOCs emitted from the landfill at a time and location when near maximum emissions might be reasonably expected. One of the samples, taken just above the landfill surface, was just at the Alberta 1-hour average AAQO of 30 ug/m3 and would be less than that concentration at any sensitive receptors. Over the course of a year, when emissions over the winter period are reduced, and winds are blowing in different directions; the concentrations at any one sensitive receptor is likely to be much less than 3 ug/m3 based on CH2M's experience with similar fugitive type emissions. Tervita notes that the nearest residence to the landfill is over 1 km away. The means through which health effects will be addressed will be reviewed by the Working Group in the draft Amendment Application Information Requirements (dAAIR).	N/A	21-Nov-16

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NH-43	4-Nov-16	Melisa Aalhus	Northern Health	Human Health	Air Study		Insufficient rationale was provided for the air quality criteria that were used. We recognize that BC may not have applicable criteria, however it is not clear why criteria from specific jurisdictions were selected (preferentially Alberta Air Quality Objectives and Guidelines and then Ontario Ambient Air Quality Criteria). For the HHRA that is to be completed, we recommend a table is provided to compare any applicable criteria from key agencies (Health Canada, US EPA IRIS, California OEHHA, WHO, Texas CEQ, etc.), and which includes information on the health basis of each criteria and the year of its development.	Comparing to nearby provinces that have standards/objectives for the specific VOC measured is a reasonable way to gauge the magnitude of the concentrations captured in the canisters. As applicable criteria are available through Canadian provincial agencies, CH2M does not recommend the comparison to US federal or state objectives. However, CH2M can include comparison to Northern Health's agency of choice (e.g., Alberta Air Quality Objectives). The methodology for the health assessment to be completed will be included in the dAAIR which will be reviewed by the Working Group, including Northern Health.	N/A	21-Nov-16
NH-44	4-Nov-16	Melisa Aalhus	Northern Health	Human Health	Air Study		It should be recognized that some contaminants can work cumulatively (e.g. impacting the same target organ), and that there can be compounded effects from multiple exposure pathways. Why were additive effects not considered?	The results of the air study are intended to report on the findings of the field work, not provide an effects assessment. The atmospheric environment as well as human health will be assessed in the Environmental Assessment Certificate Amendment Application, which will consider potential cumulative and additive impacts.	N/A	21-Nov-16
NH-44a	22-Nov-16	Melisa Aalhus	Northern Health	Human Health	Air Study		We have reviewed Tervita's responses and are still confused about the purpose of the study. If the purpose was to determine whether VOCs should be included as a COPC in the AIR then this is sufficient. The results show that a number of VOCs are present in landfill gas at high enough levels to be of concern (in particular, the benzene concentration at the hotspot was at the 1-hour threshold). Based on this, VOCs definitely need to be included as a COPC in the AIR. We ask that the VC document is revised to include VOCs as a Key Indicator for Air Quality and Human Health, or at least that VOCs are included in the AIR. The study definitely doesn't constitute an HHRA. It may form part of the baseline assessment, but they still will need to complete a proper baseline characterization of VOCs (with further monitoring and/or modelling) as well as an effects assessment of VOC emissions for the future landfill. Accordingly, the dAIR should include methodology for the completion of a more thorough effects assessment/HHRA for VOCs. When this methodology is being developed and assessed during the dAIR review, we ask that our comments on the Air Study are carried forward and considered	Tervita understands that the air study doesn't constitute an HHRA. The study was to understand the composition of landfill gas being generated at the landfill. Ongoing monitoring requirements will be discussed in the Draft Amendment Application Information Requirements (dAAIR). The draft Valued Components will also be edited to include VOCs as an indicator of air quality.	N/A	7-Dec-16

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NH-45	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		Our review of this report is limited by the fact that it is not yet clear how the Proponent intends to integrate these studies into the broader dAAIR and Environmental Assessment work plan, and in particular, how these results will inform the Human Health Risk Assessment (HHRA). The results of this study do not provide sufficient justification for the exclusion of dust deposition and surface water discharge as operable pathways within the HHRA that will be completed in the EAC Amendment Application. Further, as noted previously, for the purposes of the HHRA it should be ensured that Health Canada's guidance is adhered to for sampling methodologies and the assessment of risk (including sampling depths, screening criteria, etc.). It is our recommendation that the HHRA be conducted by a risk assessor with expertise and experience conducting human health risk assessments.	The results of the study are intended to report on the findings of the field work, not to provide an effect assessment. The environmental impact as well as human health will be assessed (using the study as support) in the Environmental Assessment Certificate (EAC) Amendment Application, which will consider cumulative and additive impacts. The studies scope and intent wasn't to provide justification for the exclusion from an HHRA. The study was performed to address working group concerns and help inform them on potential impacts listed in the draft Valued Components., therefore BC sampling regulations and guidelines were used. If a study is used to specifically inform the HHRA then Health Canada's guidance will be adhered to. Tervita will take into consideration the qualifications of each subject matter expert in developing the EAC Amendment Application.	N/A	1-Mar-17
NH-46	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		For the purposes of the HHRA, justification will need to be provided that the screening criteria used are protective of health. It should be recognized that CSR standards are intended for the remediation of contaminated sites. Accordingly, there are limitations in their application for environmental assessments in which a contaminated site is not being remediated.	If results from the study are used in the HHRA, justification will be provided.	N/A	1-Mar-17
NH-47	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		Further, there are currently no soil/sediment guidelines that are protective of human health for the country food pathway. It is common for risk assessors to screen sediment against CCME's human health-based soil quality guidelines and/or BC CSR standards but this is only acceptable for assessing the risk from direct contact. If there is a potential for the bioaccumulation of contaminants into the food chain, tissue modelling and/or sampling would be required to assess the risk to human health from the consumption of country foods.	Potential for bio-accumulation in the food chain, if applicable, will be addressed in the HHRA.	N/A	1-Mar-17
NH-48	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		Additional information is required to support the claim that sample locations for BH-9A and 10A, as well as 14A and 15A represent "undisturbed native areas". Based upon review of the maps provided in Appendix A, these locations are very close to the site. It will be important to accurately identify background soil concentrations in order to understand whether incremental changes in contaminant levels are occurring due to project activities. Historical sampling data from the site should also be considered (including data from the original EAC Application).	Further investigation for confirmation of background relative to site is taken under consideration.	N/A	1-Mar-17

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NH-49	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		It is stated that “it is determined that the measured boron concentrations are resulting from naturally occurring sources”. We expect that further justification is provided to support the conclusion that elevated boron concentrations are resulting from naturally occurring sources. While it is true that “the absence of other primary contaminants of concern for the facility (hydrocarbons) within the samples” could suggest that contaminants are not accumulating, we note the following: • Other factors such as the solubility of contaminants (such as hydrocarbons) may affect whether they are presence in leachate as well as whether they would persist in soils (and at what depth) • While the measured concentrations of many contaminants may currently be below the screening criteria, this does not indicate whether or not they are increasing due to project activities The reviewer would be interested in whether there are incremental changes occurring in contaminant concentrations in soil, as this would be more meaningful in understanding how the proposed expansion may impact contaminant levels. We note that this is of particular concern given that measured boron concentrations in soil are many magnitudes higher than the CSR AL standard of 2 mg/kg. Further information on background boron levels will be required.	Further investigation for confirmation of background relative to site is taken under consideration.	N/A	1-Mar-17
NH-50	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		Further assessment of barium (to determine if the elevated levels are due to project activities) is of particular interest, given that, as noted in the report, “the main source of materials accepted at the Facility come from the oil and gas industry activities, where barite is a common mud additive”. As noted above, while contaminant levels may be below the screening criteria employed, there may be incremental increases in contaminant concentrations in soil occurring due to project activities. Further, as noted previously, the screening criteria used are not protective of bioaccumulation in country foods. Additionally, it should be recognized that while some substances may not have been detected in soils (at the selected sampling depths), they may be present in surface water discharge and/or dust. For example, highly soluble substances might not accumulate in surficial soils, and may migrate to downstream environments. Similarly, some substances may be more readily taken up by wind and could be found at concentrations above air quality standards/criteria that would be protective of the inhalation pathway.	Thanks for taking the time to read the soil study. Tervita will take Northern Health’s comment regarding further investigation on the source of barite into consideration.	N/A	1-Mar-17
NH-51	26-Jan-17	Melisa Aalhus	Northern Health	Human Health	Soil Study		Until such time as additional information is provided on how this study will feed into the AIR and Environmental Assessment work plan (including the HHRA), it is difficult to complete a meaningful review of this report. We look forward to further discussions and collaborative efforts regarding potential impacts to human health.	The results of the study are intended to report on the findings of the field work, not to provide an effect assessment. The environmental impact as well as human health will be assessed (using the study as support) in the EAC Amendment Application, which will consider cumulative and additive impacts. Northern Health will have the chance to comment on the Draft Amendment Application Information Requirements (DAAIR) which will show how studies are being used and outline human health impacts in more detail.	N/A	1-Mar-17

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NH-52	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please ensure these guidance documents are referenced either here (in the VC Rationale Document) or in the AIR: • Evaluating Human Health Impacts in Environmental Assessments: Noise • Evaluating Human Health Impacts in Environmental Assessments: Air Quality • Evaluating Human Health Impacts in Environmental Assessments: Water Quality • Evaluating Human Health Impacts in Environmental Assessments: Radiological Impacts In general, please ensure that Health Canada's guidance is adhered to when selecting indicators for the Human Health VC.	Tervita will review the Health Canada guidance documents provided by Northern Health. If applicable, Tervita will reference them in the draft Amendment Application Information Requirements (dAAIR).	N/A	8-Aug-17
NH-53	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		If modeling studies show that there is a potential for effects to occur beyond the proposed spatial boundaries for a VC then these boundaries should be amended as appropriate. We ask that it is indicated either here or in the AIR that the spatial boundaries will be expanded if the assessment identifies a potential for effects to occur beyond these boundaries.	It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries. Tervita will provide this wording in the dAAIR document.	N/A	8-Aug-17
NH-54	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		4.1 Recommended Valued Components The document states that the key indicator for the Acoustic Environment VC will be "noise levels" (Table 2). Please ensure that the Health Canada's guidance for assessing noise effects is adhered to (including "Evaluating Human Health Impacts in Environmental Assessment: Noise" see the reference above). Accordingly, indicators of potential health affects related to noise should include noise complaints and long-term high annoyance.	Tervita will review the Health Canada guidance document provided by Northern Health and apply applicable criteria. Appropriate indicators for noise impacts on human health will be used.	N/A	8-Aug-17
NH-55	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		4.3 Spatial Boundaries for Valued Components It is stated that "no separate LSA defined" for the Air Quality VC. Please clarify what is meant by this statement. Does this proponent intend to define the LSA for the Air Quality based upon the effects assessment? Or will the LSA and RSA for air quality be the same? (i.e. a 10km radius)	The LSA and RSA for air quality radius will be the same at 10km.	N/A	8-Aug-17
NH-56	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		In addition, subcomponents for the Air Quality VC have been expanded to include emissions from the other sources (such as volatilization), and there could presumably be a potential for long or medium range transport of contaminants of potential concern. If the air quality study identifies potential effects beyond these boundaries, the LSA will need to be expanded. We ask that this is indicated either here or in the AIR.	It is standard practice for information gathered during each VC study and effects assessment to inform the understanding of the zone of influence, and therefore the LSA and RSA accordingly. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries. Tervita will provide this wording in the dAAIR document.	N/A	8-Aug-17

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NH-57	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Further will traffic corridors that are potentially affected by dust beyond the 5 km area be considered?	Beyond the 5km radius it is difficult to scientifically quantify dust effects from the proposed Project due to the active industry in the area. The Amendment Application is being submitted to assess the impacts of a potential capacity replacement of the existing Silverberry landfill. Therefore, the existing conditions adjacent to the capacity replacement site are an operational facility with similar operations. Mitigation on effects to air quality will be provided in the Amendment Application.	N/A	8-Aug-17
NH-58	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Is there potential for deposition to soil beyond the project footprint? As noted above, we ask that if the assessment identifies potential effects beyond these boundaries (e.g. through soil deposition) then that they are expanded. We ask that this is indicated either here or in the AIR.	It is standard practice for information gathered during each VC study and effects assessment to inform the understanding of the zone of influence, and therefore the LSA and RSA accordingly. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries. Tervita will provide this wording in the dAAIR document.	N/A	8-Aug-17
NH-59	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		Please provide a detailed rationale (either here or in the AIR) that a 1 km radius extending from the Project Footprint would allow effects to be captured. If the assessment indicates that effects may occur beyond the LSA then the boundaries will need to be expanded. Based on our previous correspondence, we understand that the closest permanent and temporary receptors will be captured (which may have different permissible noise levels)	It is standard practice for information gathered during each VC study and effects assessment to inform the understanding of the zone of influence, and therefore the LSA and RSA accordingly. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries. Tervita will provide this wording in the dAAIR document.	N/A	8-Aug-17
NH-60	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		The LSA for Human Health should be the maximum extent of the area encompassed by any VC LSA that might feed into the HHRA (including air quality, terrain and soils, and potentially country food pathways).	The LSA for Human Health encompasses the largest LSA for the VCs that have pathways to human health, including Air Quality, Terrain and Soils, Noise and Surface Water.	N/A	8-Aug-17
NH-61	17-Jun-17	Melisa Aalhus	Northern Health	Human Health	Draft Valued Components Document		In addition, we note that considering locations where people may be exposed to the highest concentrations of COPCs may be conservative approach. However, consideration should also be given to identifying areas where concentrations may be lower but where there may be people at a potentially greater risk (e.g. longer duration of exposure, such as permanent dwelling.) For instance, the surface and ground water LSAs are limited to a 500 m radius. However, drinking water intakes might be outside that area, and may be the point where receptors are at the greatest risk of exposure. Please ensure this is considered.	Tervita takes into account that more sensitive receptors may be present and they will be considered when Tervita is drafting the methodology for the assessment in the dAAIR and the effects assessment in the Amendment Application.	N/A	8-Aug-17
NH-62	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	General (and in Proponent's responses to comments NH-53, NH-56 and NH-59)	*"It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries. Tervita will provide this wording in the dAAIR document."* (As per the Proponent's responses to comments NH-53, NH-56 and NH-59)¶The reviewer could not locate wording in the dAAIR indicating that spatial boundaries will be expanded if the assessment identifies a potential for effects to occur beyond these boundaries. Please clarify where this can be found.	Tervita will add this wording to Section 3.2.1 of the dAAIR.	N/A	20-Apr-18

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NH-62a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)		Thank you, NH is satisfied with this response.	Tervita appreciates Northern Health's timely review of the dAAIR.	N/A	2=Sep 5
NH-63	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 4.3 Acoustic Environment	The proposed Key Indicator for the acoustic environment is “noise levels”. Additional indicators of potential health effects relating to noise should include complaints, change in the percent highly annoyed (%HA), sleep disturbance and interference with speech comprehension as applicable (as per Health Canada’s *Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise*).	The noise level indicator is brought over from the Valued Component Document. Tervita does not intend to change or add key indicators at this time.	N/A	20-Apr-18
NH-63a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)		As per NH-67, health-based indicators will need to be used to screen and assess noise-related effects, in accordance with the methodology described in Health Canada's Guidance for Evaluating Human Health Impacts in Environmental Assessment: Noise. As noted below, the dAAIR should indicate that relevant health based indicators will be used to assess effects to the Human Health VC.	Health based indicators to screen noise related effects were used in the SLHHRA. Tervita does not intend to change or add key indicators in the VCs or dAAIR at this time.	N/A	5-Sep-18
NH-63b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Thank you, NH is satisfied with this response.	Tervita looks forward to working with Northern Health on the Application.	N/A	1-Nov-18
NH-64	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	General (and in Proponent's response to comment NH-61)	*“Tervita takes into account that more sensitive receptors may be present and they will be considered when Tervita is drafting the methodology for the assessment in the dAAIR and the effects assessment in the Amendment Application.”* (As per the Proponent's response to comment NH-61) Please clarify how the locations of sensitive receptors have been considered in drafting the methodology for assessment in the dAAIR? For example, the LAAs for surface and ground water are limited to a 500 m radius from the site. This area may represent the area with the highest COPC concentrations. However, drinking water intakes may be outside that area and may represent the locations where receptors are a greater risk of exposure. These locations should therefore also be captured in the LAA.	There are no proposed changes to the LAA boundaries at this time. The locations of sensitive receptors will be considered on a case by case basis depending on the potential for, and severity of, Project interactions with that receptor. Receptors identified beyond the specific LAA with the potential to be adversely affected by the Project will be included in the assessment, either through an adjustment to the LAA boundary (see NH-62), or by expanding the assessment area to the RAA.		
NH-65	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 4.1.1.1 Spatial Boundaries (Terrain and Soils)	The LAA for terrain and soils is defined as the Project Footprint. However, the Soil Sampling study conducted August 2016 suggested potential off-site soil contamination associated with surface water discharge and dust deposition. Accordingly the LAA for soils should be expanded to capture these potential effects. It should be recognized that although COPC concentrations may be expected to be lower outside the project footprint, there may be a greater risk of exposure due to the presence of receptors, greater exposure durations, etc.	There are no proposed changes to the LAA boundaries at this time. Potential effects on soils that extend beyond the Project Footprint will be encompassed under the RAA, which is a 1 km radius extending from the Project Footprint.		

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NH-65a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)	dAAIR 4.1.1.1 Spatial Boundaries (Terrain and Soils)	We stand by our original comment and continue to feel the LAA for soils should be expanded beyond the project footprint to capture direct effects associated with the Project as identified in the Soil Sampling Study (as a result of surface water discharge and dust deposition)	Tervita does not intend to expand the LAA for soils at this time.		
NH-65b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Outstanding.	In order to address these concerns, Tervita has added the following information under Section 3.2.1 of the dAAIR:"It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."		
NH-66	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 4.2 Air Quality	As per the Proponent's response to Comment NH-5a, we understand that PM2.5 emissions will be assessed. We recommend that this be clearly indicated in the AAIR. We recommend that PM10 be assessed as well, particularly given that PM emissions will include combustion and dust sources, which would include both the finer (PM2.5) as well as coarser fractions (PM10). While we are aware that PM2.5 is associated with a greater burden of disease, exposure to PM2.5-10 (particles greater than or equal to 2.5 um and less than or equal 10 um in diameter) has been shown to be associated with health effects, including increased cardiovascular and respiratory morbidity and mortality (EPA Integrated Science Assessment for Particulate Matter, 2009).	Wording in the dAAIR will be changed to clarify that PM2.5 emissions will be assessed. Tervita notes Northern Health's recommendation regarding PM10, but at this point PM 2.5 emissions are only being assessed.		
NH-66a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)	dAAIR 4.2 Air Quality	Thank you. Please clarify where this can be found in the updated dAAIR, as the reviewer could not locate this wording in Revision 4. Please also note that a detailed rationale for the exclusion of any contaminants of potential concern (PM10) will be required in the Human Health Effects Assessment.	Tervita apologizes for the oversight and will include the methods of data collection to 4.2 to the next version of the dAAIR.		
NH-66b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Please clarify on which page this is captured. This comment is outstanding; we continue to recommend that PM10 is assessed as well if dust is a main emission source.	Changes have been made to the third bullet in the dAAIR in Section 4.2 to now read: • Ambient air concentrations of particulate matter (PM10), nitrogen oxides (NOx), and other landfill gases;		
NH-66c	23-Nov-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		The only issue we've identified as outstanding is we'd like to see both PM2.5 and PM10 assessed (not just PM10 as indicated in response to NH-66b. We appreciate the inclusion of PM10, but given that health effects assocaited with both finer and coarser fractions of particulate, we feel it will be important that both are considered.	Changes have been made to the third bullet in the dAAIR in Section 4.2 to now read: "Ambient air concentrations of particulate matter (PM10 and PM2.5), nitrogen oxides (NOx), and other landfill gases;		

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NH-67	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 8.1 Human Health	*"The KIs that will be used to measure the potential adverse effects of the proposed Project on the Human Health VC include:* • Indicators under the Terrain and Soils, Air Quality, Acoustic Environment, Vegetation, Fish and Fish Habitat, Wildlife and Wildlife Habitat and Surface Water VCs as applicable;" • Please ensure health-based indicators and guidelines are used for the purposes of the health assessment. Should a detailed quantitative HHRA be required, KIs should include Hazard Quotients (HQs) and Incremental Lifetime Cancer Risk (ILCR).	In the HHRA, assessment identification of Contaminants of Potential Concern (COPCs) were looked at in the following receptors: surface water, groundwater, soil, country foods, air, noise and naturally occurring radioactive material. If COPCs were identified, relevant health based indicators will be used to assess their effect on human health.		
NH-68	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 8.1.2 Existing Conditions	*"Interpretation and analysis of results obtained by air quality, noise, and water quality specialists as they relate to human health."* Please ensure that sampling protocols for environmental data intended to feed into the HHRA adhere to health-based guidance for sampling programs (e.g. Health Canada Federal Contaminated Site Risk Assessment in Canada guidance for HHRAs), which may be quite different from sampling methodologies for assessing environmental VCs.	Sampling already done adheres to the BC Field Sampling Manual and BC Laboratory Manual. Sampling done was to identify environmental concerns, but the data can still be reviewed to identify COPCs and potential human health impacts.		
NH-68a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)	dAAIR 8.1.2 Existing Conditions	Thank you. Please note that data and statistics used for the health assessment will need to align with health-based guidance. This should be clearly captured in the dAAIR.	The methods of data collection listed in 8.1.2 has references for Health Based Guidance that will be used in the dAAIR.		
NH-68b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Thank you, NH is satisfied with this response.	Tervita looks forward to working with Northern Health on the Application.		
NH-69	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 8.1.2 Existing Conditions (and Proponent's response to comment NH-16)	*"The description of baseline conditions in the Application will include potential receptors, nearby water sources and historic usage of land."* (As per the Proponent's response to comment NH-16) The methods of data collection to characterize existing conditions are summarized in S. 8.1.2. As per the Proponent's response to NH-16, this should also include data collection to characterize potential receptors, nearby water sources and historic usage of land.	Tervita will add these methods of data collection to Section 8.1.2		
NH-69a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)		The reviewer could not locate this change in section 8.1.2 of version 4 of the dAAIR. Please clarify.	Tervita apologizes for the oversight and will include the methods of data collection to 8.1.2 to the next version of the dAAIR.		
NH-69b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Thank you, please clarify on which page this is captured.	The following bullet has been added to 8.1.2: • Description potential receptors, nearby water sources and historic usage of land		

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NH-70	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 8.1.2 Existing Conditions	We appreciate the inclusion of a Screening Level Human Health Risk Assessment (SLHHRA) approach. However, depending on the results of the SLHHRA (i.e. whether operable exposure pathways are identified, screening criteria are exceeded, etc.), a detailed quantitative HHRA may be necessary to understand health effects associated with the Project. This should be clearly indicated in the AAIR.	Once the results of the SLHHRA are shared to the working group and feedback is received, Tervita will make a determination on whether a detailed quantitative HHRA will done.		
NH-70a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)		The need for a detailed HHRA cannot be ruled out at this stage in the EA. We appreciate the early opportunity to review the SLHHRA; however, a fulsome review of the screening level HHRA will be required, likely with several rounds of comments and information requests (depending on the quality of the SLHHRA), to confirm that a detailed HHRA is not required. Please update the dAAIR to indicate that a detailed HHRA will be conducted if deemed necessary based on the screening level HHRA.	The Screening Level Human Health Risk Assessment (SLHHRA) was conducted to provide a conservative evaluation of potential risks to human health associated with the proposed Silverberry Secure Landfill Expansion (the Facility). The SLHHRA evaluated chemical concentrations in applicable environmental media (i.e., soil, groundwater, leachate, and surface water) and compared analytical data against the applicable BC CSR Standards (BC MOE, 1996). The BC CSR Standards are derived using conservative exposure assumptions to be sufficiently protective of the general public within each land use category. Air, noise and naturally occurring radioactive materials (NORMs) have also been evaluated in the SLHHRA using applicable BC and Health Canada criteria. To identify contaminants of potential concern (COPCs), the SLHHRA compared the maximum measured concentration or highest detection limit (if greater than the maximum measured value) of chemical parameters against the most stringent BC CSR Standard for each environmental media to provide the most conservative approach to characterize on-site conditions. The risk assessment paradigm specifies that for a risk of adverse effects to human health to be plausible, three components are required to be present: a stressor (e.g., COPC in environmental media) at a concentration or magnitude that can present a hazard; an exposure pathway for the stressor to contact the receptor; and, a human receptor. The SLHHRA qualitatively evaluated the level of risk by considering potential receptor of concern (i.e., workers, land users, First Nations), the potential hazard of COPCs in an environmental media and the level of exposure. Finally, the SLHHRA considered occupational health and safety requirements and risk management measures currently in place at the Facility that will mitigate risks of adverse effects to human health. The conclusions of the SLHHRA is likely to be consistent with the conclusions of a quantitative human health risk assessment. Therefore, a quantitative human health risk assessment is not warranted at this time.		
NH-70b	31-Oct	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Please see NH-71b below. As per our previous comment, a detailed review of the SLHHRA by the working group will be required before it can be confirmed that a quantitative HHRA is not required. We continue to stand by our initial comment and advise that the AAIR be updated to indicate that a quantitative HHRA will be conducted if necessary.	Tervita will be able to send the SLHHRA to NH for review so we can collaboratively determine if an HHRA is required for the Application.		

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NH-71	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	dAAIR 8.1.3 Potential Effects	This section should indicate how potential effects to human health will be assessed and estimated. As per the Proponent's response to comment NH-29, we understand that "the potential effects of the current facility are only one factor that will feed into the determination of potential effects of the capacity replacement". What other methodology is proposed for assessing potential effects to human health? As per previous correspondence with the Proponent (in response to comments NH-17 and NH-28), we understood that the methodology for assessing potential effects would be captured in the dAAIR. Currently, a Human Health Risk Assessment approach is only proposed for existing conditions, presumably based on the assumption that effects associated with the expansion would be similar to current effects. However, for certain pathways, effects might be additive (e.g. effects to soil quality as a result of dust deposition). A detailed rationale would be required that this approach allows a conservative estimation of health effects through all pathways. We feel that at this early stage in the process, the need for a detailed assessment of predicted conditions cannot be ruled out; the AAIR should indicate that an HHRA of future conditions will be conducted if determined to be necessary to understand Project-related health effects.	Once the results of the SLHHRA are shared to the working group and feedback is received, Tervita will make a determination on whether a detailed quantitative HHRA will done.		
NH-71a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)	dAAIR 8.1.3 Potential Effects	We stand by our original comment; a scientifically defensible rationale will need to be provided that future impacts will be the same as existing impacts before this can be ruled out. For example, evidence is required that existing and predicted impacts to soil as a result of dust deposition and surface water discharge would not be additive. A Human Health Risk Assessment of predicted conditions associated with project activities will need to be conducted if determined to be necessary to understand health effects. Please update the dAAIR to ensure this is reflected (i.e. A Human Health Risk Assessment of future conditions will be conducted if deemed necessary to characterize health effects associated with the Project). As noted above, a fulsome review of the screening level HHRA will be required, likely with several rounds of comments and information requests (depending on the quality of the SLHHRA), before it can be confirmed that a detailed HHRA is not required. The dAAIR continues to be vague and lack detail on assessment methodology. Please note that if methodological concerns are identified during Application screening/review this could cause significant delays, detailed information requests and make it difficult to meet the 180 day review period.	Tervita appreciates Northern Health's concerns. Tervita will work with Northern Health to address concerns on the SLHHRA before determining whether an HHRA will be required.		
NH-71b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Thank you, we are pleased with this response. We would prefer that this be captured in the AAIR (i.e. that not only an SLHHRA will be completed but also a detailed quantitative HHRA if determined necessary to characterize health effects). Currently section 8.1.2 indicates that only a screening level HHRA will be completed.	The following comment has been added to 8.1.2. "An HHRA report if deemed required after review of the SLHHRA."		

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NH-72	19-Apr-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 1)	General	Please note that we expect that the HHRA is conducted by a professional with training/experience/qualifications in health risk assessment, recognizing that health assessment principles and methodologies can be very different from those used to assess environmental effects.	The HHRA will be conducted by an experienced HHRA professional(s)		
NH-72a	15-Aug-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 4)		Thank you. We ask that the HHRA and/or Human Health Effects Assessment includes a professional statement indicating the risk assessor's qualifications and experience in conducting HHRAs relevant to the purposes of supporting an EA.	Tervita can add a statement of qualifications to the SLHHRA.		
NH-72b	31-Oct-18	Melissa Aalhus	Northern Health	Human Health	draft Amendment Application Information Requirements document (version 5)		Thank you, we are pleased with this response.	Tervita looks forward to working with Northern Health on the Application.		
FLNRO-1	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Groundwater	Draft Valued Components Document		Surface Water - new water legislation requires ground water works to be authorized by the FLNRO. Ground water wells and monitoring may require water authorizations. Water Sustainability Act. Ground water Monitoring - Contact Yin Jun at the Omnica Region - Ground water specialist	Tervita will review the Water Sustainability Act and contact Yin Jun to determine if the existing groundwater monitoring network requires authorization. Tervita would like to note that the Ministry of Environment will review the groundwater monitoring network during the Waste Discharge Permit Amendment for Silverberry Landfill.	N/A	23-Jan-16
FLNRO-2	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Terrestrial Vegetation	Draft Valued Components Document		Terrestrial Vegetation - VC should address plant species at risk and first nation culturally important species and potential for transplant for rare and important species found.	Comment acknowledged. The 'plant species of concern' subcomponent will address plant species at risk and First Nation culturally important species. Mitigation procedures to rare and First Nation culturally important plant species will be addressed in the application.	N/A	23-Jan-16
FLNRO-3	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Surface Water	Draft Valued Components Document		Surface water - analysis of discharge of storm water + contaminated water will need to be developed - a plan on disposal of water and emergency overflow (flood event)	Due to the existing landfill in operation Tervita has developed plans to analyze, control and discharge storm water. Details of surface water controls will be provided in the application.	N/A	23-Jan-16
FLNRO-4	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Fish and Fish Habitat	Draft Valued Components Document		Fish and Fish Habitat - note that drainages may be regulated under the Water Act and WSA if they meet the definition of a stream regardless of fish presence or value; therefore, proponent needs to ensure drainages are not streams as defined under water legislation.	Comment acknowledged. Tervita will review the WSA and Water Act and address applicable mitigation measures in the application.	N/A	23-Jan-16
FLNRO-5	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Surface Water	Draft Valued Components Document		Surface water - land ownership - although a stream is found on private land - the water and stream/bed channel is vested property to the crown; therefore, if a stream does not appear on a desktop exercise, a drainage having stream characteristics whether flowing or not any time of the year can be a regulated stream under water legislation. Proponent should ensure surface water surveys address stream classification in the field to meet legislative standards.	Comment acknowledged. Tervita will review applicable legislation to ensure surface water is classified properly.	N/A	23-Jan-16
FLNRO-6	8-Jan-16	Mike D'Aloia	Forestry Land and Natural Resource Operations	Groundwater	Draft Valued Components Document		Ground water - should references to existing monitoring well information be included in methods of data collection and assessment and monitoring plan.	Existing well information will be provided in the monitoring plan which will be detailed in the application.	N/A	23-Jan-16

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PRRD-1	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Groundwater	Draft Valued Components Document		I noted that groundwater is not marked off as a candidate VC. Please clarify whether the construction of the expansion goes below ground for the first cells and if so, is it deep enough to interact with groundwater.	Groundwater is identified as a Candidate VC. The new cells will be built below grade and shallow groundwater is present at site. In 2002 the Ministry of Environment granted Tervita an exemption to the Special Waste Regulation because "…the natural geology and designs exceed the minimum requirements of the Special Waste Regulation with respect to groundwater protection." Tervita will continue to work with the Ministry of Environment to ensure the landfill design minimizes risk to groundwater. (Please note that the Special Waste Regulation has now been replaced by the Hazardous Waste Regulation)	N/A	23-Jan-16
PRRD-2	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Surface Water	Draft Valued Components Document		Is the surface water retention pond sized adequately to accommodate potential increased loading from seasonal run-off emitted from the new footprint and prevent risk of overflow? Should a KI for a retention volume be included here?	Tervita will meet the requirements of the Hazardous Waste Regulations for Secure Landfills. Section 27(5) states: "The owner of a secure landfill must design, construct and maintain a) a system capable of preventing water from draining onto any cells of the secure landfill, and b) a system to collect and control water draining from any cells of the secure landfill during a storm with a magnitude that is exceeded, on average, only once in 25 years. A KI for retention volume is not considered necessary at this time.	N/A	23-Jan-16
PRRD-3	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Groundwater	Draft Valued Components Document		For reference documents, has BC CSR Technical Guidance Document #6 (2010) been taken into account for water well and water body searches in the BC Water Resources Atlas? This is specific to any aquifer that may be within 500 metres of a site, such as the planned expansion area and focuses on whether or not the water quality of the aquifer could be affected.	Relevant technical baseline information and guidance documents will be in the application.	N/A	23-Jan-16
PRRD-4	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Terrestrial Vegetation	Draft Valued Components Document		Under rationale, recommend an additional point. When ground has been disturbed (during construction) and left exposed for a period of time, there is a high risk of occurrence of noxious weeds. To seed the perimeter, and limit this risk, here is the link for the Peace Forage Association Website & Seeding Tool, used by re-seeding contractors in the PRRD: • Peace Forage Association http://www.peaceforage.bc.ca/ • Seeding Tool http://www.peaceforagetool.ca/ For questions regarding this tool, contact the PRRD invasive Plants Department @ 250-784-3200	Tervita clarifies the point in Table 2 , Terrestrial Vegetation, Rationale, that noxious weeds may occur in disturbed construction soil. Tervita re-seeds all soil stockpiles and new berms to prevent noxious weeds, erosion and soil loss after construction. The Peace Forage Association Website & Seeding Tool will be passed onto Tervita's construction contractor.	N/A	23-Jan-16

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PRRD-5	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Community Infrastructure	Draft Valued Components Document		During the construction phase, will there be any need by Tervita to send waste from construction activities to the North Peace Regional Landfill (construction/demo waste) or the Charlie Lake Sewer Facility (domestic sewage)? I did not see this addressed as a key indicator under the health pillar nor an excluded point under Section 4.2. Further, it is assumed that any excavated soils from the construction of the new expansion will be kept onsite for operational cover.	Construction waste will be sent to the existing Silverberry Secure Landfill. Sewage will be continued to be hauled by a subcontractor to Charlie Lake Sewer Facility.	N/A	23-Jan-16
PRRD-6	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Community Infrastructure	Draft Valued Components Document		Under Community Infrastructure, I note that surrounding municipalities are being consulted. Will there be additional notices, signage posted, radio ads etc. during the construction to make those traveling back and forth on Beaton Airport Rd. aware?	As part of the consultation process of this application, Tervita will be consulting local residents, posting ads, open houses etc. Depending on resident concern and feedback Tervita will consider posting notice during construction. Mitigation will be addressed in the application.	N/A	23-Jan-16
PRRD-7	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Terrestrial Vegetation	Draft Valued Components Document		Regarding Plant Species of Concern/Invasive Plant species, recommend consulting the Invasive Plants Dept. at PRRD (250-784-3200). The department receives updates on plant species of concern annually and has additional up-to-date knowledge of the area through its weed contractors as to which plants to watch out for.	Comment acknowledged. Mitigation will be addressed in the application.	N/A	23-Jan-16
PRRD-8	7-Jan-16	Paulo Eichelberger	Peace River Regional District	Air Quality	Draft Valued Components Document		A general question - what size PM dust contaminants are monitored in the air monitoring program during construction and operation?	If an air monitoring program is required PM2.5 would be the focus. Emissions from site will largely be from internal (diesel) combustion engines. According to BC Air Quality - Pollutant Vehicles Emit, Nitrogen Oxides (NOx) and Fine Particulate Matter (PM2.5) are found in larger amounts in emissions from diesel engines than gasoline engines. Most of the combustion at site will be associated with the diesel engines of Silverberry's heavy equipment.	N/A	23-Jan-16
PRRD-9	7-Jan-16	Paulo Eichelberger	Peace River Regional District	N/A	Draft Valued Components Document		Just a comment, I do not see any issues with the Study Areas. The buffers seem quite adequate, tight to the footprint of the project area and encompassing a significant area.	Tervita appreciates the positive feedback and looks forward to a continuing relationship with the Peace River Regional District.	N/A	23-Jan-16
PRRD-10	25-Feb-16	Paulo Eichelberger	Peace River Regional District	Community Infrastructure	Draft Valued Components Document		In communicating with Area C Director, we would like to echo the concerns raised by Blueberry FN under the “Community Infrastructure” regarding the status of the road in front of the facility. The PRRD sees that there are issues not only with rock damage to windshields but also dirt tracked from the site onto the Beatton River Airport Rd. I believe it was asked during the working group meeting but can Tervita provide more clarity around how they perform road maintenance to prevent the tracking of the dirt/foreign material onto the public road?	All trucks leaving the landfill site must try and clear tires and tire wells of as much mud as possible. Tervita checks the roadway daily for tracking of dirt on to Beatton River Airport Rd. During wet conditions a skid steer is used to blade off any mud on the public roadway and brings it back to the landfill. When its dry out the skid steer has a sweeper bucket attachment to sweep any gravel and mud from the roadway. There is also an exit grid in place at Silverberry Landfill that trucks must drive over to remove excess mud from tires. Swamp/rig mats are also used in the landfill cells during wet conditions. Due to public concerns Tervita is looking at other mechanisms to prevent tracking on to public roadways. Tracking of dirt will be captured under the Transportation Infrastructure Disturbance key indicator in the Amendment Application.	N/A	15-Mar-16

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PRRD-11	7-Mar-16	Paulo Eichelberger	Peace River Regional District	Terrain and Soils	Draft Valued Components Document		Regarding soil sampling, while they have a sample regimen stated in one of their documents, it's unclear how often they would be sampling (whether it's monthly, annually, case-by-case, etc.). Can we get that clarification?	The soil sampling program is planned to be a one time only study to determine if existing operations have impacted the surrounding soils.	N/A	15-Mar-16
PRRD-12	15-Nov-16	Paulo Eichelberger	Peace River Regional District	Air Quality	Air Study		The proponent performed the study as outlined in the tracking log: prelim then follow-up sampling. With the exception of benzene in one sample, the results were well below the limits applicable. Rationale for non-detect samples is clear as well.	Thanks for the time to comment on the air study results. Tervita appreciates the feedback from Peace River Regional District.	N/A	13-Dec-16
PRRD-13	15-Nov-16	Paulo Eichelberger	Peace River Regional District	Air Quality	Air Study		In the conclusion, we note the rationale that samples will be stronger in concentration directly on the landfill rather than off of it, due to dispersion via wind. This makes sense. However, it is not clear how the last statement of the conclusion that "Based on the results…additional monitoring is not required" can be made based on one sample shot in time. As the landfill develops over time, there should be some form of continuous monitoring, which should be covered off in the recommended valued components under air quality. If this can be clarified, there should be no issue.	The Hazardous Waste Regulation doesn't stipulate conditions or guidelines on air/ landfill gas monitoring at Secure Landfills. Ongoing monitoring requirements will be discussed in the Draft Amendment Application Information Requirements (dAAIR). The draft Valued Components will also be edited to include VOCs as an indicator of air quality.	N/A	13-Dec-16
PRRD-14	15-Nov-16	Paulo Eichelberger	Peace River Regional District	Air Quality	Air Study		General question to the Ministry of Environment: what is typically used as an air quality standard in these cases? The proponent states that BC has no applicable ambient air criteria for any of the VOC's in the specified method used for sampling.	Please reference the Ministry of Environments response on December 1st 2016.	N/A	13-Dec-16
PRRD-15	26-May-17	Paulo Eichelberger	Peace River Regional District	Surface Water	Draft Valued Components Document		Boundaries of study expanded to include the ephemeral drainage area in the Northwest corner of the site, this should satisfy a lot of the concerns with respect to risk of degrading soil quality in that area. We are pleased to see that this has been added.	Thanks for taking the time to comment on the draft Valued Components. Tervita appreciates the feedback from Peace River Regional District.	N/A	12-Jun-16
PRRD-16	26-May-17	Paulo Eichelberger	Peace River Regional District	Air Quality	Draft Valued Components Document		Road dust mitigation is adequately recognized under the air quality VC. Air quality mitigation will be of tremendous aid to area traffic regularly passing the site.	Thanks for taking the time to comment on the draft Valued Components. To help enhance the reduction in dust, Tervita will be paving the access road to the scale house in the summer of 2017.	N/A	12-Jun-16
PRRD-17	26-May-17	Paulo Eichelberger	Peace River Regional District	Terrestrial Vegetation	Draft Valued Components Document		We note an emphasis on data gathering in the Terrestrial Vegetation VC with respect to spread of invasive plant species, which is excellent. It will be important for Tervita to mitigate any possible impacts with the washing of equipment, as indicated in the document. Treatment and monitoring should be considered on any area of the landfill where the ground is disturbed then left for a period of time during the continued operation of the site.	Currently, construction equipment has to be steamed/washed prior to mobilizing and demobilizing from site to control the spread of noxious weeds. This practice will continue. After soil stockpiles are seeded they will be monitored and noxious weeds controlled as needed. Mitigation measures will be detailed in the Amendment Application.	N/A	12-Jun-16
PRRD-17.1	10-Apr-18	Paulo Eichelberger	Peace River Regional District	Terrestrial Vegetation	Draft Valued Components Document		We are satisfied as per comment PRRD-4.1. No further comment.	Tervita thanks the PRRD for taking the time to review the dAAIR document.	N/A	16-Apr-18

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PRRD-18	10-Apr-18	Paulo Eichelberger	Peace River Regional District	Health Hazard Risk Assessment	Tervita_SLRA_Memo		The SLRA methodology outlined seems to assign metrics as well as provide a step-by-step process for performing the assessment qualitatively and quantitatively. Our takeaway is that the idea behind identifying possible exposure pathways will help decide the level of risk and therefore help inform recommendations to address specific health hazards. This methodology makes sense provided that it the results clearly describe what, if any, risks there are and what the recommendations are to mitigate those risks. We look forward to seeing the resulting HHRA document.	Tervita will be circulating the draft HHRA for comment very soon and looks forward to the PRRD's comments.	N/A	16-Apr-18
MOE-1	18-Jan-16	Patrick Williston	Ministry of Environment	Surface Water	Draft Valued Components Document		This section should include a brief description of the proposed leachate treatment system, the locations of discharge, and the parameters of concern in the discharged effluent, including radioactivity.	Comment acknowledged. Leachate characteristics, disposal, etc. will be discussed in the application.	N/A	23-Jan-16
MOE-1a	10-Feb-16	Patrick Williston	Ministry of Environment	Surface Water	Draft Valued Components Document		1a. (leachate characterization and treatment)--MOE requests long-term data showing seasonal variability of leachate chemistry and volume. The data should include mean, median, max, min, and 95th percentiles of leachate chemistry and addition to volume summary statistics. In short, a complete characterization is expected based upon the currently produced leachate. 1b. This same characterization is requested for the storm water discharge effluent.	Comment acknowledged. Tervita feels an in-depth leachate and surface water analysis is more pertinent to Tervita's upcoming EMA permit amendment. Tervita suggests a meeting between the MoE and our internal hydrogeologists to determine what data will be needed to satisfy this request so its ready for the EMA Permit amendment.	N/A	3-Mar-16
MOE-2	18-Jan-16	Patrick Williston	Ministry of Environment	N/A	Draft Valued Components Document		In the last paragraph of this section there is a reference to the PAC. This is also repeated in Section 5. I recommend up-dating the terminology used in this VC document to reflect the current process.	Tervita will confirm with the EAO on preferred wording.	N/A	23-Jan-16
MOE-3	18-Jan-16	Patrick Williston	Ministry of Environment	N/A	Draft Valued Components Document		This section (Section 3) includes conflicting statements - it states that the VCs were based upon the 2002 PAC assessment and then suggests that this reflects Tervita's current understanding of what is important to First Nations, the public, and government agencies. It is not clear from this methodology whether recent (within the last two years) and relevant First Nations, public, and agency input was solicited to inform the list of candidate VCs relating to this 2016 certificate amendment application. Tervita's extensive experience operating secure landfills is a benefit in refining VCs, but it does not replace independent review by individuals and organizations that may have more extensive knowledge and understanding of regional sensitivities.	Tervita has had an on-going relationship with many First Nations and government agencies through the operation of Silverberry Landfill. Through the comment period on the draft VCs and the amendment process, Tervita will be able to work with First Nations, agencies and the public to understand and address regional sensitivities.	N/A	23-Jan-16
MOE-4	18-Jan-16	Patrick Williston	Ministry of Environment	Surface Water	Draft Valued Components Document		How were the Important Features in the Project area identified? How were priorities of local, provincial or federal governments, First Nations, or the public determined (3rd bullet in Step 3)? Why was the creek to the west of the project area omitted as an Important Feature?	Through the comment periods of the application process Tervita will be able to determine the priorities of local, provincial and federal government, First Nations and the public. Nearby creeks that may be impacted are an Important Feature. Surface water is a proposed VC.	N/A	23-Jan-16

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MOE-5	18-Jan-16	Patrick Williston	Ministry of Environment	Surface Water	Draft Valued Components Document		The surface water streams to the north and west of the Tervita property should be included in the assessment of potential impacts to surface waters. The topography of the site slopes to the northwest, indicating that these streams are the closest surface waters to the facility. Water quality data, representing high flows and low flows and showing seasonal variation, is recommended for these two streams. These two streams are inexplicably omitted from Figure 2 - the figure should be corrected to show them.	Figure 2 represents the LSA and RSA boundaries and surface water bodies shown are to give reference to those boundaries. Surface water streams to the north and west will be included in the assessment of potential impacts to surface waters.	N/A	23-Jan-16
MOE-6	18-Jan-16	Patrick Williston	Ministry of Environment	Groundwater	Draft Valued Components Document		The list of ground water quality parameters is incomplete and should be corrected. Furthermore, an analysis of risks posed by an exceptionally high or seasonally high water table should be completed. Details about the direction of flow and flow rate of the groundwater are recommended.	The water quality parameters in Table 2 are an example of what may be analyzed. Full details of parameters and the groundwater monitoring program will be discussed in the application. Risks of a high groundwater table will also be taken in for consideration and discussed in the application.	N/A	23-Jan-16
MOE-7	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		The statement that "NORM waste has a low potential to affect human health" should not be made in advance of a radiological risk assessment. NORMs are recognized by the Canadian Association of Petroleum Producers (CAPP) as having both long-term and short-term human health effects. Exposure to NORMs is one of the key risks associated with this project and a thorough radiological risk assessment that includes appropriate public and First Nations consultation will be necessary.	Due to the engineering controls and the on-going monitoring as part of the Radiation Protection Plan (RPP) present at site, there is data to make these assertions. NORMS will be assessed under the Health pillar and details on NORM monitoring and health and safety programs will be discussed in the application.	N/A	23-Jan-16
MOE-8	18-Jan-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		What data can be presented to support the assertion that the site does not produce uncontrolled releases of methane?	Data regarding air monitoring and landfill gas generation will be discussed in the application.	N/A	23-Jan-16
MOE-9	18-Jan-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		MOE requests data from ambient air quality monitoring to demonstrate that the landfill is not producing potentially harmful concentrations of methane or other landfill gasses. If this monitoring is not presently occurring, it should commence immediately to provide the supporting data for the EA Application.	Comment acknowledged. Tervita has given an air study scope to the EAO for circulation to Working Group members. Tervita looks forward to Working Group member comments on the study scope.	N/A	23-Jan-16
MOE-10	18-Jan-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Draft Valued Components Document		What soil sampling will be collected to support the assessment of soils? Where will soil chemistry be sampled and analyzed? What is the soil quality at the existing effluent discharge location and in soils that are downwind of the facility?	There was a siting investigation done before the original landfill was built. The original geology of the area will not have changed. However, Tervita is supplementing the original siting investigation with some further analysis of the expansion area. Soil chemistry, quality etc. will be assessed in the field and discussed in the application.	N/A	23-Jan-16
MOE-11	18-Jan-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Draft Valued Components Document		9a. (soil sampling)--MOE requests soil chemistry sampling downgradient to determine if storm water effluent discharge has impacted soil quality. 9b. Representative soil chemistry should also be presented from sampling locations downwind of the landfill to evaluate the efficacy of current dust suppression mitigation for preventing contamination of regional soils. Representative windrose data is recommended to support the selection of soil sampling locations. Soil samples should be tested for NORMs. A qualified professional should be engaged to design and implement the soil sampling program to ensure that it is scientifically defensible.	Comment acknowledged. Tervita has given soil study scope to the EAO for circulation to Working Group members. Tervita looks forward to Working Group member comments on the study scope.	N/A	23-Jan-16

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MOE-12	18-Jan-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		What information is gathered through ongoing monitoring and data collection efforts? What ambient air quality monitoring occurs on-site?	Monitoring (including air) will be discussed in the application.	N/A	23-Jan-16
MOE-12a	10-Feb-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		MOE requests a summary of the ambient air quality program (what is being monitored, how frequently, and analysis of trends). It is necessary to describe the current ambient air quality on site and review historic trends. If an ambient air quality program is not in place, MOE requests a program to be implemented by a qualified professional to the satisfaction of MOE. The assessment will require site specific monitoring data to demonstrate that current practices are protective of human health and the environment.	Air monitoring for NORM occurs bi-annually and recent results and the air monitoring program design will be summarized in the application. After the results of the air quality scope being circulated are completed further discussion on air monitoring can be had with the MoE during the EMA permit amendment.	N/A	3-Mar-16
MOE-13	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		List all parameters that will be measured to assess this component, where, and how frequently. Will the existing water treatment system be used to support the expanded landfill? What is the predicted increase in leachate production? Where is the treated effluent discharged?	Leachate is currently deep welled at approved facilities. Leachate quality, treatment, production etc. will be discussed in the application.	N/A	23-Jan-16
MOE-14	18-Jan-16	Patrick Williston	Ministry of Environment	Groundwater	Draft Valued Components Document		Explain what parameters are measured, where, and how frequently. The regional groundwater flows northwest. What is the rate? What is the predicted fate of leachate should a liner breach occur during high and low groundwater seasons?	Groundwater monitoring will be discussed in detail in the application. A leak detection system is also in place to ensure landfill integrity is maintained.	N/A	23-Jan-16
MOE-14a	10-Feb-16	Patrick Williston	Ministry of Environment	Groundwater	Draft Valued Components Document		What would be the fate of leachate in the event of a liner breach? What direction/path is the groundwater flow pattern and what is the rate of groundwater movement? How long would it take to reach the nearest receptors? MOE requests that these concerns be addressed in the groundwater section of the application.	In the event of a liner breach the leachate is still contained by the compact clay liner and driven towards the leachate collection. The shallow groundwater flows to the Northwest. The horizontal groundwater velocity beneath the site is estimated to be less than 0.3m/year in 2014. Potential receptors and potential accidents and malfunctions will be discussed in the application.	N/A	3-Mar-16
MOE-15	18-Jan-16	Patrick Williston	Ministry of Environment	Terrestrial Vegetation	Draft Valued Components Document		What data collection has been completed to date to determine if the vegetation in the receiving environment has been exposed to contaminants during existing operations?	Surface water is tested before being released to the environment. Stressed vegetation around the landfill will be noted by Operations and measures taken to investigate the source.	N/A	23-Jan-16
MOE-15a	10-Feb-16	Patrick Williston	Ministry of Environment	Terrestrial Vegetation	Draft Valued Components Document		MOE requests vegetation tissue sampling downwind from the landfill to evaluate the efficacy of existing mitigation for preventing the contamination of vegetation off-site. A qualified professional should be engaged to design and implement the vegetation tissue sampling program to ensure that it is scientifically defensible.	Tervita has committed to completing soil sampling at the surface water Discharge Area and in the Project Area adjacent to the existing landfill to determine if contamination is present. If contamination is discovered, mitigation will be implemented to reduce the risk that contaminants will reach receptors. In addition, Tervita has committed to conducting air quality monitoring to determine if emissions are being produced by the landfill, and naturally occurring radioactive materials (NORMs) are monitored twice a year to determine if atmospheric levels are within regulatory standards. Since the possible pathways for contamination are being studied, it would be duplicative to sample vegetation tissue to determine if contamination is being spread through air, water or soil. Therefore, Tervita is not proposing a tissue sampling program at this time.	N/A	3-Mar-16

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MOE-15b	29-Aug-18	Kym Keogh	Ministry of Environment	Terrestrial Vegetation	dAAIR		The dAAIR needs to ensure that if air quality emissions and dust concentrations are over a predetermined threshold, then potential impacts to vegetation are evaluated. These impacts should not just include a decrease in vegetative species and abundance but also evaluate how those air contaminants will be taken up by wildlife utilizing that vegetation. The human health risk assessment seems to be addressing something similar. However, the connection still needs to be made to the wildlife assessment section in the dAAIR. Impacts to wildlife, if there are any from air contaminants on vegetation, are not just about how those impacts translate to human health but also about the health of the wildlife itself. Despite earlier comments and responses, this remains as a gap	Tervita has taken the MOE's comment into consideration and revised the dAAIR to address potential effects of dust on vegetation and wildlife. Section 4.2.3 (Air Quality Potential Effects), Section 4.6 (Terrestrial Vegetation Key Indicators), Section 4.6.3 (Terrestrial Vegetation Potential Effects), Section 4.8 (Wildlife and Wildlife Habitat Key Indicators), Section 4.8.3 (Wildlife and Wildlife Habitat Potential Effects) have been edited accordingly. Tervita performed a soil sampling program as requested by the Working Group to address the Potential Dust Migration Area (PDMA). To mitigate dust impacts, Tervita progressively caps cells as they reach capacity and will actively water waste to prevent potential dispersion drying dry periods. Tervita can work with the MOE on the potential of an air monitoring plan during the EMA Permit amendment. Tervita would like to note that Silverberry is in an active Oil and Gas Area and would be difficult to delineate contamination and contaminant migration between operations.	N/A	5-Sep-18
MOE-16	18-Jan-16	Patrick Williston	Ministry of Environment	Groundwater	Draft Valued Components Document		Groundwater contamination from leachate leakage through ruptured cell liners or elevated groundwater events.	Concerns noted. Groundwater contamination is a Valued Component and it is noted that leachate may migrate into groundwater. Tervita will discuss mitigation in the application.	N/A	23-Jan-16
MOE-17	18-Jan-16	Patrick Williston	Ministry of Environment	Surface Water	Draft Valued Components Document		Surface water contamination from leachate leakage, or from contaminated storm water discharge.	Concerns noted. Surface water contamination is a Valued Component and it is noted that surface water may come into contact with waste (leachate). Tervita will discuss mitigation in the application.	N/A	23-Jan-16
MOE-18	18-Jan-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Draft Valued Components Document		Impacts to soils and biota on lands and surface waters downwind of the prevailing winds from the transport of contaminated or radioactive dust.	Concerns noted. As discussed in the January 27 2016, working group meeting Tervita will be circulating proposed studies to look at the possibility of contamination around the facility. Tervita performs NORM air monitoring bi-annually to ensure on on-site mitigation measures are sufficient to prevent the spread of naturally occurring radiation outside the landfill.	N/A	23-Jan-16
MOE-19	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		Impacts to workers, the public and biota from elevated radiation due to the exposure of NORMS.	Concerns noted. As discussed in the January 27 2016, working group meeting Tervita has shared information regarding their Radiation Protection Plan at Silverberry. The Ministry of Environment is going to review applicable material and propose a scope for a Radiological Risk Assessment.	N/A	23-Jan-16
MOE-20	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		A radiological risk assessment on human and environmental health including a summary of the current monitoring program with methods and data representing worker and fence-line exposures (comparisons should be made to the relevant national and international standards and guidelines)	See row above for response.	N/A	23-Jan-16
MOE-21	18-Jan-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		An assessment of the risk posed by contaminated dust mobilization supported by field sampling to show the current status of soils downwind of the existing facility, and an estimate of dust deposition and composition.	Concerns noted. As discussed in the January 27 2016, working group meeting Tervita will be circulating proposed studies to look at the possibility of contamination around the facility.	N/A	23-Jan-16

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MOE-22	18-Jan-16	Patrick Williston	Ministry of Environment	Surface Water/Groundwater	Draft Valued Components Document		Baseline water quality data (including hydrocarbons and radiation) for surface waters and groundwater, capturing seasonal variation in streams to the north and west of the landfill facility	Concerns noted. Relevant information will be provided in the application.	N/A	23-Jan-16
MOE-23	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		Best Available Control Technology review for leachate minimization and full treatment with a surface discharge	Concerns noted. Tervita can discuss practical and economical leachate disposal options in the application.	N/A	23-Jan-16
MOE-23a	10-Feb-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		MOE requests a review of secure landfill facilities operated by Tervita and/or others with full landfill leachate treatment and surface discharge. The BACT review should explain why full leachate treatment is or is not appropriate for the Silverberry Landfill.	Leachate disposal will be discussed in the application but a full BACT discussion will not occur. Tervita has pursued treatment technologies in the past and they are not economically feasible. The Ministry and other working group members have already expressed concern over the surface water discharges from site (collected storm water), thus leachate treatment and discharge to the environment is not recommended at this time. Tervita welcomes Ministry recommendations on BACT for leachate treatment.	N/A	3-Mar-16
MOE-24	18-Jan-16	Patrick Williston	Ministry of Environment	Human Health	Draft Valued Components Document		Leachate characterization using the toxicity leachate characteristic procedure (TCLP)—is the leachate hazardous waste? How much leachate is discharged and are there ways to minimize leachate volumes including the implementation of the free liquid test rather than the paint filter test and containing or covering the leachate storage facilities to prevent dilution by rain?	Concerns noted. Relevant information regarding leachate characterization, volumes and minimization will be provided in the application.	N/A	23-Jan-16
MOE-25	2-Mar-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Draft Valued Components Document		Secure Landfills: Common Issues and Commitments Report. EAO 2009. Section 5.4.2. Primary Atmospheric Concerns and Proposed Mitigation. “Potential atmospheric impacts associated with a proposed secure landfill site include: fugitive dust from equipment activities that may adversely affect vegetation and increase the intake of particles on wildlife and human receptors;”	Concerns noted. Please see response 48a. Fugitive dust emissions will be addressed under the Dust subcomponent in the Amendment Application.	N/A	6-Apr-16
MOE-26	2-Mar-16	Patrick Williston	Ministry of Environment	Terrestrial Vegetation	Draft Valued Components Document		Landfill Criteria for Municipal Solid Waste. MOE 1993. Section 7.15. Monitoring. “Monitoring of other environmental media such as vegetation and soils should be assessed and a program developed as the site-specific situation warrants.”	There may be some applicable information from the Landfill Criteria for Municipal Solid Waste, 1993, that can be applied to Secure Landfills, however it should be noted that the Hazardous Waste Regulation should be used as the Regulation for operations of Secure Landfills. There is a substantial difference in what wastes are landfilled at a Secure Landfill and a Municipal Solid Waste (MSW) Landfill. There is no direction in the Hazardous Waste Regulation that directs vegetation sampling for secure landfills.	N/A	6-Apr-16
MOE-27	2-Mar-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Draft Valued Components Document		Integrated Approach for the Analysis of Ecosystems at Risk: a case study in a waste landfill. R. Mazzeo et al. 2013. Environmental Engineering and Management Journal 12: 165-168. “Quantification of heavy elements levels in soil and air cannot generate sufficient information on impact because the absolute metal concentration alone does not reflect the degree to which these compounds affect the environment (Cheung et al., 1993). Data on the bioaccumulation and effects of leachate on wild populations are essential to assess the environmental impact of these disposal sites.”	Tervita read the extended abstract of the article referenced. The landfill referenced in the abstract is a municipal solid waste landfill. No details of landfill design, siting or geology are given. Therefore, a correlation between the environmental effects of Ginestreto and Tervita Silverberry cannot be made. A picture of the Ginestreto landfill is in the following link: http://www.soglianoambiente.it/it/case-history/attivita/smaltimento-rifiuti/ampliamento-discarica-ginestreto	N/A	6-Apr-16

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MOE-28	2-Mar-16	Patrick Williston	Ministry of Environment	Terrestrial Vegetation	Draft Valued Components Document		There are a growing number of studies showing effects of airborne landfill contaminants on vegetation, particularly lichens: • Paoli, L., Grassi, A., Vannini, I. Maslaňáková, I. Bil'ová, M. Bačkor, A. Corsini, and S. Loppi. 2015. Epiphytic lichens as indicators of environmental quality around a municipal solid waste landfill (C Italy).Waste Management 42:67-73. • Paoli, L., A. Corsinib, V. Bigaglib, J. Vanninib, C. Bruscolib, and S. Loppia. 2012. Long-term biological monitoring of environmental quality around a solid waste landfill assessed with lichens. Environmental Pollution 161: 70–75 • Kotovicova, J., F. Toman, M. Vaverkova, and B. Stejskal. 2010. Evaluation of Waste Landfills' Impacts on the Environment using Bioindicators. Polish Journal of Environmental Studies 20: 371-377. And a link has also been established between landfill gas and impaired vegetation: • Chan, G.Y.S, M.H. Wong and B.A. Whitton. 1991. Effects of landfill gas on subtropical woody plants. Environmental Management 15:411-431. • Buekens, A.G and V.V. Dragalov (eds.). 1998. Environmentally devastated areas in river basins in Eastern Europe. Environment Vol. 45.	Concerns noted. Please see response MOE-15a. Airborne landfill contaminants will be assessed under the Air Quality VC in the Amendment Application.	N/A	6-Apr-16
MOE-29	2-Mar-16	Patrick Williston	Ministry of Environment	Air Quality	Draft Valued Components Document		The potential impacts from landfill dust and emissions remains a key uncertainty that should be resolved prior to the submission of an application. A limited sampling program would go a long way in showing that current practices provide adequate environmental protection for vegetation and the wildlife that use the nearby habitat for forage. I have conducted lichen sampling and tissue analysis in the past—it is an approach that is broadly used around the world for assessing the potential impact of emissions and is not a complicated undertaking.	Concerns noted. Please see response MOE-15a. In order to determine effects of emissions on vegetation the potential emissions from Silverberry first have to be understood. If vegetation sampling or monitoring is required then this should be discussed in the EMA Permit amendment.	N/A	6-Apr-16
MOE-30	2-Mar-16	Patrick Williston	Ministry of Environment	Air Quality	Air/Soil Study Scope		I ran the Tervita Air Study and Soil Study Scope by MOE meteorologist Warren McCormick and he indicated that the plan seems okay, but noted that the Air Scope did not list the parameters to analyzed. He also suggested that the study purpose and objectives could be more clearly defined.	The parameters to be assessed through a summa canister collection during the air study include a full suite of volatile organic compounds including benzene, toluene, ethylbenzene, and xylenes. The study purpose is to identify and quantify potential petroleum fuel and waste emissions from the current Silverberry landfill, as baseline information. The baseline information will be used to assess the potential effects and magnitude of potential effects of the capacity replacement project in the Amendment Application.	N/A	6-Apr-16
MOE-31	30-Mar-16	Patrick Williston	Ministry of Environment	Wetlands	Draft Valued Components Document		Ministry of Environment letter, dated March 30, 2016.	Tervita responded by letter on April 6th to the EAO and the MoE.	N/A	6-Apr-16

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MOE-32	13-Jul-16	Patrick Williston	Ministry of Environment	Terrain and Soils	Soil Study		The work plan states that Qualified Professionals (QP) will summarize the method, equipment used, and interpret the results of both the air and soil study, however, it is not stated that this plan has been developed by QPs and there was no QP signature on the document. A QP operating within their area of expertise should be developing any sampling plans that will be used to determine potential effects to the environment as a result of existing or proposed activities. Several of the MOE comments in the tracking table speak to the need for QPs at the design phase	The work plan states that a QP will provide a technical memorandum summarizing the method and equipment used, lab results and a discussion of findings for the soil survey. The current scope of work has been developed by CH2M senior technical consultants with 15-25 years of experience in the air and soil assessment industry, including experience with landfills in Canada. The intent of the air and soil sampling is to provide high level baseline information to inform the assessment of potential effects of the proposed capacity replacement. The intent of the air and soil survey is not to assess the effects of the existing landfill, or provide long-term monitoring information, as that level of detail is not warranted in order to be able to assess the effects of the capacity replacement. The study methods will for the assessment of effects in the Amendment Application will be finalized in the draft Amendment Application Information Requirements stage.	N/A	11-Aug-16
MOE-33	13-Jul-16	Patrick Williston	Ministry of Environment	Air Study	Air Study		Proposed monitoring of emissions for the air study appears to occur on a single day in July. The comment number 43a in the tracking table from the Ministry of Environment requested monitoring to verify that the landfill is not currently producing emissions that are potentially harmful to the environment and human health. Further explanation is needed to demonstrate how July was determined to be the period of maximum emissions. Typically, monitoring involves more than one sampling event and should be a scheduled period of sampling to capture annual and seasonal variations that take into account temperature and precipitation changes.	The purpose of the proposed study is not to quantify the emission rates of the possible contaminants. The purpose of the study is to determine which contaminants are being emitted and in order for the lab to detect the possible contaminants, a sampling period of likely maximum emissions is desired. The rationale for a July survey date was because maximum emissions are likely during a period of warm weather.	N/A	11-Aug-16
MOE-34	13-Jul-16	Patrick Williston	Ministry of Environment	Air Quality	Air Study		Warren McCormick, Emission Inventory Specialist, also reviewed the recent work plan air study and Northern Health comments and provided these thoughts. These additional comments from Warren McCormick were after further consideration of the parameters and purpose, as identified missing in comment 63, that were now provided in the air study. As the majority of wastes are industrial in origin, I would propose that use of a CH4/CO2 analyser to survey the site is likely not going to work in the way described. A suitable BTEX type analyzer, with appropriate resolution, would be a better survey tool. I also have to agree with the NH question of whether a single survey will be adequate to characterize the situation. The facility could purchase a suitable analyzer and have on-site staff survey the active area at appropriate times. Speciation analysis via the Summa canisters can also be done annually at the appropriate times as well.	The rationale for choosing a CH4 monitor for the initial survey part of the study was to identify a “hotspot” location where gases were emitting to the atmosphere. Based on CH2M’s technical experience, a CH4/CO/H2S monitor would suit this purpose given the wide range of waste types collected at the site. However, CH2M and Tervita agree than a portable BTEX analyzer would also suit this purpose. A suitable characterization of the types of contaminants emitted can be accomplished with a single sample at a hotspot location as determined through the preliminary survey. The information collected will be used to assess the potential effects of air emissions from the proposed capacity replacement.	N/A	11-Aug-16

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MOE-35	13-Jul-16	Patrick Williston	Ministry of Environment	Air Quality	Air Study		The proposed soil sampling study appears to address part of the MOE request for soil sampling in comment 44a of the tracking table. However, within the list of contaminants to be analysed, I did not see any reference to radioactive elements. The request for monitoring in 44a identified a need to test for NORMs in the soil. A recent e-mail indicates that a separate radiation assessment will be completed. Please identify if this area and/or these soils will be included in this assessment as requested by MOE's earlier comments.	Testing for NORMs is conducted biannually within the Tervita Silverberry landfill. Therefore, testing for NORMs outside of the landfill boundaries is not considered to be warranted at this time. NORMs are considered to be a subcomponent under the Human Health Valued Component and therefore, potential effects to human health from NORMs will be assessed in the Amendment Application within the Screening Level Human Health Risk Assessment.	N/A	11-Aug-16
MOE-36	1-Dec-16	Warren McCormick	Ministry of Environment	Air Quality	Air Study		Objectives, Standards and/or guidance for VOCs: BC does not have any made-in-BC objectives, standards or guidance for ambient concentrations of the VOCs listed in this project study. When needed, the use of other jurisdictions numbers can be used; as was done here (i.e. Alberta and Ontario). Others could have included Environment and Health Canada. Texas and Washington also have a good list of screening values. One of the main issues is that many of these VOCs are carcinogenic and use a long term (annual) value to assess impacts	Thank you for taking the time to answer Peace River Regional District's comment.	N/A	1-Mar-17
MOE-37	1-Dec-16	Warren McCormick	Ministry of Environment	Air Quality	Air Study		Given the type of waste being landfilled here I would support the comments from other reviewers regarding monitoring. I would support an annual or other monitoring survey (perhaps monitoring tied to operational schedules). This is supported by the results shown, especially benzene. I am also suggesting that the proponent install and operate a meteorological tower/station to assist the monitoring program and to support operational issues. This would include wind speed and direction, temperature and humidity/dew point measurements archived on an hourly basis as per Ministry of Environment requirements.	The Hazardous Waste Regulation doesn't stipulate conditions or guidelines on air/ landfill gas monitoring at Secure Landfills. Ongoing monitoring requirements will be discussed in the Draft Amendment Application. The draft Valued Components will also be edited to include VOCs as an indicator of air quality. Silverberry Secure Landfill currently has a weather station installed that records wind speed and direction, temperature and humidity. Could the Ministry of Environment please let us know what guidelines exist in place for cataloging the data to ensure we meet your requirements.	N/A	1-Mar-17
MOE-38	1-Dec-16	Kym Keogh	Ministry of Environment	Air Quality	Air Study		The concerns with the need for long-term air emission monitoring and evaluation of potential contaminants of concern also apply to whether there will be effects to nearby waterbodies and terrestrial ecosystems from the landfill gas emissions. Changes in water quality and damage to terrestrial foliage can result in impacts to aquatic and wildlife ecosystems. Benzene appears to have potential for such an impact. Because of this, I see a need for air monitoring to follow a program that allows for proper evaluation of the potential for impacts and addresses the issues raised by both MOE's air quality specialist and Northern Health's technical advisor. The information gathered from this type of program would provide the basis to further determine if there could be an impact to the terrestrial and aquatic receiving environment.	The Hazardous Waste Regulation doesn't stipulate conditions or guidelines on air/ landfill gas monitoring at Secure Landfills. Ongoing monitoring requirements will be discussed in the Draft Amendment Application. The draft Valued Components will also be edited to include VOCs as an indicator of air quality, and VCs to assess effects to aquatic and terrestrial environments have been included.	N/A	1-Mar-17
MOE-39	20-Apr-18	Jeannette Lough	Ministry of Environment	Economy	dAAIR		Including Financial Security Requirements, (EMA Section 14(1)(b)	If economic benefit information is available in the financial security estimate, it will be used in the application.	N/A	24-Apr-18
MOE-40	20-Apr-18	Jeannette Lough	Ministry of Environment	Economy	dAAIR		Annual EMA Permit Fees	When Tervita describes annual government revenues in the application , fee associated with the Waste Discharge Regulation will be detailed.	N/A	24-Apr-18

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MOE-41	20-Apr-18	Jeannette Lough	Ministry of Environment	Water (Surface)	dAAIR		Will assessment include a look at best Achievable Technology Standards for leachate treatment and disposal?	Section 1.4 of the dAAIR is to look at alternative project locations. If the MOE, would like to discuss best Achievable Technology Standards for leachate treatment, Tervita feels the discussion is best suited for the upcoming EMA permit amendment.	N/A	24-Apr-18
MOE-42	20-Apr-18	Jeannette Lough	Ministry of Environment	Cumulative Effects Assessment	dAAIR		Will existing landfill be considered in cumulative effects assessment.	The existing landfill will be considered in the CEA as an existing development per S3.10.1 - "*The following development categories will be considered in the Application:* • *Projects or activities that have already been built or conducted for which the environmental effects overlap with those of the proposed Project (i.e. certain)"*	N/A	24-Apr-18
MOE-43	20-Apr-18	Jeannette Lough	Ministry of Environment	Effects and Mitigation	dAAIR		Will financial security requirements be considered as part of appropriate strategy?	Financial Security is based off an estimate for decommissioning/closure/post-closure. If the assessment of effects and mitigation effectiveness need to be altered, financial security will be reviewed to determine if changes are necessary.	N/A	24-Apr-18
MOE-44	20-Apr-18	Jeannette Lough	Ministry of Environment	Effects and Mitigation	dAAIR		Although written with municipal solid waste in mind, this may be helpful for use as a procedure for assessing landfill gas: https://www2.gov.bc.ca/assets/gov/environment/waste-management/garbage/lgassessment.pdf	Tervita will review the Landfill Gas Generation Assessment Procedure Guidelines for any applicable material when determining air quality.	N/A	24-Apr-18
MOE-45	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2 - Visual dust	KIs should be quantitative in nature. 'Visible' is qualitative and subject to interpretation by different people. I recommend an alternate measure to ensure that this KI is adequately addressed. For example, air quality instruments can quantify the concentration of particles in the coarse fraction. Other instruments can provide a measure of visual range.	Tervita recognizes the subjectivity of visible dust, but has proposed quantitative KI's such as ambient air concentrations of particulate matter, nitrogen oxides, VOCs and GHG emissions. These quantitative KIs will be expanded upon in the application.	N/A	25-Apr-18
MOE-46	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2 - Detectable odour	Why not simply state odour levels at sensitive receptor? Does including the word 'detectable' add clarity to the KI?	"Detectable" helps provide clarity for the chosen KI.	N/A	25-Apr-18
MOE-47	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2 - Ambient PM and NOx	A) What size fractions of PM is this statement describing? B) Also note that this KI has links with the first and fourth bullets, and that some linkages should be made.	The PM size fraction is PM2.5. This KI will be expanded upon in the application.	N/A	25-Apr-18
MOE-48	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2 GHGs in the AQ chapter	Suggest adding a separate chapter for GHGs.	GHG's were originally excluded in the VC document. After working group feedback, Tervita added GHGs under the air quality VC as a KI.	N/A	25-Apr-18
MOE-49	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2.2 Existing Conditions	When including the discrete data collected on August 24 2016, ensure to compare the nature of this sampling program to the bullets detailed in section 3.3 of the dAAIR. Specifically, consider these two samples relative to the first bullet: "A description of the quality and reliability of the existing (or baseline) data and its applicability for the purpose used, including any gaps, insufficiencies and uncertainties, particularly for the purpose of monitoring activities". The reason I say this is because the collection of two samples on one day at two locations in a landfill needs to be evaluated in the context of uncertainty, and sufficiency.	The data gathered on air quality and potential effectiveness regardin+I180:K184g uncertainty and sufficiency will be expanded upon in the application.	N/A	25-Apr-18

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MOE-50	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2.2 - Some nearby baseline data available	For the baseline data review note that there was ambient air quality monitoring at Blueberry River from July 2016 - Nov 2017, and at Buick Creek from Feb 2015 to July 2016. The data from Blueberry River are on the MOE website and data for Buick Creek should be obtained through the OGC.	Tervita appreciates the reference to the data. The data will be reviewed and will be considered when developing baseline conditions regarding air quality.	N/A	25-Apr-18
MOE-51	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2.2 - Some nearby baseline data available	In addition to ambient concentrations at BC monitoring stations, the desktop review should look for ambient CAC measurements on/at/near other landfills.	Tervita will look to determine if there are any BC monitoring stations by the other developed Secure Landfills in the Province (Northern Rockies, Peejay).	N/A	25-Apr-18
MOE-52	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2.2 - Air Quality Technical Report	In addition to all other parts of the AQTR please include the following: an outline of the conditions which lead to maximum fugitive emissions of dust and VOCs. (Soil moisture, incoming solar radiation, outgoing longwave radiation, ambient air temperature, soil temperature, wind speed, etc.) Include supporting literature. Also include proposed method(s) for how those will be measured onsite. The proponent should develop a fugitive emissions model which will predict the time of maximum emissions. The proponent should install all relevant equipment which can measure this on the ground. At the time of maximum emissions the proponent should collect enough baseline data in order to adequately characterize baseline conditions. The sampling program can be refined as more samples are taken. This way, if future monitoring is required (post expansion), these can be put in the context of the robust baseline. Proponent currently has 2 samples within one hour and proposes that this is sufficient information to conclude additional monitoring is not required. However, the proponent also states that "the results presented in this report are reflective of the conditions at the time and at the locations where the samples were collected". There is insufficient evidence to conclude that these samples represent worst-case emissions and if they do, the uncertainty of data given two very different benzene concentrations will make it difficult to determine whether there is a change associated with a future expansion. (For fugitive dust it appears that there have been zero samples, can this be confirmed).	At this time there are no further air sampling/monitoring programs proposed.	N/A	25-Apr-18
MOE-53	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2.3 - Potential Effects	This list is missing fugitive emissions (of coarse particles, VOCs and odorants). Fugitive emissions should be considered an activity of sorts.	Tervita can add fugitive emissions to the list of Potential effects in 4.2.3.	N/A	25-Apr-18
MOE-54	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	earlier comments		In response to earlier comments by MOE and other agencies concerning the air study, the proponent stated: "Ongoing monitoring requirements will be discussed in the Draft Amendment Application Information Requirements (dAAIR)." (MOE 37, 38; NH 44a; PRRD 13). Note that the dAAIR does not discuss ongoing monitoring requirements; instead it defers ongoing monitoring requirements to a technical report which will be attached as an appendix to the amendment application. It appears that this technical report will include the results of the air study, which is a form of circular discussion. Regardless of whether the AQTR contains the results of the August samples, earlier comments must be fully addressed.	The NORM program is the only on-going air monitoring program at Silverberry. The dAAIR will be edited to remove reference to "Other on-going monitoring", since the NORM sampling is referenced in the second bullet of 4.2.2.	N/A	25-Apr-18

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MOE-55	23-Apr-18	Ben Weinstein	Ministry of Environment	Air Quality	earlier comments		Furthering the discussion on MOE-37, MOE can provide documents relating to the installation of a meteorological monitoring station, and can assist with station siting if desired.	Tervita would appreciate the documents referenced by the MOE so they can be reviewed for any future installations.	N/A	25-Apr-18
MOE-56	24-Apr-18	Kym Keogh	Ministry of Environment	Assessment Methodology	dAAIR	3.0	I would suggest the final AAIR have a conceptual site model, which illustrates the potential pathways of contaminants to VCs. Some may have multiple pathways from the site such as wildlife which can be exposed directly by being on site or indirectly by the movement of a contaminant through the environment. It would provide guidance to the proponent on what data is needed for the EA Environmental Impact Study. And would create a clearer understanding for agencies, First Nations, and public for reviewing the environmental assessment of VCs.	The HHRA will illustrate potential pathways of contaminants to VCs.	N/A	1-May-18
MOE-57	24-Apr-18	Kym Keogh	Ministry of Environment	Terrain and Soils	dAAIR	4.1.2	Where CCME soil quality guidelines do not exist for a particular parameter, the BC CSR numerical standards should be used in the evaluation of soil analysis results. Alternatively, other applicable guidelines or standards can be used if available such as from the US EPA.	The BC CSR will be added as a source of data under Section 4.1.2.	N/A	1-May-18
MOE-58	24-Apr-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4	Water quality parameters. This needs more definition. Is sediment, TSS or sediment from the bottom of a watercourse? Which hydrocarbons and what analysis? Total Extractable Hydrocarbons are an outdated test and does not include enough information to determine the potential for effects. Will other standard water quality parameters be used to monitor the site such as turbidity, TDS or pH, conductivity, etc.? If so, it should also be collected.	Currently, the surface water at site is tested for Schedule 1.2 of the HWR. Historical results will be reviewed.	N/A	1-May-18
MOE-59	24-Apr-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4.1.4	It appear that only a few years of data containing 3 samples are currently available despite discharging from the sediment pond occurring throughout the season. Sampling needs to match the discharging. Considering the evaluation of effects of the project, additional sampling may be needed to properly determine the effects for this amendment.	Tervita keeps records of analytical, date and volumes of surface water discharged. Tervita analyzes the water prior to discharge against Schedule 1.2 of the HWR. Discharge is intermittent depending on precipitation and is only typically done in spring and fall.	N/A	1-May-18
MOE-59a	29-Aug-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4.1.4	There are only 3 samples for water quality for the discharge from the sediment pond over a 2 year period. It is not appropriate to evaluate the predictions for impacts to the environment from 3 sample points. I realize discharging from this pond is intermittent but there appeared to be additional flows that would have allowed for more sampling. I would suggest that during the EA process, the proponent collects some additional data to validate the predictions.	Tervita performed a soil sampling program as request by Working Group members to help determine impacts of the surface water discharge. Tervita can re-supply this report to the MOE.	N/A	5-Sep-18
MOE-59b	6-Nov-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4.1.4	Tervita should include any monitoring surface water data collected during operation of the existing landfill developing the water quality predictions for the expansion. This information would not only strengthen their predictions but would also give more certainty to the surface water quality assessment portion of the application.	Tervita will include existing monitoring data in the application when developing the water quality predictions for the expansion.	N/A	12-Nov-18

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MOE-60	24-Apr-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4.2	Enough data is needed to determine the potential effects. An understanding is also needed as to whether water quality is better by dilution from snow melt in the spring or whether than spring runoff picks up more contaminants and reduces water quality. And the same understanding is needed for the late summer period when the main contributor to runoff is from groundwater. Is there enough data collected to answer these questions?	Currently, the surface water at site is tested for Schedule 1.2 of the HWR. Historical results will be reviewed.	N/A	1-May-18
MOE-60a	6-Nov-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4.2	There needs to be a bullet added to Section 4.4.2 Surface Water/Existing Conditions for the requirement to compare surface water quality data to the British Columbia Water Quality Guidelines (BC WQGs), at a minimum. This comparison should cover a number of water uses including aquatic life, wildlife, agriculture, and drinking water. If there are no BC WQGs applicable, Tervita should expand their comparison to other guidelines such as CCME guidelines. Other jurisdictions that have applicable guidelines could also be used if the comparison is provided along with rationalization. But the BC WQGs need to be used at least in this Section. I realize that there may be other predefined, water quality standards Tervita must meet for discharging but the comparison to BC WQGs allows for an understanding of the characteristics in the receiving environment.	Tervita will add the following bullet to Section 4.4.2 of the dAAIR: • Comparison of the surface water quality data to the British Columbia Water Quality Guidelines (BC WQGs), at a minimum. This comparison should cover a number of water uses including aquatic life, wildlife, agriculture, and drinking water. If there are no BC WQGs applicable, Tervita could expand their comparison to other guidelines such as CCME guidelines.	N/A	12-Nov-18
MOE-61	24-Apr-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4	How will the sampling of water quality be evaluated? Against which standards? No information is provided on whether BC CSR numeric standards are to be used or BC WQGs or CCME guidelines. BC CSR standards have limits on their application, are based on broad use, and assume a minimum 1:10 dilution which would need to be verified if discharging to a creek. As the discharge is entering an ephemeral stream, there could be times that no dilution is available until reaching a larger watercourse. BC WQGs should be used for when the discharge from the sediment pond is going directly to a creek whether it is ephemeral or not. This is essential if this ephemeral creek is used at times by fish and other key aquatic organisms.	Currently, the surface water at site is tested for Schedule 1.2 of the HWR. Historical results will be reviewed.	N/A	1-May-18
MOE-62	24-Apr-18	Kym Keogh	Ministry of Environment	Surface Water	dAAIR	4.4	The spatial boundaries of the RAA include a number of creeks and rivers. How will those be monitored to ensure no deleterious effects to surface water from the discharge and from groundwater infiltration? Sites will need to be established for long term monitoring.	Tervita can work with the MOE on potentially developing a surface water monitoring plan during the EMA permit amendment. Due to the development of oil and gas infrastructure in the area, potential contamination found in rivers and creeks may be inadvertently and incorrectly tied to Silverberry Landfill operations. Tervita follows the HWR developed by the MOE to ensure surface water discharge has limited impacts on the surrounding environment.	N/A	1-May-18
MOE-63	24-Apr-18	Kym Keogh	Ministry of Environment	Groundwater	dAAIR	4.5	Like surface water, the water quality parameters for groundwater need to be laid out clearly and relate to the potential contaminants. Should hydrocarbons be included in the groundwater quality parameters.	Tervita is continually working with the MOE on Silverberry's groundwater monitoring plan. Most recently, with Linda Elder, Rusto Martinka and Jeannette Lough. Tervita can list hydrocarbons in the groundwater quality parameters.	N/A	1-May-18
MOE-64	24-Apr-18	Kym Keogh	Ministry of Environment	Groundwater	dAAIR	4.5	How will groundwater sample results be evaluated? Will the BC CSR numeric standards be used or the contaminated sites federal interim groundwater guidelines?	Tervita's groundwater consultant uses the BC CSR when interpreting the monitoring results. For consistency, the application will also use the BC CSR when comparing results.	N/A	1-May-18

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MOE-65	24-Apr-18	Kym Keogh	Ministry of Environment	Groundwater	dAAIR	4.5	The background well, BH-103 has had issues and periodic parameter levels higher than the monitoring wells. This should be discussed and the work completed to understand why the results are high and how it is assured to be background only. Has there been consideration of another background well?	Tervita has discussed BH-103 with MOE staff. Tervita will properly decommission and replace background monitoring well BH-103, including the installation of a deeper nested monitoring well with landfill cell 8 construction in 2019.	N/A	1-May-18
MOE-66	24-Apr-18	Kym Keogh	Ministry of Environment	Terrestrial Vegetation	dAAIR	4.6.3	Dust from construction and operation needs to be added to potential effects. While dust itself can cause damage to the plants by limiting growth or causing die-off, if metals and other contaminants are present in the dust that settles on the plants, it can be picked up by wildlife consuming the plants.	The bullet points in 4.6.3 detail project phases when Terrestrial Vegetation will interact with the project. Potential effects of dust will be expanded in the Environmental Affects Assessment, Section 4.2 Air Quality of the application.	N/A	1-May-18
MOE-67	24-Apr-18	Kym Keogh	Ministry of Environment	Terrestrial Vegetation	dAAIR	4.6.1.1	With respect to vegetation, there is a 100 m uniform buffer around the site. I gather from the meteorologist that the predominant wind direction in this area is SW. This is confirmed in the March 2017 soils study by CH2M. This should be considered when evaluating the potential effects from the dust to the environment and whether the 100 m along the SW side of the site is sufficient.	Tervita will review buffers surrounding the Silverberry Landfill.	N/A	1-May-18
MOE-68	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	4.7	While I think it is great that this VC is including Aboriginal Interests, I also want to see health of the aquatic ecosystem considered rather than just a few key food fish species. Smaller and more localized species, such as sculpin, are better sentinels for contaminants than many food fish. A few species should be considered when looking at effects to the habitat.	Tervita can work with the MOE and our consultant on potential indicator species to be used in the application.	N/A	1-May-18
MOE-69	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	4.7	It is important that the change in habitat incorporates water quality as well as the physical changes such as loss of habitat types or invertebrates. Both of these are good identifiers of potential effects but should also tie in the findings on water quality.	Tervita recognizes the interrelated nature of certain VCs and will conduct a a comprehensive assessment of each VC with this in mind.	N/A	1-May-18
MOE-70	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	4.7	Does the change in mortality risk account for the chronic conditions such as lowered fecundity, reduced growth or difficulties avoiding predators.	Tervita is be unable to meaningfully assess how increased mortality risk would contribute to chronic conditions such as lower fecundity, reduced growth or difficulties avoiding predators.	N/A	1-May-18
MOE-71	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	4.7.2	Will the existing conditions identify species and their current use of the RAA? Have benthic invertebrate collections occurred in areas that will receive surface water discharges?	There is no direct discharge of surface water to water bodies.	N/A	1-May-18
MOE-72	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	4.7.2	The immediate receiving environment is an ephemeral creek. Does the creek get used during the season by fish? If so, are these times critical to the fish lifecycle such as spawning or rearing.	The creek has not been identified as suitable for fish habitat. As per the Fisheries Habitat Assessment done during the original EAC application, "A non fish-bearing, ephemeral tributary along the northwest corner of the existing facility offers seasonal connectivity to the downstream fish habitat from an area immediately adjacent to the north property boundary."	N/A	1-May-18
MOE-73	24-Apr-18	Kym Keogh	Ministry of Environment	Fish and Fish Habitat	dAAIR	14.0	A water quality management plan should be included. This should identify both the ongoing groundwater sampling and a surface water sampling plan, including some basic biological sampling to confirm that the receiving environment is fine.	Tervita feels additional monitoring plans should be discussed during the EMA permit amendment application .	N/A	1-May-18

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MOE-74	29-Aug-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2	Key indicators should be quantifiable. The KI 'visual dust' is not, unless it refers to something like 'coarse-fraction particulate matter', or 'total suspended particulate matter'… A KI should be a measurable thing so that a mitigation strategy can be developed and, if necessary, implemented and evaluated.	Tervita would like to continue using Visual Dust as a KI since it is relatable for the general public reviewing the application. Tervita can discuss other quantifiable measurements during the EMA Permit amendment application.	N/A	5-Sep-18
MOE-75	29-Aug-18	Ben Weinstein	Ministry of Environment	Air Quality	dAAIR	4.2	2 grab air quality samples are insufficient to be called a baseline air quality dataset. There is no way around this. The proponent cannot state that they have collected air quality data in a manner sufficient to be termed 'baseline'. If baseline air quality data is important (for any air pollutant), a baseline sampling program must be designed and executed. Unfortunately, since the proponent's April responses did not arrive until August, it is too late to do this now. This program was likely time-sensitive to summer months.	Tervita can work with the MOE on a suitable air monitoring program (if necessary) during the EMA Permit amendment application.	N/A	5-Sep-18
MNGD-1	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 3.1, addition of GPS coordinates to the report tables.	Borehole logs were inadvertently omitted from Appendix C. GPS coordinates will be included with the borehole logs when Appendix C is updated	N/A	1-Mar-17
MNGD-2	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 3.1, what are specific COPCs for this site?	Tervita Silverberry Secure Landfill mainly takes oilfield waste. The site is permitted to take BTEX levels over limits specified in Schedule 4 of the Hazardous Waste Regulation. The main contaminants of concern are hydrocarbon based due to the nature of the waste, thus BTEX, VPHs, LEPHs, HEPHs, PAHs and metals are the main contaminants of concern.	N/A	1-Mar-17
MNGD-3	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.1, it doesn't appear any samples were taken to the northwest, just north.	When surface water is discharged, it is discharged directly north from the storm water pond. If there is no sign of contamination directly north where water is discharged, it can be assumed that no/minimal contamination is reaching the ephemeral drainage that drains northwest.	N/A	1-Mar-17
MNGD-4	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.1, surface water flow outlet, depressions, tree line are not shown on figure.	There is no permanent surface water flow outlet. Water is discharged using a trash pump with the location varying between borehole 5 and 8 as shown on Figure 2 of the study.	N/A	1-Mar-17
MNGD-5	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.1, is there no sample BH11?	Correct no BH11 was taken due to time constraints in the field.	N/A	1-Mar-17
MNGD-6	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.2, is there weather information from the landfill itself?	The Landfill now records weather information but not at the time of study. For the purpose of the study information from the Fort St. John weather station is sufficient to direct sampling. The study was to gain an understanding of potential contamination to address concerns from the working group and wasn't part of a full delineation program.	N/A	1-Mar-17

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MNGD-7	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.2, why was no sample collected southwest of the work area (i.e. south/southeast of the leachate frac/water ponds or west of cell 6 given prevalent conditions.	Land by the leachate ponds is on the footprint of an oilfield waste management facility and water injection facility. Any sampling taken in this area would make it difficult to differentiate between contamination caused by the landfill and oilfield waste management facility. Land directly west of Cell 6 is going to be developed into a new landfill cells. The study work plan was circulated to the working group prior to initiation and the sampling locations were deemed satisfactory.	N/A	1-Mar-17
MNGD-8	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.2, from the aerial photo, it appears that there are breaks/cuts in the tree line to the south and west of the site...why were samples not collected there at further downwind locations? In addition, at least one downwind sample could have been taken regardless of the limited access (i.e. the forest is not completely impenetrable, or use other access points within 200 m?)	The study was to gain an understanding of potential contamination to address concerns from the working group and wasn't part of a full delineation program. The study work plan was circulated to the working group prior to initiation and the sampling locations were deemed satisfactory.	N/A	1-Mar-17
MNGD-9	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.4, maximum depth of holes? number of samples per location collected/analyzed?	The report will be revised and the details added in the borehole logs, Appendix C.	N/A	1-Mar-17
MNGD-10	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 5.5, it would be useful to have a summary table noting each sample location, and what it was analyzed for.	Comment noted. Existing table and borehole logs provide the information.	N/A	1-Mar-17
MNGD-11	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 6.3, Inconsistent naming of the BH locations throughout text/tables/figures...is it 1 or BH-1 or BH-1A or BH1-A or BH-1-A (I'm assuming they are all the same, but this isn't always true)	The report will be revised and corrections made.	N/A	1-Mar-17
MNGD-12	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 6.3.1.1 does not match table 2a...results reported for all locations and values range from 5.63-7.18 (SWDA) and 4.75-5.73 (PDMA). Are these regionally normal levels?	The report will be revised and corrections made. Regional pH levels will be researched to see if they are available.	N/A	1-Mar-17
MNGD-13	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 7.6, I don't see any documentation to support this noted in the laboratory reports in the appendix.	The correspondence with ALS will be appended to the report.	N/A	1-Mar-17
MNGD-14	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 7.7, Again, I would like to see this statement supported in writing from the lab/in the lab reports.	The correspondence with ALS will be appended to the report.	N/A	1-Mar-17
MNGD-15	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 8, any correlation between the depths of the samples and the results? Can you provide a figure with exceedance results shown?	Sampling depth was a fixed variable, thus it is hard to draw a conclusion between depth and results. A figure showing exceedances will be considered	N/A	1-Mar-17
MNGD-16	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 8.1, barium results from on-site locations are consistently higher than off-site locations. Are we seeing a possible impact from operations here (even though they are still below regional background levels)?	Further investigation will have to be performed to draw a more substantial correlation between operations and a possible barium impact. Tervita will take into consideration further investigation on the source of barite/barium.	N/A	1-Mar-17
MNGD-17	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 8.1, or is this a small APEC? dumping area? this could be confirmed by additional sampling of soil and surface water.	There is a small probability of an APEC. Tervita will take into consideration further sampling programs.	N/A	1-Mar-17
MNGD-18	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 8.2, are there any studies/geologic reports to support this	Natural background concentrations are derived from MoE Protocol 4. MoE provides background barium concentrations in protocol 4 and outlines a procedure in Protocol 14 to differentiate between anthropogenic and non-anthropogenic sources.	N/A	1-Mar-17

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MNGD-19	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 8.2, Can you really say with 100% certainty that it is due to natural background conditions? Is there more support for this argument? i.e. What is the natural source? has this been accepted at other regionally similar sites by MoE?	As noted in the report “additional investigation may be warranted to confirm the source of the barium, whether it is from naturally occurring barium concentrations or the materials stored at the Facility.” Tervita will take into consideration further sampling programs to determine possible natural/artificial sources. Tervita doesn’t know what the MoE has accepted from other companies in Northeast BC and the ability to apply MoE Protocol 14 Determining a Barite Site.	N/A	1-Mar-17
MNGD-20	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Section 9, or that they are attributed to natural background concentrations. Sec 8.2 says to confirm applicability of using this protocol first.	Tervita would ask the Ministry of Natural Gas Development to clarify. Section 8.2 does not specifically say that the applicability of Protocol would be reviewed first. As stated in Section 9, “To confirm whether these barium concentrations are a result of potential barite presence within the soils handled at the Facility or due to natural elevated background concentrations in the native soils…” barium concentrations could still be attributed to natural background concentrations.	N/A	1-Mar-17
MNGD-21	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Attachment B, where is table 1?	The report will be revised and corrections made.	N/A	1-Mar-17
MNGD-22	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Table 3a for results <600 (regional background) would you still consider them an exceedance in this table? should be somehow highlighted differently.	Tervita would ask the Ministry of Natural Gas Development to clarify. There are exceedances depending on what criteria is being referenced. The different exceedances and their reference are at the bottom of the Table under Notes.	N/A	1-Mar-17
MNGD-23	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Table 3a, why was the barium result for BH-13-A not calculated	The report will be revised and corrections made.	N/A	1-Mar-17
MNGD-24	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Attachment C shows air monitoring results, not borehole logs.	The report will be revised and a comment will be made.	N/A	1-Mar-17
MNGD-25	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Attachment D, this is not discussed in the text...occurs for more than one sample in the lab report.	The mercury is biased low, but results show that results are less than 1% of the applicable standard thus results won’t influence the report.	N/A	1-Mar-17
MNGD-26	30-Jan-17	Jennifer White	Ministry of Natural Gas Development	Terrain and Soils	Soil Study		Attachment D (page 119), was this done?	The comment refers to a generic list of acronyms. The particular one referenced by the reviewer was not used to qualify the data within the lab report. As such, there is no amendment required to the report at this time.	N/A	1-Mar-17

Appendix 13
British Columbia Environmental Assessment Office Working Group First Nations Comments during Pre-Application Stage for the Proposed Project Expansion

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
Comments Received Through BC EAO Working Group									
BRFN-1	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		Tervita clearly relied heavily on BC EAO's guidelines for VC selection (2013), without engaging with Blueberry to discuss VC selection.	Tervita was following guidance documents provided by the BC EAO. The BC EAO will have to discuss relevance of their guidance documents with BRFN.	23-Jan-16
BRFN-2	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		Tervita be required to revise the VC document in direct consultation with Blueberry prior to the development of the dAAIR.	Tervita would like to note that this is the draft VC document Blueberry provided comment on. Comments and concerns received from Blueberry will be incorporated into the finalized version of the VC.	23-Jan-16
BRFN-3	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		None of the VCs proposed contemplate Project impacts on aboriginal peoples or their treaty rights practices. One of the social pillar VCs - Land and Resource Use - identifies agriculture, oil and gas activity, and trapping as subcomponents. The rationale for this selection is that "agriculture, oil and gas activity, trapping and forestry are the four main land and resource uses that occur within a 5-km radius of the proposed Project site". Both the subcomponents and rationale ignore the myriad of practices that Blueberry relies on the lands and resources that stand to be impacted by the Project. As a result, this VC will not assess potential impacts on Blueberry's treaty rights.	As part of the Application process Tervita will engage with Blueberry as per Tervita's First Nation Consultation Plan. Blueberry also has the opportunity to comment on the draft VCs, dAAIR and Application. Through this process, the BC EAO and Tervita will be able to address applicable impacts on Blueberry's treaty rights.	23-Jan-16
BRFN-4	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		Of the biophysical VCs proposed, such as Wildlife and Wildlife Habitat, the subcomponents fail to identify species of critical importance to Blueberry and there is no distinction made between species of greater and lesser importance to Blueberry. For example, proposing to treat western toad on the same footing as furbearers and ungulates does not take into consideration the relative importance of these animals. An assessment of the Wildlife and Wildlife Habitat generally, and general subcomponent of ungulates, may well mask impacts to the most valued wildlife such as moose.	As part of the Application process Tervita will engage with Blueberry as per Tervita's First Nation Consultation Plan. Tervita has also engaged local trappers. Blueberry also has the opportunity to comment on the draft VCs, dAAIR, and Application. Through this process, Tervita will be able to address applicable impacts and mitigation on wildlife "valued" by Blueberry First Nation.	23-Jan-16
BRFN-5	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		An increase in noise could have devastating impacts on wildlife, which will in turn adversely impact Blueberry's interests.	Comment acknowledged. Tervita will add noise as a VC.	23-Jan-16
BRFN-6	13-Jan-16	Norma Pyle	BRFN	Economy	Draft VCs Document		Tervita's exclusion on an economic VC. Tervita states that it did not include an economic VC because the "Project is expected to have a positive impact balance on the economy and no negative effects pathways are anticipated." However, the Project could have adverse effects on Blueberry's treaty rights practices, affecting our economic interests and traditional economy.	Comment acknowledged. Tervita will add the economy as a VC.	23-Jan-16
BRFN-7	13-Jan-16	Norma Pyle	BRFN	Fish and Fish Habitat	Draft VCs Document		Blueberry requests that Fish and Fish Habitat be included as a VC or, alternatively, that a much more fulsome justification of the exclusion of this VC be provided for working group review and comment.	Comment acknowledged. Tervita will talk to our subject matter experts to provide a more fulsome justification for exclusion. Updated: Tervita has incorporated Fish and Fish Habitat as a VC.	23-Jan-16
BRFN-8	13-Jan-16	Norma Pyle	BRFN	Environmental Assessment Methods	Draft VCs Document		Tervita's methods for data collection rely largely on desktop reviews. Significantly more data collection will be required and it is critical that Tervita shares plans for data collection and analysis, including sampling site locations, season and specific parameters that will be measured.	Additional details regarding data collection will be laid out in technical investigations, monitoring programs etc. as a part of the Application. Updated: The air study and soil sampling scope has been distributed by the BC EAO.	23-Jan-16

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BRFN-9	13-Jan-16	Norma Pyle	BRFN	Environmental Assessment Methods	Draft VCs Document		There is no rationale provided for the VC's spatial boundaries listed in Table 4. There is no reference to scientific, local or traditional knowledge, expertise, evidence, or biophysical and social cultural, economic and environmental baseline conditions. Consultation with Blueberry is necessary to ensure that the local and regional assessment boundaries consider all available information and expertise. Tervita must provide a rational for the different VC spatial boundaries.	Please see the following for justification of spatial boundaries. Air RSA - The expected contaminants of concern for the proposed Project are primarily fugitive dust emissions (particulate matter), and to a lesser extent various minor combustion tailpipe emissions. This choice of study area dimensions is expected to be sufficient to capture the area of maximum impact for such low lying releases. Also, although no modeling is planned for the proposed Project, the extent of the study area is consistent with current BC Air Dispersion Modelling Guidance (see Section 6.1 of Guideline for Air Quality Dispersion Modelling in BC, BC MECCS, October 2006). Surfacewater and groundwater RSA/LSA - Potential effects of the Project on surface water and groundwater are considered within the context of the LSA and the RSA. The LSA is the geographic area in which direct interaction of the Project with surface water and groundwater is expected. The RSA is a larger area that provides context for the assessment of direct and cumulative adverse effects of the proposed Project, and is not the area within which direct Project effects are expected. Cumulative effects of the proposed Project with existing and reasonably foreseeable projects on surface water and groundwater are considered within the boundary of the RSA. The 15-km radius of the RSA is delimited by the Blueberry River, as the Project is not expected to act cumulatively on surface and groundwater with other existing or reasonabl foreseeable projects beyond the Blueberry River. The LSA is considered to be the extent in which direct potential effects could occur (that is, the geographic area in which direct interaction of the Project with surface water and groundwater may occur). The LSA boundary is defined as a 30-m radius extending outwards from the Project Footprint, including associated physical works and activities. Management measures to contain contaminated water within the facility will ensure that no effects to surface or groundwater occur beyond the LSA, therefore, effects on the Blueberry River, or other watercourses beyond the LSA, are not anticipated. Ongoing management measures include surface and groundwater collection and monitoring to ensure potential waterborne contaminants do not enter the environment. Update: The air RSA is now 10 km and incorporates most of Blueberry First Nation. The justification and rational for chosen LSA and RSA boundaries are explained in full in Table 4 of the draft VC document.	23-Jan-16
BRFN-10	13-Jan-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		Need for a Blueberry Treaty Rights stand alone VC.	Tervita followed BC EAO technical guidance documents. Blueberry First Nation will need to engage the BC EAO on the possibility of a stand-alone VC for Blueberry Treaty Rights.	23-Jan-16
BRFN-11	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Trigger points for additional mitigation measures should be identified before surveys are conducted to ensure findings are objectively used to develop appropriate avoidance and mitigation measures.	The intent of the Wildlife Survey as drafted is to first complete the survey to understand the species present and local habitat usage. With this information, local and regional habitat use patterns can be assessed against the proposed project development. Given this knowledge, supported by supplemental surveys, we will be able to understand what triggers if any exist and what mitigation measures will be required to address the triggers identified. Given the majority of the Project Footprint is actively cultivated, the anticipated number of trigger points is low due to cultivated agricultural land having a lower wildlife capacity when compared to woodlands and wetlands. That said, post survey completion, the mitigation measures will be provided to BRFN and other working group members for review once survey results are finalized.	8-Sep-16

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BRFN-12	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Additional information about Blueberry's role in the fieldwork, including detail on how Blueberry's traditional knowledge will be collected, understood and incorporated into the surveys is required.	Tervita wishes to engage Blueberry First Nation Members to provide one wildlife spotters / observers / field monitors for the surveys. With respect to the collection, understanding and incorporation of traditional knowledge, Tervita is willing to work with Blueberry River First Nation on a Traditional Knowledge and Use Study. Tervita received a scope of work from BRFN for a Traditional Knowledge and Use Study (Appendix 1). Tervita responded (Appendix 2) to Blueberry's request on June 17th seeking more clarity on the scope of work. Please provide the clarity Tervita is seeking so Blueberry's traditional knowledge can be collected, understood and incorporated.	8-Sep-16
BRFN-13	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		The proposed SOW does not account for the impact of recent wildfires in the area. As a result of this recent change to the landscape a wildlife tree survey is needed.	Wildfires result in a structural mosaic of wildlife habitat, including the creation of wildlife trees (that is, standing snags) (y et al. 2004). However, current forest practices such as salvage logging may reduce the number of wildlife trees present in recently burned areas. Based on the 2015 site survey, large trees are predominantly located outside of the Project Footprint, particularly to the south. Tervita is including wildlife tree survey to catalogue wildlife trees in the Project Footprint in the supplemental winter wildlife surveys.	8-Sep-16
BRFN-14	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		The SOW proposes two wildlife cameras, but based on information about groundwater flow, Blueberry requests that two additional wildlife cameras be installed in the north and west of the Project area to determine activity levels at areas where there is a potential risk of contamination from the Project.	Tervita has purchased and installed two additional wildlife cameras. The cameras are installed along the north and west edges of the Project area. There are now a total of four wildlife cameras onsite.	8-Sep-16
BRFN-15	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Additional information about the fall survey is required, including how observation stations will be selected and how many times the survey will be repeated.	The survey sites for the fall survey will be selected to represent a sample of the available habitat types present within the Project area (for example, wetlands and ponds, hayfield, shrubby areas, forested areas). A total of 10 observation stations have been selected for the fall survey (Figure 1). All potential staging waterbodies within the Project area will be visited, therefore, six observation stations are located in the area of ponds and wetlands that may be used by staging migratory waterfowl. Two replicate observation stations were placed in each other general habitat type (shrubby/field and forested) to capture other migratory species that may be present in the Project area: two observation stations are located within shrubby or previously disturbed areas and two observation stations are located within forested habitats. The fall survey will be repeated once, as this will provide an adequate snapshot of migratory bird use in the area to supplement existing information and desktop review, and to inform Project mitigation measures.	8-Sep-16
BRFN-16	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Additional information about the winter survey is required, including information about where survey transects will be located and how many times the survey will be repeated.	Additional information regarding the winter survey locations will be provided before the fieldwork begins (details are currently being developed). The winter survey will be repeated twice, in early and late winter, as to provide adequate data on ungulate, medium sized mammal, small mammal, and game bird usage of the Project area in winter and to inform Project mitigation measures.	8-Sep-16

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BRFN-17	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		The spring surveys should be improved by ensuring surveys of breeding birds include nest surveys in addition to point count surveys and by ensuring that amphibian surveys are repeated three times, identify migration pathways for western toad (assuming they are present) and record the presence of egg masses and larvae.	Nest surveys will not be included in the spring surveys. The assessment of Project effects and development of mitigation measures takes a precautionary approach whereby conclusions and mitigation are derived based on the assumption that species that have potential to occur will interact with the Project. Therefore, it is assumed that birds detected during the breeding bird point counts are breeding in the Project area and it is unnecessary to perform invasive nest surveys. Tervita performs nest surveys before any cell construction at Silverberry, to accurately understand impacts prior to construction and apply appropriate mitigation measures to specific nests found in the area. The spring survey, including bird point counts and amphibian surveys, will be repeated three times, as to ensure amphibian habitat use by a variety of life history stages (for example, breeding adults, eggs, tadpoles, and dispersing juveniles) is accurately captured and to provide adequate data to inform Project mitigation measures.	8-Sep-16
BRFN-18	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Blueberry expects that all fieldwork conducted in our territory is monitored by Blueberry field monitors, we look forward to ensuring the same occurs for these studies.	Tervita wishes to engage Blueberry First Nation Members to provide one wildlife spotters / observers / field monitors for the surveys.	8-Sep-16
BRFN-19	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Survey timing (fall, winter, and spring) is important to understand how wildlife are currently using the area and determine what the additional impacts will be from the proposed Project.	We agree with this statement and thus as proposed Tervita will be completing fall winter and spring surveys according to the BC Resource Inventory Methods for each target wildlife group (for example, breeding birds, amphibians, and ungulates).	8-Sep-16
BRFN-20	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		It is not clear how the information collected in the proposed surveys will be used to develop meaningful mitigations for wildlife that are currently using the area, and may be displaced or otherwise impacted by the proposed expansion of the landfill. If high ungulate use of the area is observed, how will this be mitigated? If small/medium sized mammal use is high, how will impacts be determined and mitigated? If specific wildlife trails or migration pathways (for example, for amphibians) are observed, how will these sites be protected? What findings would trigger additional mitigations? Best practices for impact assessments require determining these potential trigger points before surveys are conducted to ensure findings can be objectively used to develop appropriate mitigations.	Wildlife mitigation measures will be developed following the supplemental wildlife surveys and informed by the survey results. These surveys will enhance our understanding of how wildlife is using the habitat within the Project area in order to inform Project mitigation measures. Given the majority of the Project Footprint is actively cultivated, the anticipated number of trigger points is low due to cultivated agricultural land having a lower wildlife capacity when compared to woodlands and wetlands. The mitigation measures will be provided to BRFN and other working group members for review once survey results are finalized.	8-Sep-16
BRFN-21	26-Aug-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Wildlife Survey		More detail is required on the proposed role of First Nations “throughout” fieldwork, as stated in broad strokes in Section 5 of the SOW, as well as a commitment to work with Blueberry to appropriately collect, interpret and incorporate our traditional knowledge.	Tervita welcomes the engagement of Blueberry First Nation in the wildlife studies. Please refer to question FN12 and FN18 for more detail.	8-Sep-16
BRFN-22	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Recent wildfire in the area makes protection of wildlife habitat and habitat features even more important at this time, potentially exacerbating existing cumulative effects and further reducing the number of wildlife trees in the area. These trees are an important habitat feature for many species of birds and mammals (including bats). A focused survey is needed to look at wildlife tree occurrence and determine whether additional mitigations should be considered to restore this habitat feature. The resulting frequency of snag occurrence should be compared to normal occurrence frequencies for this BEC zone / variant to provide a target for wildlife tree creation / restoration as a mitigation for wildlife trees lost due to clearing—an effect that will compound the potential loss of large, old trees and snags due to the recent wildfire.	Wildfires result in a structural mosaic of wildlife habitat, including the creation of wildlife trees (that is, standing snags) (Nappil et al. 2004). However, current forest practices such as salvage logging may reduce the number of wildlife trees present in recently burned areas. Based on the 2015 site survey, large trees are predominantly located outside of the Project Footprint, particularly to the south. Tervita is including wildlife tree survey to catalogue wildlife trees in the Project Footprint in the supplemental winter wildlife surveys.	8-Sep-16

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BRFN-23	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Use of the area by ungulates, including moose, deer and elk, is of interest and concern to Blueberry. Our members are concerned about animals browsing shrubs and using lick sites or getting water from areas immediately downstream and downgradient of the Silverberry Secure Landfill. We note that, based on the Project description from the proponent, groundwater generally flows to the northwest (p. 24 of *CEA Act* Project Description). Surface water also flows northwest, towards an unnamed tributary of the Blueberry River about 500 m west of the site (p. 6 of BC EAO Project Description). Though the proponent reports that ground and surface water quality monitoring has not raised any concerns to date, there are concerns that an expanded Project Footprint or a spill could increase the potential for contamination of ground and surface water, which could result in contamination risks to wildlife using the area. To capture wildlife activity in the area most at risk of contamination from ground and surface water, Blueberry recommends that at minimum four wildlife cameras be deployed in the north and west of the Project area (in addition to the two cameras currently proposed to the north and east) throughout all seasons (fall, winter, spring) to determine how moose and other ungulates are using these areas, including determining activity levels and assessing the likelihood of contamination from water sources and mineral.	Tervita has purchased and installed two additional wildlife cameras. The cameras are installed along the north and west edges of the Project area. There are now a total of 4 wildlife cameras on site.	8-Sep-16 8-Sep-16
BRFN-24	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		If there are known mineral licks in the area (within 2 km), these should be monitored with wildlife cameras.	Tervita is unaware of any mineral licks in the area. Could BRFN show the location of mineral licks within 2 km of Silverberry Landfill on a map so Tervita can consider the viability of placing wildlife cameras at the licks.	8-Sep-16
BRFN-25	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Results of these surveys should be shared with Blueberry on completion and analyzed and presented to decision-makers as part of the Project Application to ensure results are incorporated into the assessment of Project impacts.	Results of the surveys will be shared with Blueberry upon finalization and will be used in the Project Application to ensure they are incorporated into the assessment of Project impacts and to inform the development of Project mitigation measures.	8-Sep-16
BRFN-26	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		The brief description provided on p. 3-1 is not explicit about how observation stations will be selected and how often the survey will be repeated. Because migration events can be sporadic and may be difficult to predict due to climate change, we recommend repeating the survey at least three times over the course of the expected migration period (beginning, middle and end).	The survey sites for the fall survey will be selected to represent a sample of the available habitat types present within the Project area (for example, wetlands and ponds, hayfield, shrubby areas, and forested areas). A total of 10 observation stations have been selected for the fall survey (Figure 1). All potential staging waterbodies within the Project area will be visited, therefore, six observation stations are located in the area of ponds and wetlands that may be used by staging migratory waterfowl. Two replicate observation stations were placed in each other general habitat type (shrubby/field and forested) to capture other migratory species that may be present in the Project area: two observation stations are located within shrubby or previously disturbed areas and two observation stations are located within forested habitats. The fall survey will be repeated once, as this will provide an adequate snapshot of migratory bird use in the area to supplement existing information and desktop review, and to inform Project mitigation measures.	8-Sep-16
BRFN-27	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Blueberry requests additional information about where the surveys will be located and what habitat types will be represented in the survey. Blueberry would like the opportunity to comment on proposed survey locations once this information has been provided.	The survey sites for the fall survey will be selected to represent a sample of the available habitat types present within the Project area (for example, wetlands and ponds, hayfield, shrubby areas, forested areas). A total of 10 observation stations have been selected for the fall survey (Figure 1). All potential staging waterbodies within the Project area will be visited, therefore, six observation stations are located in the area of ponds and wetlands that may be used by staging migratory waterfowl. Two replicate observation stations were placed in each other general habitat type (shrubby/field and forested) to capture other migratory species that may be present in the Project area: two observation stations are located within shrubby or previously disturbed areas and two observation stations are located within forested habitats. The fall survey will be repeated once, as this will provide an adequate snapshot of migratory bird use in the area to supplement existing information and desktop review, and to inform the Project mitigation measures.	8-Sep-16

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BRFN-28	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		As with the fall survey, the description provided on p. 3-1 is not explicit about whether surveys will be conducted more than once or where survey transects will be located. To increase certainty regarding the results of winter track surveys and translate that information into developing meaningful mitigations, Blueberry recommends that track surveys be repeated at least three times over the course of the winter. This will also capture any changes in use of the area depending on timing during the winter.	Additional information regarding the winter survey locations will be provided before the fieldwork begins (details are currently being developed). The winter survey will be repeated twice, in early and late winter, as to provide adequate data on ungulate, medium sized mammal, small mammal, and game bird usage of the Project area in winter and to inform Project mitigation measures.	8-Sep-16
BRFN-29	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Blueberry requests an opportunity to review proposed survey locations and recommend additional survey sites based on our knowledge of how ungulates, medium sized mammals, small mammals, and game birds are using the area.	Proposed winter survey locations will be shared with BRFN.	8-Sep-16
BRFN-30	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		For breeding birds, nest surveys should occur in addition to point count surveys. A sample of the located nests should be monitored to determine fledgling success rates.	Nest surveys will not be included in the spring surveys. The assessment of Project effects and development of mitigation measures takes a precautionary approach whereby conclusions and mitigation are derived based on the assumption that species that have potential to occur will interact with the Project. Therefore, it is assumed that birds detected during the breeding bird point counts are breeding in the Project area and it is unnecessary to perform invasive nest surveys. Tervita performs nest surveys before any cell construction at Silverberry, to accurately understand impacts prior to construction and apply appropriate mitigation measures to specific nests found in the area.	8-Sep-16
BRFN-31	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		If western toads are present, an emphasis should be placed on finding migration pathways between wetland breeding sites and upland areas, to ensure that these migration routes can be protected.	The spring surveys will collect information amphibian habitat use by a variety of life history stages (for example, breeding adults, eggs, tadpoles, and dispersing juveniles) to inform Project mitigation measures.	8-Sep-16
BRFN-32	26-Aug-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		The spring surveys will collect information amphibian habitat use by a variety of life history stages (for example, breeding adults, eggs, tadpoles, and dispersing juveniles) to inform Project mitigation measures.	The spring surveys will collect information amphibian habitat use by a variety of life history stages (for example, breeding adults, eggs, tadpoles, and dispersing juveniles) to inform Project mitigation measures	8-Sep-16
BRFN-33	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		What mitigations are going to be proposed if important wildlife features are found (for example, what can be realistically be done to protect a game trail or mineral lick, if one is found in the proposed footprint or LSA). As outlined in our August 26, 2016 letter it is important that potential mitigations are identified at this time.	Results of each survey event will be shared with BRFN. If important wildlife features are found, mitigation measures will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process. Tervita would also like to meet with BRFN to discuss potential mitigation measures appropriate to the results of the surveys. No species of conservation concern were observed during the survey and results will be shared as soon as possible with BRFN.	24-Oct-16
BRFN-34	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		What role Blueberry will be offered in the development and implementation of the wildlife survey and subsequent mitigation, monitoring and reclamation programs given our stewardship rights and responsibilities are high in this area and in the heart of our territory.	Thus far, Tervita has listened to and made substantial changes to the wildlife surveys due to Blueberry First Nation's input. Due to Blueberry's feedback, Tervita has increased the amount of wildlife cameras and added six additional field survey dates. We look forward to BRFN, Lands Department, continued input into the wildlife surveys. Subsequent mitigation, monitoring and reclamation, appropriate to the results of the wildlife surveys, will be discussed in the Application and in consultation with BRFN.	24-Oct-16
BRFN-35	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Whether the surveys proposed will be adequate to find all wildlife features, without a more dedicated effort to incorporate multiple Blueberry Land Users who have a long relationship with this area. Finding specific wildlife features (for example game trails, bear dens, stick nests, lick sites, amphibian movement corridors) will require a full walk through/ survey of the site and LSA. Blueberry members should be leading this work and be given the authority to mark areas for protection from disturbance.	Thus far, Tervita has listened to and made substantial changes to the wildlife surveys due to Blueberry First Nation's input. Due to Blueberry's feedback, Tervita has increased the amount of wildlife cameras and added six additional field survey dates. We look forward to BRFN, Lands Department, continued input into the wildlife surveys. Additionally, Tervita is committed to working with BRFN and would like to meet BRFN, Lands Department, to see how we can incorporate some of the above concerns in the proposed TLU survey. Specific wildlife features and their protection will be discussed in the Application and in consultation with BRFN. Tervita would also like to meet with BRFN to discuss potential mitigation measures appropriate to the results of the surveys.	24-Oct-16

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BRFN-36	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Please identify what mitigation measures will be committed to/ conducted if important wildlife features (for example, stick nests, lick sites, wildlife trails, amphibian movement corridors) are encountered during fieldwork.	Results of the fieldwork will be shared with BRFN. Mitigation measures will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process. Tervita would also like to meet with BRFN to discuss potential mitigation measures appropriate to the results of the surveys.	24-Oct-16
BRFN-37	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Will additional fieldwork be proposed if initial surveys identify important features that should be avoided during construction?	Results of the fieldwork and surveys will be shared with BRFN. Initial results of the surveys will have to be reviewed by Tervita and Jacobs' Registered Professional Biologist to determine whether further fieldwork would be required. If further surveys are required, Tervita will notify BRFN.	24-Oct-16
BRFN-38	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Is there any leeway to adjust the boundaries of the proposed construction site if needed?	The EAC Amendment proposed construction area looks to minimize impact through use of Tervita's currently privately owned land, maximizing the utilization of existing land use (currently cultivated lands), adjacency to the existing landfill, and use of the existing landfill infrastructure. The boundaries of the construction will remain consistent throughout the EAC Amendment.	24-Oct-16
BRFN-39	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		What other mitigation measures are being considered to reduce the impacts of the proposed Project on important wildlife features in the area?	Results of the fieldwork will be shared with BRFN. Mitigation measures will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process. Tervita would also like to meet with BRFN to discuss potential mitigation appropriate to the results of the surveys.	24-Oct-16
BRFN-40	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		What role does Tervita commit to engage BRFN in regard to the development of site-specific wildlife mitigation, monitoring and adaptive management program development?	Results of the fieldwork will be shared with BRFN. Mitigation measures will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process. In addition, information that may contribute to wildlife mitigation may be shared during Blueberry River First Nation's TLU program. Tervita would also like to meet with BRFN to discuss potential mitigation appropriate to the results of the surveys. Adaptive management strategies can also be discussed once survey results are finalized and mitigations measures are discussed.	24-Oct-16
BRFN-41	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		At this time, Blueberry is participating in field studies on a monitor basis only, despite a desire to be involved in developing and implementing field studies and the assessment of Project impacts based on the same.	Tervita would like continue the dialogue with BRFN, Lands Department, to discuss the development and implementation of the wildlife surveys. To date, Tervita has listened to and made substantial changes to the wildlife surveys due to Blueberry First Nation's input. Due to Blueberry's feedback, Tervita has increased the amount of wildlife cameras and added six additional field survey dates.	24-Oct-16
BRFN-42	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Blueberry should be consulted regarding the timing of field surveys, as our knowledge holders have very thorough local knowledge of how animals are using these areas. To date Blueberry's traditional knowledge has not informed the timing of the surveys.	The timing of the wildlife field surveys will be guided by the appropriate survey guidelines provided by BC Resource Inventory Standards Committee. Local knowledge of the timing of wildlife habitat use will be welcomed during consultation with BRFN and will be considered in survey timing. At present, two winter surveys are planned for January and February 2017, and three spring surveys are planned for May and June 2017 (a total of five more surveys). Tervita would value Blueberry River First Nation's input on the dates of the additional proposed surveys.	24-Oct-16
BRFN-43	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Please see additional issues raised under point 1, above. Blueberry is interested in hearing more from Tervita about what options may be considered in terms of mitigations, particularly whether there are still opportunities to adjust the location or design of the site to protect important wildlife features, if they are observed during fieldwork.	The initial and most important mitigation is in the section of the proposed project site. The EAC Amendment proposed construction area looks to minimize impact through use of Tervita's currently privately owned land, maximizing the utilization of existing land use (currently cultivated lands), adjacency to the existing landfill, and use of the existing landfill infrastructure. Results of the fieldwork will be shared with BRFN. Mitigation measures will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process. Tervita may discuss design mitigations in the Application, if applicable. As noted above the location of the Project (construction boundaries) is not expected to change based on the sighting mitigation strategies discussed above.	24-Oct-16

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-44	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		As suggested in the original question, please identify baseline comparison numbers that will be used to determine whether wildlife tree restoration should be considered in the area. For example, how many snags/ha may be a good target in this ecosystem; has it been considered?	A survey of wildlife trees in the Project Footprint and surrounding areas will be completed during the winter fieldwork, before spring leaf-out. Existing conditions will be described in the Application from the results of the wildlife fieldwork. Mitigation measures including wildlife tree restoration, if required, will be addressed in the Application which will be reviewed by BRFN as part of the Working Group process.	24-Oct-16
BRFN-45	27-Sep-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Wildlife Survey		Blueberry is hopeful that a Knowledge and Use Study can be conducted with funding provided by Tervita. Provided adequate funding is offered, Blueberry will be able to identify the locations of mineral licks that stand to be impacted by the proposed Project. Irrespective of such a study, it is critical that lands impacted by the proposed Project are properly surveyed (that is, the full area should be walked) to identify the lick sites and wildlife movement corridors and ensure these areas are monitored and protected. Blueberry recommends that an independent field crew be funded by Tervita, and coordinated by Blueberry, to walk the entire site and survey for important wildlife features (for example lick sites, game trails, bear dens, and stick nests). These areas should be marked and avoided during new construction.	Tervita is committed to working with BRFN and would like to meet BRFN, Lands Department, to see how we can incorporate some of the above concerns in the proposed TLU survey. Specific wildlife features and their protection will be discussed in the Application and in consultation with BRFN. Tervita would also like to meet with BRFN to discuss potential mitigation measures that can be used to help protect important wildlife features.	24-Oct-16
BRFN-46	7-Jun-17	Norma Pyle	BRFN	Air Quality	Draft VCs Document		The VC document suggests that the Project may result in release of particulates which may contain NORM. BFRN's concern is that atmospheric transport will lead to deposition of these materials beyond the selected LSA for this VC (currently established as a 1-km polygon around the Project), with consequent effects on soil quality, surface and groundwater quality, vegetation quality, wildlife health, and traditional use of resources.	With respect to spatial boundaries: • The LSA and RSA were changed after the draft VCs) working group meeting and comments were received. Please refer to Tervita's January 23rd 2016, letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. Applicable results in the TUS, once published, will be used to help determine potential effects and appropriate mitigation measures in the Application.With respect to data collection: • There is no further soil sampling planned at this point. Applicable results in the TUS, once published, will be used to help determine potential effects and appropriate mitigation measures in the Application. Effects to plants will be assessed under the Vegetation VC and effects to wildlife will be assessed under the Wildlife and Wildlife Habitat VC. • Please refer to the March 6th 2017 Soil Study done at Silverberry Landfill. The study was given to the BC EAO for subsequent distribution to the working group. Results of the study will be used to help address concerns of uptake in the Application.	3-Aug-17
BRFN-47	7-Jun-16	Norma Pyle	BRFN	Air Quality	Draft VCs Document		Odour from the present facility is a significant concern to BRFN because it has a profound effect on the experience of the land and to avoidance/alienation from lands. It will be very important to adequately characterize the odour associated with the expansion in locations important to BRFN.	With respect to spatial boundaries: • The LSA and RSA boundaries were changed after the draft VC working group meeting and comments were received. Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. • Applicable results in the TUS, once published, will be used to help determine potential effects and appropriate mitigation measures in the Application. With respect to data collection: • Effects to traditional use will be assessed in the Application, Part C, using information from the TUS. Applicable results in the TUS, once published, will be used to help determine appropriate receptors. NORM dust and any accompanying studies will be assessed in the Application and will be addressed under the Human Health VC.	3-Aug-17

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-48	7-Jun-16	Norma Pyle	BRFN	Human Health	Draft VCs Document		Since there are various components and experiences of noise, it will be important to identify parameters for study and measure them appropriately. In particular, wildlife are known to be sensitive to different frequencies. Both A-weighted and C-weighted noise must be considered, as must low-frequency noise/vibration.	With respect to spatial boundaries: • Effects to traditional use will be assessed in the Application, Part C, using information from the TUS. Applicable results in the TUS, once published, will be used to help determine appropriate receptors. With respect to data collection: • The methodology for the noise study will be addressed in the dAAIRs. Mitigation measures for noise will be addressed in the Application. The landfill capacity replacement currently under assessment is located adjacent to the existing Silverberry landfill, which is considered to be part of the baseline existing conditions. Therefore, the assessment of changes to the acoustic environment is expected to be minimal given that the operations in the expanded landfill area are expected to be equivalent to current operations.	3-Aug-17
BRFN-49	7-Jun-16	Norma Pyle	BRFN	Surface Water	Draft VCs Document		We are not aware of extent of the surface water monitoring program at the site. It is not clear from the documents provided, which potential pathways of exposure and potential surface water receptors are considered. BRFN is concerned the identified 500-m LSA is not sufficient. No technical rationale was provided to justify this distance. Ontario Guideline D-4 was referenced which does not apply to landfills that accept/have accepted hazardous or liquid industrial waste. As D-4 states: “For proposals in the vicinity of landfills and dumps that have accepted liquid industrial, toxic or hazardous waste, the BC MECCS shall expect proponents to undertake further investigations and provide a report to the approving authority.”	With respect to spatial boundaries: • Please refer to Tervita's January 23rd, 2016 letter to Blueberry River First Nation providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • Currently, there is no surface water monitoring program or a requirement to do so. Water is tested and passes specific criteria before being discharged. Tervita can share the latest surface water analytical. Analytical, date and volume of discharge are all recorded and kept on file. Please see the attached Figure showing pathways and receptors. The surface water effects assessment will be determined during the AAIRs process.	3-Aug-17
BRFN-50	7-Jun-16	Norma Pyle	BRFN	Groundwater	Draft VCs Document		We are not aware of the extent of the groundwater monitoring program at the site. It is not clear from the documents provided, which potential pathways of exposure and potential surface water receptors are considered. BRFN is concerned the identified 500-m LSA is not sufficient. No technical rationale was provided to justify this distance. Ontario Guideline D-4 was referenced which does not apply to landfills that accept/have accepted hazardous or liquid industrial waste. As D-4 states: “For proposals in the vicinity of landfills and dumps that have accepted liquid industrial, toxic or hazardous waste, BC MECCS shall expect proponents to undertake further investigations and provide a report to the approving authority.”	With respect to related VCs: • Tervita provided the 2011-2015 groundwater reports to the BC EAO in spring 2016 for distribution to the working group. Tervita can provide the 2016 groundwater report to supplement the reports already provided. There is no interaction between the zone of influence of groundwater and wetlands. With respect to spatial boundaries: • Please refer to Tervita's January 23, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • Tervita provided the 2011-2015 groundwater reports to the BC EAO spring 2016 for distribution to the working group. Tervita can provide the 2016 groundwater report to supplement the reports already provided. The methodology for assessing effects will be determined during the AAIR stage. Pathways and receptors will be discussed in the Application.	3-Aug-17

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-51	7-Jun-16	Norma Pyle	BRFN	Terrestrial Vegetation	Draft VCs Document		BRFN continues to be concerned that this VC is not sufficiently defined to allow a determination of effects on plant species, or desirability of/access to plant species, used for traditional purposes and/or the desire/ability to harvest these species in the context of noise and odour issues.	With respect to subcomponents: • Effects to traditional use will be assessed in the Application, Part C, using information from the TUS. With respect to spatial boundaries: • Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC and any changes to the LSA and RSA during the dAAIR and Application stage will be based on information that changes the understanding of the zone of influence.	3-Aug-17
BRFN-52	7-Jun-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Draft VCs Document		BRFN remains concerned that the subcomponent is not sufficiently disaggregated to identify those species and their habitats that are of particular concern to BRFN. BRFN notes that these species should be identified through a TLU study. Distributions and appropriate sampling locations could also be identified, at least in part, by the same. BRFN is also concerned that “habitat” as a subcomponent, and “change” as a KI, are not yet adequately defined to ensure that study is not limited to physical change. An effects assessment must also address changes in invertebrate community composition as these are a leading indicator of ecosystem health. These in turn may affect human health, sense of place, and transmission of knowledge and must be carried forward for assessment accordingly.	With respect to subcomponents: • Effects to traditional use will be assessed in the Application, Part C, using information from the TUS. With respect to spatial boundaries: • Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • Effects to invertebrates will be captured under effects to Fish and Fish Habitat, under the Change in Habitat KI. Applicable mitigation measures will be addressed in the Application.	3-Aug-17
BRFN-53	7-Jun-16	Norma Pyle	BRFN	Wildlife and Wildlife Habitat	Draft VCs Document		BRFN remains concerned that the KIs are poorly characterized and that traditional knowledge has not been used to understand behaviors and movement patterns of particular species of importance to BRFN. The concern, therefore, is that these effects will be under-emphasized when carried forward to assessment of effects on TLU, sense of place, and transmission of knowledge, among others. The species of importance to BRFN and the practice of BRFN’s treaty rights are not identified with clear and relevant indicators for assessment that capture how these species are relied upon by BRFN.	With respect to subcomponents: • Tervita will engage with BRFN on the furbearers of concern. Effects to traditional use will be assessed in the Application, Part C, using information from the TUS. • The Silverberry landfill and capacity replacement area is not within or in proximity to woodland caribou range. In addition, the area in the Wildlife and Wildlife Habitat LSA is poor caribou habitat. • Porcupine and Beaver will be assessed under the Furbearers KI. With respect to KIs: • The key concerns listed by Blueberry River First Nation will be assessed under the Wildlife and Wildlife Habitat KIs including change in habitat and change in movement. With respect to spatial boundaries: • Please refer to Tervita's January 23, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • Effects to traditional use will be assessed in the Application, Part C, using information from the TUS.	3-Aug-17

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-54	7-Jun-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		By identifying “First Nation hunting…” as a subcomponent of this VC, it is clear that this VC is intended to be used to assess effect of the Project on BRFN use. BRFN remains deeply concerned that the proponent has an unduly narrow understanding of traditional use that is restricted to extractive uses or travel patterns associated with extractive uses. A full suite of nonextractive values exist that may be affected by the Project. These may include (but are by no means limited to): • Experience of the land/sense of place associated with food and water taste, quality, and abundance • Sense of cultural identity associated with place, place (visual/odour/light) quality, and ability to exercise traditional practices • Intergenerational cultural transmission Spirituality and Stewardship: • As set out in the letter enclosing these comments, key concerns specific to the present project must be identified in the context of a TLU study, measured appropriately, and assessed accordingly. Rather than taking an unduly narrow view of Blueberry’s interests as attempted by this VC, a VC	With respect to subcomponents: • Effects to traditional use, including an assessment specific to Blueberry River First Nation, will be assessed in the Application, Part C, using information from the TUS. With respect to KIs: • Effects to water are covered under the surface water and groundwater VC. • Effects of odour are covered under the air quality, noise under the acoustic environment VC respectively. Light and its effect are not being considered a VC at this time. Effects to Blueberry River First Nation land will be considered in Part C of the Application. • Effects of the Project on Blueberry River First Nation will be addressed in Part C of the Application. With respect to spatial boundaries: • Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence. With respect to data collection: • BRFN will have the opportunity to comment on data and data gathering methods.	3-Aug-17
BRFN-55	7-Jun-16	Norma Pyle	BRFN	Aboriginal Groups Rights and Interests	Draft VCs Document		BRFN note that Visual Quality and Aesthetics have been excluded from consideration on the grounds that the site is remote and that a visual barrier will be erected to disguise the new landform created by the landfill. This exclusion represents a fundamental misunderstanding of First Nations’ relationship to land. Landforms reflect important elements of culture and are used as a tool for intergenerational transmission of knowledge. The remoteness of a location and, by extension, its “naturalness” is a key component of cultural identity and sense of place, where naturalness has distinct features that differ by season and time. Night-time “naturalness” (notably the absence of artificial light is important to BRFN members both because night sky viewing is important and because BRFN is concerned that artificial light will have a disruptive effect on birds and wildlife.)	The Application is being submitted to assess the impacts of a potential capacity replacement of the existing Silverberry landfill. Therefore, the existing conditions adjacent to the capacity replacement site is an operational facility, including visual disturbance and light emissions. There are no expected changes to visual quality or light emissions based on the proposed capacity replacement. The operating hours of the landfill are mainly during daylight hours and night operations are rare. There are no plans to include visual quality as a VC at this time.	3-Aug-17

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-56	7-Jun-16	Norma Pyle	BRFN	Human Health	Draft VCs Document		BRFN members continue to be concerned that the landfill is, or will, affect water, air, and collected, gathered, or harvested consumables that in turn will affect BRFN member health. Whether or not contaminants are below regulated levels is one important KI; a second KI is the extent to which perception leads to avoidance of country foods, leading to adverse health and economic effects of reliance on store-bought foods.	With respect to subcomponents: • The Application is being submitted to assess the impacts of a potential capacity replacement of the existing Silverberry landfill. Therefore, the existing conditions adjacent to the capacity replacement site is an operational facility. • Traditional use effects specific to BRFN, will be discussed in Part C of the Application. With respect to KIs: • The human health effects assessment is based on pathways of potential effects from the Air Quality, Terrain and Soils, Noise and Surface Water VCs. Effects to traditional use of the Blueberry River First Nation will be assessed in Part C of the Application. With respect to boundaries: • Please refer to Tervita's January 23rd, 2016 letter to BRFN providing justification for the LSA and RSA boundaries. The spatial boundaries are based on the anticipated zone of influence for each VC. Changes to the LSA and RSA during the dAAIR and Application stage will only be warranted if information is produced during the technical assessment that changes the understanding of the zone of influence.With respect to data collection: • The Blueberry River First Nation-specific Socio-Economic Study will be used inform the effects assessment in the Application. • Information on traditional use provided by Blueberry River First Nation will inform the assessment to TLU in Part C of the Application.	3-Aug-17
BRFN-57	7-Jun-16	Norma Pyle	BRFN	Socio-Economic	Draft VCs Document		BRFN's direct experience has been that the negative socio-economic impacts of industrial developments are disproportionately experienced by BRFN. While the VC contemplates assessing impacts on First Nations separately from the general public a specific BRFN subcomponent is needed to ensure appropriate KIs and appropriate data is gathered.	With respect to subcomponents: • Effects specific to Blueberry River First Nation will be addressed in Part C of the Application. With respect to KIs: • The Application is being submitted to assess the impacts of a potential capacity replacement of the existing Silverberry landfill. Therefore, changes to employment and economy from the baseline conditions are expected to be small. Potential impacts to the proposed KIs will be covered under the current KI Economic Activity Levels in the LSA and RSA. With respect to data collection: • The Blueberry River First Nation-specific Socio-Economic Study will be used inform the effects assessment in the Application.	3-Aug-17
BRFN-58	12-Sep-18	Jane Calvert	BRFN	General	dAAIR (February 2018)	Application Summary	If the summary reflects the methodology of the Application, the bullet points are out of order: a summary of key effects, mitigation measures, residual, and cumulative effects will inform effects on Aboriginal interests and therefore should precede this bullet.	Tervita will switch the ordering of the bullets in the Application Summary.	18-Sep-18
BRFN-59	12-Sep-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 3rd bullet	In addition to describing the location of the proposed Project relative to Aboriginal groups' territories, please provide maps identifying project components in relation to territories.	Tervita can include this figure in the draft Application. Tervita currently, has Figure A-3 in the VCs, that show's the Project in relation to BRFN and DRFN.	18-Sep-18
BRFN-59a	31-Oct-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 3rd bullet	For clarity, BRFN is requesting a figure in addition to VC Figure 3 that identifies the Project within the Nation's traditional territory, not just it's proximity to the existing IR.	Tervita will be able to supply this Figure in the Application.	1-Nov-18
BRFN-59b	14-Nov-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 3rd bullet	Resolved	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-60	12-Sep-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	Please add the Agreement to the list of provincial documents to be considered	Tervita will add the Agreement to the list of provincial documents to be considered. Tervita would like to note that the Agreement is for Oil and Gas Applications under the OGC and that the landfill expansion will take place on private land.	18-Sep-18

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BRFN-60a	31-Oct-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	Resolved. BRFN believes it is important that the Environmental Assessment reference the Agreement to provide context: BRFN's territory is already heavily impacted and efforts to reduce further impact should underpin all future activities, including those on private lands.	Tervita thanks BRFN for providing context to the requested reference.	1-Nov-18
BRFN-60b	14-Nov-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-61	12-Sep-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	Please add national, or international planning or management designations (for example Cecil Lake Important Bird Area etc.) to the list of land uses to be considered.	Tervita will add Wildlife Management Areas (WMAs) under the 8th bullet.	18-Sep-18
BRFN-61a	31-Oct-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	Since Cecil Lake is the only area with another management designation (an Important Bird Area, what is the reason for its omission? Will this be mentioned in the context of assessment of Eared Grebes in the Wildlife and Wildlife Habitat Section?	Currently, Tervita does not anticipate that the Cecil Lake Important Bird Area overlaps or will be potentially effected by the Project.	1-Nov-18
BRFN-61b	14-Nov-18	Jane Calvert	BRFN	Project Description	dAAIR (February 2018)	1.2, 8th bullet	BRFN is concerned that cumulative effects to what is understood to be an important area for birds, including the Eared Grebe, are assessed. To that end, BRFN requests that cumulative effects to this Important Bird Area be assessed.	The 8th bullet in Section 1.2 of the dAAIR has been revised as follows to include the Cecil Lake Important Bird Area: Provincial land use plans (for example Land and Resource Management Plans) and provincial land use designations (for example Agricultural Land Reserve, Old Growth Management Areas, Wildlife Management Areas (including the Cecil Lake Important Bird Area), *Forests and Range Practices Act* designations) and provincial land use management objectives	22-Nov-18
BRFN-62	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Please include "Odour" in the title of the Air Quality VC to make this specific value explicit.	Tervita will edit the document and add "Odour" to the Air Quality VC bullet under 3.1 of the dAAIR.	18-Sep-18
BRFN-62a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-62b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	BRFN would like to understand and contribute to developing the methodology for assessing odour prior to submission of the Application.	Tervita will reach out to BRFN to discuss methodologies for assessing odour prior to submission of the Application.	22-Nov-18
BRFN-63	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Please add "Visual Quality" as a VC to permit data collection about, and assessment of, Project effects on conditions important to BRFN.	Tervita will edit the document and incorporate Visual Quality under the Human Health bullet, as "Human Health including Visual Quality."	18-Sep-18
BRFN-63a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Partially Resolved. For clarity, visual quality is a contributor to well-being. Scoping this sub-VC carefully will be important to ensure data is adequately captured so that the Crown can assess effects to rights.	Tervita thanks BRFN for the clarification and will scope relevant data to assess visual quality.	1-Nov-18
BRFN-63b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	BRFN would like to understand and contribute to the scoping and methodology for this sub-VC prior to receiving the Application.	Tervita will reach out to BRFN to discuss methodologies for assessing visual quality prior to submission of the Application.	22-Nov-18
BRFN-64	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Please add revise the title of the VC to "Cultural and Heritage Resources" to permit data collection about, and assessment of Project effects on, BRFN's cultural practices, values, and nonconsumptive uses.	Tervita will edit the document and change "Heritage Resources" to "Cultural and Heritage Resources."	18-Sep-18
BRFN-64a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-65	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Please revise the title of the VC to "Economies" to permit data collection about, and assessment of, Project effects on traditional or barter economy.	Tervita can edit the subcomponents under Section 5.1 of the dAAIR to add barter economy.	18-Sep-18
BRFN-65a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-66	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	Please add "Treaty Rights" as a VC to permit data collection about, and assessment of, Project effects on BRFN's rights and culture.	The BC EAO will have to discuss the addition of Treaty Rights as they are a Crown obligation to address and not the permittee.	18-Sep-18

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BRFN-66a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	It will be critical, however, for Tervita to collect the data needed regarding effects to biophysical and socio-economic conditions to adequately assess effects on Rights. We urge BC EAO and the Proponent to engage with BRFN to identify the information required in the Application to enable a trustworthy assessment of effects on Treaty Rights.	Tervita looks forward to working with BRFN to identify relevant information required for the Application.	1-Nov-18
BRFN-66b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.1 (Issues Scoping and Selection of VCs)	As indicated in the conference call facilitated by BC EAO on November 9, 2018, BRFN would like to work together to scope baseline studies to ensure that data regarding its interests is sufficiently captured for use by the Crown. BC EAO for the Crown should facilitate these meetings since they will require the information to conduct their assessment.	If any further baseline studies are required, Tervita will share the scope with working group members for comment. Studies/assessments scopes conducted so far have been shared with working group members for comment prior to the work being conducted. Tervita looks forward to further collaboration between BRFN, Tervita and the BC EAO.	22-Nov-18
BRFN-67	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	In describing the LAA, please add the following text: "In establishing the LAA for each VC, preference must be given to natural ecological boundaries, (for example watersheds) through which local effects may propagate, as opposed to uniform linear or area boundaries." This will guide the development of ecologically appropriate boundaries for the remaining assessment.	In order to address these concerns, Tervita has added the following information under Section 3.2.1: • "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-67a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN)	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-67b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-68	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	In describing the RAA, please add the following text: "In establishing the RAA for each VC, preference must be given to natural ecological boundaries, for example watersheds) through which local effects may propagate, as opposed to uniform linear or area boundaries." This will guide the development of ecologically appropriate boundaries for the remaining assessment.	In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-68a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's Local and/or LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN).	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-68b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-69	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	Temporal boundaries for this project are not provided. This represents a gap in the dAAIR. Temporal boundaries must be provided. As well, the following text should be added to section to guide the proponent: "It is important to situate temporal effects within broader ecological windows (for example, breeding, feeding, nesting, calving, migratory periods) to understand the context of effects, regardless of duration." This guidance is important to identify and implement critical life cycle windows or periods of the seasonal round for which additional seasonal or temporal mitigations will be required.	In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-69a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN).	This language has been revised in the methods section (Sections 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-69b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.2 (Assessment Boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-70	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions), 6th bullet	Please add the following text to this bullet in order to direct the way in which proponents uses TEK provided by BRFN: "An effort should be made, and the effort described in the Application, to integrate TEK with western data to identify both mutually supporting conclusions and areas of disagreement. Areas of disagreement may point to areas where further data collection is required."	Tervita will be able to incorporate TEK provided by BRFN into the Application. Tervita will edit bullet 6 to: "Description of what TEK, including Aboriginal Traditional Knowledge, was used in the VC assessment. Western Data can be integrated during the assessment to support conclusions or areas of disagreement."	18-Sep-18
BRFN-70a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions), 6th bullet	Please indicate what is meant by "…(TEK), Including Aboriginal Traditional Knowledge". This implies the existence of traditional knowledge besides aboriginal ecological knowledge. Is there other traditional knowledge available besides that held by aboriginal peoples? Alternatively, please revise bullet 6 to remove the subordinate clause "including Aboriginal TEK".	Tervita will remove the clause "including Aboriginal TEK."	1-Nov-18
BRFN-70b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions), 6th bullet	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-71	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions)	This section must also describe and discuss the context for existing conditions by providing baseline data available for the period prior to construction of the existing facility in order to more clearly understand potential cumulative effects on rights and the ability to regain traditional practices.	Tervita takes Blueberry River First Nation's comment into consideration and will discuss baseline conditions in the Application.	18-Sep-18
BRFN-71a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions)	This is not referenced in the revised dAAIR (Rev 5). Please explicitly state in this section that "Tervita will consider baseline conditions prior to the construction of the original landfill as context for the cumulative effects assessment".	Tervita will add this bullet to Section 3.3 of the dAAIR. Tervita will consider baseline conditions prior to construction of the original landfill as context for the assessment on Environmental, Economic, Social, Heritage and Health effects.	1-Nov-18
BRFN-71b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.3 (Existing Conditions)	What is the rationale for omitting the reference to cumulative effects? BRFN respectfully requests that the reference to cumulative effects be explicit in the dAAIR.	The bullet has been revised as follows: • Tervita will consider baseline conditions prior to construction of the original landfill as context for the cumulative effects assessment on Environmental, Economic, Social, Heritage and Health effects.	22-Nov-18
BRFN-72	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures), 2nd and 3rd bullets.	This bullet must provide more information about the ways in which the proponent is required to describe mitigation as follows: "Mitigation measures must be described with sufficient detail (for example areas, rations, timelines) in order that implementation can be measured and meaningful predictions regarding effectiveness can be made."	Tervita takes Blueberry River First Nation's comment into consideration and will discuss mitigation measures in the Application.	18-Sep-18

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-72a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures), 2nd and 3rd bullets.	For clarity, it is the level of detail that is of interest to BRFN. BRFN will be looking for sufficient detail (in terms of ratios, areas, thresholds, timelines, etc.) in the description of mitigations to evaluate their potential effectiveness as it relates to conclusions regarding residual project effects. We request that the AAIR clarify the detail required for mitigation measures, as per our original comment	The current wording addresses the area by the word in bold in the second bullet of Section 3.5 (for example equipment selection, placement, emissions, abatement measures), and construction and operation procedures and practices.The current wording addresses timelines by the word in bold in the second and eight bullet of Section 3.5: • Describe the mitigation measures incorporated into the Project, including site and route selection, project scheduling. • Include the time required for mitigation to become effective. Thresholds are addressed by bullet 7 in Section 3.5 where Tervita has to measure the success of each mitigation measure.	1-Nov-18
BRFN-72b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures), 2nd and 3rd bullets.	BRFN looks forward to working with Tervita to ensure that detail sufficient to assess mitigation efficacy is provided. BRFN would like to review proposed mitigations prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-73	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures)	Please add a bullet that reads "Identify any mitigation measures associated with land use planning processes or bilateral/government to government agreements" to ensure that these processes are recognized in permitting and operations.	Tervita will add this bullet to Section 3.5 of the dAAIR.	18-Sep-18
BRFN-73a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-73b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.5 (Mitigation Measures)	Resolved.	N/A	22-Nov-18
BRFN-74	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	As commented with reference to section 3.3, this section must provide appropriate grounding in the history of the area. To that end, the following should be added to section 3.6.1 (Context): "Context must include a discussion of pre-contact conditions, as they are best understood, to be able to adequately assess effects to each VC contributing to an assessment of effects on Treaty Rights."	The BC EAO will have to discuss the addition of Treaty Rights as they are a Crown obligation to address and not the permittee. TLU of Blueberry River First Nation will be discussed in Section 11 of the Application.	18-Sep-18
BRFN-74a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	It will be critical, however, for Tervita to collect the data needed regarding effects to biophysical and socio-economic conditions to adequately assess effects on Rights as identified in BRFN comment #BRFN-66.	Tervita looks forward to working with BRFN to identify relevant information required for the Application.	1-Nov-18
BRFN-74b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	As indicated in the conference call facilitated by BC EAO on November 9, 2018, BRFN would like to work together to scope baseline studies to ensure that data regarding its interests is sufficiently captured for use by the Crown. BC EAO for the Crown should facilitate these meetings since they will require the information to conduct their assessment.	If any further baseline studies are required, Tervita will share the scope with working group members for comment. Studies/assessments scopes conducted so far have been shared with working group members for comment prior to the work being conducted. Tervita looks forward to further collaboration between BRFN, Tervita and the BC EAO.	22-Nov-18
BRFN-75	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	As commented with reference to section 3.2, this section must lay the foundation for ecosystem management. To that end, the following text should be added to section 3.6.2 (Spatial boundary) to guide the proponent: "All boundaries should preferentially be scoped based on an ecologically meaningful basis (for example, watershed, airshed, ecozone, critical habitat) to ensure that the effects assessment is able to reflect potential adverse effects on functional systems at a landscape or ecosystem basis. A rationale should be provided that identifies the functional nature of each selected boundary."	In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-75a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN).	This language has been revised in the methods section (Sections 3.2 and 3.6) and pertains to all VCs.	1-Nov-18

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BRFN-75b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-76	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	As commented with reference to Section 3.2, it will be important to provide guidance for situating temporal effects in their ecological context. To that end, the following text should be added to guide the proponent: "Temporal effects (duration, frequency, and magnitude) must be described with reference to ecological windows (for example, breeding, feeding, nesting, calving, migratory periods) to understand the context of effects, regardless of duration."	Temporal Boundaries are listed under 3.2.1 as boundary that will be assessed. In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-76a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN)	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-76b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.6 (Characterization of Residual Effects)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-77	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.10 (Cumulative Effects Assessment)	The map showing the location of projects and activities being included in the cumulative effects assessment should display projects by industry sector to understand the regional distribution of project, and therefore, impact types.	A very thorough search was completed and only one future development (a small oil and gas project) was identified within the Wildlife RAA. Distances to future developments from the Project site are detailed where information was available, however, due to the limited number of future developments mapping was not deemed necessary. Granted, there are more in the socio-eco related RAAs, and specific details (including distance from Project) on these developments are provided, however, there is no assessment value in mapping these for socio-economic related VCs and in many cases specific footprint details are unavailable.	18-Sep-18
BRFN-77a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.10 (Cumulative Effects Assessment)	Respectfully, BRFN disagrees with the statement that "there is no assessment value in mapping these for socio-economic related VCs". BRFN is concerned with spatial use changes throughout its territory because these have the potential to affect traditional patterns of land use. A figure will help BRFN understand the way in which the Project, in relation to other land uses, will result in alteration of traditional use and practice. BRFN requests the provision of a figure as requested on 12 September 2018. Points in lieu of specific footprints are sufficient where footprints are not available.	Tervita will be able to supply this Figure in the Application.	1-Nov-18
BRFN-77b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.10 (Cumulative Effects Assessment)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-78	12-Sep-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.11 (Follow-up Strategy)	Follow-up strategies must be sufficiently defined to allow evaluation of their likelihood of success. It is not sufficient to say that monitoring will be done to identify deviations from predicted Project effects. Schedules for follow-up must be provided, and specific processes for developing and implementing further mitigation must be described.	Tervita is obligated to communicate about the Project throughout its life. The Application will elaborate on the follow-up strategy, including tools likes schedules and on-going consultation to address mitigation concerns.	18-Sep-18
BRFN-78a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.11 (Follow-up Strategy)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-79	12-Sep-18	Jane Calvert	BRFN	Air Quality	dAAIR (February 2018)	4.2 (re: selection of KIs)	This section must provide guidance on how to measure effects on Kiss. To that end, this section should include the following direction: "The location of sensitive receptors should be identified in consultation with First Nations in order to be able to address potential effects to VCs of importance to Aboriginal communities."	The location of sensitive receptors will be done in consultation with BRFN.	18-Sep-18

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Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-79a	31-Oct-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.11 (Follow-up Strategy)	Resolved. BRFN looks forward to working with Tervita to define these locations.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-79b	14-Nov-18	Jane Calvert	BRFN	Environmental Assessment Methods	dAAIR (February 2018)	3.11 (Follow-up Strategy)	BRFN welcomes the opportunity to work with Tervita to identify these locations prior to conducting baseline studies	If any further baseline studies are required, Tervita will share the scope with working group members for comment. Studies/assessments scopes conducted so far have been shared with working group members for comment prior to the work being conducted. Tervita looks forward to further collaboration between BRFN, Tervita, and the BC EAO.	22-Nov-18
BRFN-80	12-Sep-18	Jane Calvert	BRFN	Acoustic Environment	dAAIR (February 2018)	4.3 (re: selection of KIs)	Please add "% Annoyance" as a KI. This is a first step in being able to assess the effects of Project noise on traditional use of lands, where silence and solitude are valued.	% Annoyance is difficult to adequately quantify. The Human Health VC will assess impacts to the surrounding community.	18-Sep-18
BRFN-80a	31-Oct-18	Jane Calvert	BRFN	Acoustic Environment	dAAIR (February 2018)	4.3 (re: selection of KIs)	BRFN understands that it is difficult to quantify this. Nevertheless, % Annoyance is a common metric in Environmental Assessment and a prediction of potential effect is critical as a tool for the Crown to effectively consider effects to aboriginal rights. Please include it as a metric for assessment.	Level of annoyance has been added to Section 4.3.	1-Nov-18
BRFN-80b	14-Nov-18	Jane Calvert	BRFN	Acoustic Environment	dAAIR (February 2018)	4.3 (re: selection of KIs)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-81	12-Sep-18	Jane Calvert	BRFN	Surface Water	dAAIR (February 2018)	4.4 (re: selection of KIs)	Please add "Taste/Smell" as a KI. These data may be qualitative but must be collected in order to permit the effects of the Project noise on the perceived health, safety, or desirability of surface water.	Taste/Smell of surface water in the area is difficult to adequately quantify. Tervita can add this as a potential adverse effect to Aboriginal interests in Section 11.1 and will then be able to discuss mitigation measures.	18-Sep-18
BRFN-81a	31-Oct-18	Jane Calvert	BRFN	Surface Water	dAAIR (February 2018)	4.4 (re: selection of KIs)	BRFN understands that it is difficult to quantify this. Nevertheless, the perceived value and safety of water - as experienced through water taste and smell - is central to aboriginal values. A prediction of potential effects to these physical properties of water is critical as a tool for the Crown to effectively consider effects to aboriginal rights. Please include it as a metric for assessment.	The following bullet has been modified under Section 4.4 to reflect perceived taste/smell; Water quality parameters (for example, sediment, metals, hydrocarbons, perceived taste and smell); and	1-Nov-18
BRFN-81b	14-Nov-18	Jane Calvert	BRFN	Surface Water	dAAIR (February 2018)	4.4 (re: selection of KIs)	BRFN welcomes the opportunity to work with Tervita to define the methodology to be used to assess taste and smell prior to submission of the Application	Tervita will reach out to BRFN to discuss methodologies for assessing taste/smell prior to submission of the Application.	22-Nov-18
BRFN-82	12-Sep-18	Jane Calvert	BRFN	Groundwater	dAAIR (February 2018)	4.5 (re: selection of KIs)	Please add "Taste/Smell" as a KI. These data may be qualitative but must be collected in order to permit the effects of the Project noise on the perceived health, safety, or desirability of groundwater.	Taste/Smell of groundwater in the area is difficult to adequately quantify. Tervita can add this as a potential adverse effect to Aboriginal interests in Section 11.1 and will then be able to discuss mitigation measures.	18-Sep-18
BRFN-82a	31-Oct-18	Jane Calvert	BRFN	Groundwater	dAAIR (February 2018)	4.5 (re: selection of KIs)	BRFN understands that it is difficult to quantify this. Nevertheless, the perceived value and safety of water - as experienced through water taste and smell - is central to aboriginal values. A prediction of potential effects to these physical properties of water is critical as a tool for the Crown to effectively consider effects to aboriginal rights. Please include it as a metric for assessment.	The following bullet has been modified under Section 4.5 to reflect perceived taste/smell; Water quality parameters (for example, inorganic parameters, ions, dissolved metals, perceived taste and smell and other contaminants); and	1-Nov-18
BRFN-82b	14-Nov-18	Jane Calvert	BRFN	Groundwater	dAAIR (February 2018)	4.5 (re: selection of KIs)	BRFN welcomes the opportunity to work with Tervita to define the methodology to be used to assess taste and smell prior to submission of the Application.	Tervita will reach out to BRFN to discuss methodologies for assessing taste/smell prior to submission of the Application.	22-Nov-18
BRFN-83	12-Sep-18	Jane Calvert	BRFN	Terrestrial Vegetation	dAAIR (February 2018)	4.6 (re: selection of KIs)	Please add two additional KIs as follows: (a) "spatial distribution of losses" and (b) landscape change (for example, changes in forest age/seral stage, patch size). These data are important to understand effects on TLU in terms of distance travelled for harvest and peaceful enjoyment of wilderness.	Tervita will adequately address these requested Kis under the current KI - Loss of Vegetation Communities of Concern. The spatial distribution is described under the LAA and RAA.	18-Sep-18
BRFN-83a	31-Oct-18	Jane Calvert	BRFN	Terrestrial Vegetation	dAAIR (February 2018)	4.6 (re: selection of KIs)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-83b	14-Nov-18	Jane Calvert	BRFN	Terrestrial Vegetation	dAAIR (February 2018)	4.6 (re: selection of KIs)	Resolved.	N/A	22-Nov-18

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BRFN-84	12-Sep-18	Jane Calvert	BRFN	Fish and Fish Habitat	dAAIR (February 2018)	4.7 (existing conditions)	Given BRFN's intimate knowledge of the landscape and legal guidance regarding the equal standing of traditional knowledge, existing conditions must be informed by traditional knowledge. To that end, "Traditional Knowledge information regarding species presence, abundance, and distribution" must be added as a means of describing existing conditions.	Tervita will add the following bullet: "Traditional Knowledge information regarding species presence, abundance, and distribution"	18-Sep-18
BRFN-84a	31-Oct-18	Jane Calvert	BRFN	Fish and Fish Habitat	dAAIR (February 2018)	4.7 (existing conditions)	Resolved. BRFN looks forward to working with Tervita to incorporate this information in section 4.7 of the assessment.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-84b	14-Nov-18	Jane Calvert	BRFN	Fish and Fish Habitat	dAAIR (February 2018)	4.7 (existing conditions)	BRFN welcomes the opportunity to work with Tervita to ensure that TK informs the study designs prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-85	12-Sep-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.1 (Spatial Boundaries)	Further to comment made associated with section 3.2 of the dAAIR, the spatial boundaries for this Section should be revised to reflect meaningful ecological boundaries (for example habitat, breeding/rearing areas, important migration corridors, etc.)	In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-85a	31-Oct-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.1 (Spatial Boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN).	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-85b	14-Nov-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.1 (Spatial Boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-86	12-Sep-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.3 (Administrative boundaries)	This section should be revised to identify any proposed critical habitat for Species at Risk (SAR) within the revised LAA and RAA.	There are no anticipated changes to the LAA or RAA at this time. In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-86a	31-Oct-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.3 (Administrative boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN)	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs.	1-Nov-18
BRFN-86b	14-Nov-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.1.3 (Administrative boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-87	12-Sep-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.2 (Existing Conditions)	Given BRFN's intimate knowledge of the landscape and legal guidance regarding the equal standing of traditional knowledge, existing conditions must be informed by traditional knowledge. To that end, "Traditional Knowledge information regarding species presence, abundance, distribution, and the presence of game trails, bear dens, stick nests, lick sites, amphibian movement corridors, etc." must be added as a means of describing existing conditions.	Tervita will add the following bullet: "Traditional Knowledge information regarding species presence, abundance, distribution, and the presence of game trails, bear dens, stick nests, lick sites, amphibian movement corridors, etc."	18-Sep-18

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-87a	31-Oct-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.2 (Existing Conditions)	Resolved. BRFN looks forward to working with Tervita to incorporate this information in section 4.8 of the assessment.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-87b	14-Nov-18	Jane Calvert	BRFN	Wildlife and Wildlife Habitat	dAAIR (February 2018)	4.8.2 (Existing Conditions)	BRFN welcomes the opportunity to work with Tervita to ensure that TK informs the study designs prior to submission of the Application.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-88	12-Sep-18	Jane Calvert	BRFN	Economy	dAAIR (February 2018)	5.1	In order to assess effects on traditional use and practices, please add and collect data regarding a sub-VC for "Subsistence/traditional economy". Data collected for this sub-VC must be disaggregated by First Nation. An appropriate KI for this VC is "harvest levels and sharing among community members".	Effects on TLU will be addressed in Section 11 of the Application.	18-Sep-18
BRFN-88a	31-Oct-18	Jane Calvert	BRFN	Economy	dAAIR (February 2018)	5.1	Understood. It will be critical, however, for Tervita to collect the data needed regarding effects to biophysical and socio-economic conditions to adequately assess effects on Rights as identified in comment #BRFN-66. In this regard, it will be important to disaggregate data by First Nation.	Tervita looks forward to working with BRFN during the Application phase to ensure Section 11 is adequate.	1-Nov-18
BRFN-88b	14-Nov-18	Jane Calvert	BRFN	Economy	dAAIR (February 2018)	5.1	As indicated in the conference call facilitated by BC EAO on November 9, 2018, BRFN would like to work together to scope baseline studies to ensure that data regarding its interests is sufficiently captured for use by the Crown. BC EAO for the Crown should facilitate these meetings since they will require the information to conduct their assessment.	If any further baseline studies are required, Tervita will share the scope with working group members for comment. Studies/assessments scopes conducted so far have been shared with working group members for comment prior to the work being conducted. Tervita looks forward to further collaboration between BRFN, Tervita and the BC EAO.	22-Nov-18
BRFN-89	12-Sep-18	Jane Calvert	BRFN	Visual Environment	dAAIR (February 2018)	5.2 (New Section)	In order to meaningfully assess effects on traditional use and practices, data must be collected on all aspects of the environment that are of value to BRFN. To that end, the proponent must add, collect data, and establish an additional VC that addresses Visual Quality. Appropriate subcomponents and their indicators are landscape profile (assessed through project mock-ups) and night sky (assessed in terms of increased skyglow.) Since this was not assessed with the initial project, a robust cumulative effects assessment that meaningfully addresses context is required. This assessment is required, in turn, to inform the regulators determination regarding effects on treaty rights. Note that this VC also has linkages to migratory bird behavior and distribution (particularly in the case of night-time migrators) so the results of this assessment must be carried back to the assessment of project effects on Wildlife and Wildlife habitat. and then carried forward to an assessment of effects on harvesting.	Visual Quality can be discussed under Human Health Effects. There are no anticipated additions to light infrastructure at the landfill due to the expansion. The landfill also operates during daylight hours most of the year therefore cumulative impacts on skyglow and light effects on wildlife are not anticipated.	18-Sep-18
BRFN-89a	31-Oct-18	Jane Calvert	BRFN	Visual Environment	dAAIR (February 2018)	5.2 (New Section)	If the facility operates during daylight hours most of the year, what portion of the year do operations occur after dark? Is the facility unlit when not in operation? Will the expansion remain unlit?	Tervita has another facility (Silverberry TRD) on the same footprint which has light infrastructure associated with it. Currently, the TRD operates 24 hours a day, so from a casual observer's standpoint it may seem light is coming from the landfill during all nighttime hours. The landfill operates from 7 a.m. to 7 p.m. From approximately, end of April to the beginning of September there is enough daylight where light stands do not need to be operated. The rest of the year the light stands only operate a couple hours a day prior to sunrise and after sunset. The landfill portion of the footprint remains unlit when not in operation. The expansion area will have lighting where required but light stands from the current footprint will be moved over to the active area and no new light stands are anticipated.	1-Nov-18
BRFN-89b	14-Nov-18	Jane Calvert	BRFN	Visual Environment	dAAIR (February 2018)	5.2 (New Section)	BRFN remains concerned that additional lighting at dawn and dusk - which are critical periods for migratory birds - may have cumulative effects on bird navigation and way-finding. BRFN understands that no new lighting will be added and will request that lighting is an element to be monitored.	Tervita will work with BRFN during the Application to address Light Management/Monitoring and subsequent mitigation strategies.	22-Nov-18

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-90	12-Sep-18	Jane Calvert	BRFN	Land and Resource Use	dAAIR (February 2018)	6.1 (VCs)	The VCs selected for this assessment are primarily consumptive in nature (that is relate to collection or harvest). This represents a gap in the assessment: BRFN also relies on the landscape to supply a number of nonconsumptive benefits, ranging from peaceful enjoyment to education to spiritual practice. To that end, an additional VC with appropriate subcomponents (for example recreation/nonconsumptive enjoyment; education; spiritual practices) and KIs (for example land disturbance, noise, light) must be developed in collaboration with BRFN to identify and collect data regarding nonconsumptive uses and the potential effects of the Project on these uses. These data are also critical for regulators when determining effects to Treaty Rights.	Tervita will discuss nonconsumptive effects on BRFN under Section 11 of the Application.	18-Sep-18
BRFN-90a	31-Oct-18	Jane Calvert	BRFN	Land and Resource Use	dAAIR (February 2018)	6.1 (VCs)	Understood. It will be critical, however, for Tervita to collect the data needed regarding effects to biophysical and socio-economic conditions to adequately assess effects on Rights as identified in comment #BRFN-66. In this regard, it will be important to establish subcomponent values that fall under the category of Land and Resource Use, such as recreation/nonconsumptive enjoyment; education; spiritual practices, and assess these in order that the data on which the assessment in Section 11 is well supported by adequate data.	Tervita looks forward to working with BRFN during the Application phase to ensure Section 11 is adequate.	1-Nov-18
BRFN-91	12-Sep-18	Jane Calvert	BRFN	Land and Resource Use	dAAIR (February 2018)	6.1.1.1 and 6.1.1.2 (Spatial and Temporal Boundaries)	See comments associated with Section 3.2 regarding boundaries. Boundaries must be established that fully reflect use in order that potential impacts to these uses can be assessed. Examples of appropriate spatial boundaries include trap-line lengths (in order to assess increased effort associated with reliance on farther reaches of the line) and appropriate temporal boundaries could include important harvest periods during the seasonal round. Boundaries should be rescoped in consultation with BRFN.	In order to address these concerns, Tervita has added the following information under Section 3.2.1: "It is standard practice for information gathered during each VC study and effects assessment to inform the zone of influence. If information is produced that indicates the zone of influence should be adjusted, it has the potential to change the study area boundaries."	18-Sep-18
BRFN-91a	31-Oct-18	Jane Calvert	BRFN	Land and Resource Use	dAAIR (February 2018)	6.1.1.1 and 6.1.1.2 (Spatial and Temporal Boundaries)	For clarity, BRFN views the landscape as a set of integrated ecological and cultural units. To ensure this is reflected in the AAIR, BRFN requests that this addition be revised to read "It is standard practice for information gathered during each VC study and effects assessment to result in alterations to the spatial and temporal boundaries of a VC's LAAs and RAAs. If information is produced that indicates assessment boundaries should be adjusted to better reflect ecosystem boundaries and divides, ~~it has the potential to change the~~ study area boundaries will be revised." (bold italics reflect the addition requested by BRFN).	This language has been revised in the methods section (Section 3.2 and 3.6) and pertains to all VCs, therefore, language was excluded from the Land Use Section.	1-Nov-18
BRFN-91b	14-Nov-18	Jane Calvert	BRFN	Land and Resource Use	dAAIR (February 2018)	6.1.1.1 and 6.1.1.2 (Spatial and Temporal Boundaries)	BRFN welcomes the opportunity to work with Tervita to develop appropriate study boundaries to ensure that adequate spatial data is collected.	Tervita looks forward to working with BRFN during the Application phase.	22-Nov-18
BRFN-92	12-Sep-18	Jane Calvert	BRFN	Heritage Resources	dAAIR (February 2018)	7.1.1.2 (Temporal Boundaries)	It is not clear why the operations phase has been omitted. Noise, light, and other potential Project effects may affect the continued use or value of archaeological sites and must therefore be assessed either here or in the Land and Resource Use section of the final Application.	Tervita will add the Operations Phase to Section 7.1.1.2.	18-Sep-18
BRFN-92a	31-Oct-18	Jane Calvert	BRFN	Heritage Resources	dAAIR (February 2018)	7.1.1.2 (Temporal Boundaries)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-92b	14-Nov-18	Jane Calvert	BRFN	Heritage Resources	dAAIR (February 2018)	7.1.1.2 (Temporal Boundaries)	Resolved.	N/A	22-Nov-18
BRFN-93	12-Sep-18	Jane Calvert	BRFN	Human Health	dAAIR (February 2018)	8.1 (VC Selection)	The selection of VCs results in a very narrow definition of health restricted to physical wellbeing. In order to better capture Project effects to BRFN, additional subcomponents/indicators must be added that address mental and/or community health. These should be selected in collaboration with BRFN.	Tervita will add "Community Health" as a KI under Section 8.1.	18-Sep-18
BRFN-93a	31-Oct-18	Jane Calvert	BRFN	Human Health	dAAIR (February 2018)	8.1 (VC Selection)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-94	12-Sep-18	Jane Calvert	BRFN	Human Health	dAAIR (February 2018)	8.1.1.1 (Spatial Boundaries)	It is assumed that the Air Quality RAA is the largest of all RAAs. Nevertheless, the RAA must also include the maximum extent of the Fish RAA and Wildlife RAA in order to properly capture potential effects to human health from harvested foods.	The dAAIR will be edited to include Wildlife and Fish LAA to be listed in 8.1.1.1	18-Sep-18
BRFN-94a	31-Oct-18	Jane Calvert	BRFN	Human Health	dAAIR (February 2018)	8.1.1.1 (Spatial Boundaries)	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-95	12-Sep-18	Jane Calvert	BRFN	Accidents and Malfunctions	dAAIR (February 2018)	9	Please add "Fires" to the list of accidents to be assessed.	Fires will be added to Section 9 as an accident to be assessed.	18-Sep-18
BRFN-95a	31-Oct-18	Jane Calvert	BRFN	Accidents and Malfunctions	dAAIR (February 2018)	9	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-96	12-Sep-18	Jane Calvert	BRFN	Effects of the Environment on the Project	dAAIR (February 2018)	10	Please clarify the effect by revising the factor name to "Wildfires" (emphasis added for clarity).	Section 10 of the dAAIR will be edited to reflect this comment.	18-Sep-18
BRFN-96a	31-Oct-18	Jane Calvert	BRFN	Effects of the Environment on the Project	dAAIR (February 2018)	10	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-97	12-Sep-18	Jane Calvert	BRFN	Aboriginal interests	dAAIR (February 2018)	11.1	Please add the following topic to the list of potential effects on Page 84: "Effects on sense of community and identity, where identity is predicated, in part, on the condition of the land and its resources." The addition of this topic should not be construed as the only topic required to be added to the list.	"Effects on sense of community and identity, where identity is predicated, in part, on the condition of the land and its resources," will be adequately addressed by following two potential effects already listed in Section 11.1: • Effects to the exercise of traditional practices, including via perceived odour, noise and light • Effects to the exercise of traditional practices, including via perceived odour, noise and light	18-Sep-18
BRFN-97a	31-Oct-18	Jane Calvert	BRFN	Aboriginal interests	dAAIR (February 2018)	11.1	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-98	12-Sep-18	Jane Calvert	BRFN	Management Plans	dAAIR (February 2018)	13	Please add specific Management Plans for "Odour Control" and "Night-time Light Management".	Tervita will edit the document and list these Management Plans in Section 13..	18-Sep-18
BRFN-98a	31-Oct-18	Jane Calvert	BRFN	Management Plans	dAAIR (February 2018)	13	Resolved.	Tervita looks forward to working with BRFN during the Application phase.	1-Nov-18
BRFN-99	6-Dec-18	Jane Calvert	BRFN	Assessment Methodology	dAAIR (February 2018)	3	Following the final paragraph of this section, please add: “The Application will describe the way in which BRFN was engaged in establishing and refining study scoping and methodology to ensure that data needed to assess effects on VCs relevant to BRFN were adequately assessed.”	BRFN’s engagement will be detailed in Part C of the Application. This will include any conversations Tervita had with BRFN regarding study scoping methodology. Part C of the Application includes a description of potential adverse effects of the proposed Project on Aboriginal interests.	4-Jan-19
BRFN-100	6-Dec-18	Jane Calvert	BRFN	Issues Scoping and Selection of VCs	dAAIR (February 2018)	3.1	Following the final paragraph of this section, please add: “The Application will identify the VCs modified as a result of consultation with BRFN and provide a rationale for their omission if they have not been assessed.”	Section 4.2 of the VC document includes rational for the exclusion of candidate VCs. Tervita will ensure VC selection rationale is carried forward into the Application.	4-Jan-19
BRFN-101	6-Dec-18	Jane Calvert	BRFN	Assessment Boundaries	dAAIR (February 2018)	3.2	Following the final paragraph of this section, please add: “The Application will identify any requested study boundary revisions for each VC and provide the rationale for boundary revisions or the retention of original boundaries.”	Section 4.3 and Table 4-4 of the VC document, outlines the rationalization for the spatial boundaries. As outlined in Section 3.2 the dAAIR “the draft Application will include rational for any differences in boundaries from those presented in the final AAIR.” Tervita has added the following sentence to Section 3.2 to address BRFN's request: "The Application will identify any requested revisions for each VC and provide the rationale for boundary revisions or the retention of original boundaries."	4-Jan-19
BRFN-102	6-Dec-18	Jane Calvert	BRFN	Potential Effects	dAAIR (February 2018)	3.3	Following the final paragraph of this section, please add: “The Application will identify those effects being assessed that were specifically requested by BRFN and, if any were not, the rationale for excluding these effects from consideration will be provided.”	Part C of the Application includes a description of potential adverse effects of the proposed Project on Aboriginal interests. As noted in Section 11.1 of the dAAIR the Application will include “a summary of any outstanding Aboriginal interests issues identified by Aboriginal Groups.” BRFN will be able to review Part C of the draft Application and provide feedback on effects.	4-Jan-19

Table A13-1. First Nations Comments Table

Identifier Number	Comment Date	Reviewer Name/ Agency	Reviewer Agency/Organization	Subject	Document	Document Section	Comment	Proponent Response, Change, and Action	Response Date
BRFN-103	6-Dec-18	Jane Calvert	BRFN	Cumulative Effects Assessment	dAAIR (February 2018)	3.10	Following the final paragraph of this section, please add: “The Application will include a discussion of cumulative effects since European contact to provide a context for the Project and development in the region.”	Tervita will work collaboratively with BRFN to ensure the Application adequately addresses key effects, proposed mitigation measures and residual and cumulative effects on VCs. Part C of the Application will also address Aboriginal interests. To has added the following bullet to Section 3.10 to address BRFN's request. The Application will include a discussion of cumulative effects since European contact to provide a context for the Project and development in the region. BRFN will be able to provide feedback on the draft Application and the cumulative effects.	4-Jan-19
BRFN-104	6-Dec-18	Jane Calvert	BRFN	Follow-up Strategy	dAAIR (February 2018)	3.11	Following the final paragraph of this section, please add: “The follow-up strategy shall be sufficiently described with timelines and structures such that its efficacy can be assessed.”	Section 3.11 of the Application will include measures to evaluate the effectiveness of proposed mitigation measures. Tervita has added the following bullet to Section 3.11 to address BRFN's request: • The follow-up strategy shall be sufficiently described with timelines and structures such that its efficacy can be assessed.	4-Jan-19
Comments Received through First Nations TUS									
DRFN - 1	18-Dec-17	Urban Systems	DRFN	Tervita Silverberry Project	N/A	N/A	Through the Tervita Silverberry Non-Confidential Desktop TUS (December 18, 2017), DRFN identified hunting, trapping, fishing and plant gathering activities within the LAA and RAA. Travel routes and an archaeological site was identified within the LAA. No land and resource use sites were identified within the Project Footprint. DRFN expressed concerns about access to TLU areas and a healthy ecosystem that supports hunting, trapping, fishing, and peaceful enjoyment of the land.	Tervita held a phone meeting with DRFN to discuss the TUS report. The meeting was attended by Cec Heron (DRFN), Dave Flanders (Urban Systems), Heather Conquergood (Jacobs), and Todd Frankel and Peter Nelson (both Tervita). Tervita and DRFN discussed working with DRFN when placing final cover, to ensure the proper vegetation is planted to help support local wildlife populations. Tervita will work with local First Nations on the appropriate seed mix for revegetation and capping. DRFN also expressed concern of the deforestation around Silverberry affecting Caribou populations. Tervita and DRFN discussed the potential off restoration at a later date. Lastly, DRFN expressed concern about the amphibians found at site. Tervita will perform amphibian surveys prior to expansions construction.	18-Dec-17

Notes:
Comments were received from BRFN from the BC EAO Working Group.

AAIR = Amendment Application Information Requirement
the Agreement = Regional Strategic Environmental Assessment Interim Measures Agreement
the Application = the Environmental Assessment Certificate Application
BC = British Columbia
BRFN = Blueberry River First Nations
BC EAO = British Columbia Environmental Assessment Office
dAAIR = draft Amendment Application Information Requirements
DRFN = Doig River First Nation
EAC = Environmental Assessment Certificate
EMA = *Environmental Management Act*
Jacobs = CH2M HILL Canada Limited
km = kilometre(s)
LSA = Local Study Area
m = metre(s)
NORM = naturally occurring radioactive material
RSA = Regional Study Area
TEK = Traditional Ecological Knowledge
Tervita = Tervita Corporation
TLU = Traditional Land Use
TRD = Treatment, Recovery, and Disposal
TUS = Traditional Use Study
VC = Valued Component

Attachment 1
Registry Search Record

BC Registry Services

Mailing Address:
PO BOX 9431 Stn Prov Govt.
Victoria BC V8W 9V3
www.corporateonline.gov.bc.ca

Location:
2nd Floor - 940 Blanshard St.
Victoria BC
250 356-8626

Extraprovincial Company Summary

For

TERVITA CORPORATION

Date and Time of Search: **April 04, 2012 10:41 AM Pacific Time**

Currency Date: February 20, 2012

ACTIVE

Registration Number in BC: A0073826

Name of Extraprovincial Company: TERVITA CORPORATION

Registration Date and Time: February 25, 2008 09:40 AM Pacific Time as a result of an Amalgamation

Last Annual Report Filed: Not Required **Receiver:** No

FOREIGN JURISDICTION INFORMATION

Identifying Number in Foreign Jurisdiction:	Name in Foreign Jurisdiction:
2013628892	TERVITA CORPORATION
Date of Incorporation, Continuation or Amalgamation in Foreign Jurisdiction:	**Foreign Jurisdiction:**
November 14, 2007	ALBERTA

COMPANY NAME INFORMATION

Previous Company Name	Date of Company Name Change
CCS CORPORATION	March 26, 2012
CCS INC.	July 08, 2008

AMALGAMATING CORPORATION(S) INFORMATION

Name of Amalgamating Corporation	Registration Number in BC
1331826 ALBERTA ULC	Foreign Co
CCS INC.	A0070473

HEAD OFFICE INFORMATION

Mailing Address:
500, 140 10TH AVENUE S.E.
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CANADA

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VICTORIA BC V8W 3G3
CANADA

DIRECTOR INFORMATION

Directors are not recorded for extraprovincial registration types. Go to the incorporating jurisdiction for director information.

Attachment 2
Silverberry Secure Landfill –
Name Change to Tervita Corporation

May 21st, 2019

Environmental Assessment Office
836 Yates Street
Victoria, BC
V8W 1L8

Attention: Natalie Schell

RE: Silverberry Secure Landfill – Name Change to Tervita Corporation

As a leader in environmental and energy services, Tervita Corporation (Tervita) has a strong track record of safety and environmental compliance. We have built our track record on the safe, secure management of industrial and oil and gas wastes through our network of Treatment and Recovery facilities and industrial landfills.

Tervita is requesting that the name on Environmental Assessment Certificate (EAC) WD02-01 is changed from CCS Corporation to Tervita Corporation. In 2012 CCS Corporation and 12 owned subsidiaries (HAZCO, Prodrill, Concord etc.) came together under the new name of Tervita Corporation. There were no ownership changes to the company. Attachment 1 is the historical amalgamation filed with BC Registry Services.

Should you require further information, please feel free to contact me directly at (403) 234-4875.

Sincerely,

Tervita Corporation

Peter Nelson
Advisor, Environment and Regulatory

Tervita Corporation
1600, 140 – 10 Avenue SE
Calgary, AB, Canada T2G 0R1

Tel: **1.403.233.7565**
Fax: 1.403.261.5612