APPENDIX 7.1-1

Heritage Resources Baseline

REPORT

WESPAC TILBURY MARINE JETTY PROJECT

Heritage Resources Baseline

Prepared under Musqueam Heritage Research/Investigation Permit MIB-2018-111-AOA,
Squamish Nation Archaeological Investigation Permit 15-0134,
Seyem'Qwantlen Business Group Single Use Heritage Investigation Permit SQ 2016-30,
Stó:lō Heritage Investigation Permit 2015-118, and
Tsleil-Waututh Nation Cultural Heritage Investigation Permit 2015-050

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Executive Summary

WesPac Midstream-Vancouver LLC (“WesPac”) proposes to construct and operate a marine jetty for loading Liquefied Natural Gas onto specialized liquid natural gas carriers and barges at the “Project site” on Tilbury Island along the South Arm of the Fraser River, in Delta, British Columbia. This Heritage Resources Overview Assessment presents the existing conditions within the Local Assessment Area and Regional Assessment Area for the Heritage Resources Valued Component, which includes paleontological resources, archaeological resources, and historical resources.

The Local Assessment Area for the Heritage Resources Overview Assessment consists of the Project site, including Onshore and Offshore components, and a 100 m buffer around the Project site. Given the site-specific and stationary nature of heritage resources, this is the maximum area where potential direct and indirect Project effects on heritage resources are reasonably expected to occur.

The Regional Assessment Area for the Heritage Resources Overview Assessment consists of the Local Assessment Area and the South Arm of the Fraser River from the Project site downstream to Sand Heads and upstream to Annacis Island, and extending one kilometer inland from the north and south shores of the South Arm of the Fraser River. The Regional Assessment Area captures the 5,000 years of human occupation along this section of the Fraser River.

Known heritage resources were identified through a review of existing literature. The desktop review identified no known paleontological sites or resources within the Local Assessment Area or Regional Assessment Area. No registered archaeological sites were identified within the Local Assessment Area, while 16 registered archaeological sites (six within Delta and 10 within Richmond) were identified within the Regional Assessment Area. Four sites represent heritage wrecks (postcontact marine shipwrecks), two sites are classified as legacy sites, and the remaining 10 sites represent occupations from the precontact, postcontact, and historic periods. A number of these sites are multi-component in nature, with evidence of more than one occupation during a single period or occupations during different periods.

No historical heritage sites were identified within the Local Assessment Area, while 76 recognized historical heritage sites were identified within the Regional Assessment Area. This includes 30 heritage properties and landscapes within Delta and 46 heritage properties and landscapes within Richmond. Heritage wrecks were not observed within the Local Assessment Area. Based on the location and condition of known heritage wrecks within the Regional Assessment Area and additional wrecks observed in the historical aerial photographs of the Regional Assessment Area, it is unlikely that there are undetected wrecks in the Local Assessment Area.

As noted above, the Local Assessment Area is the maximum area where potential direct and indirect Project effects on paleontological, archaeological, and historical resources are reasonably expected to occur. This desktop study has demonstrated that there has been extensive precontact and historic use of the shores of the Local Assessment Area, which is also a very active river delta environment. As such, the Local Assessment Area may have heritage resource potential; however, the integrity of the underlying deposits and the likelihood of encountering these heritage resources during Project-related activities must be considered in light of:

- Historically documented sediment migration and erosion processes, which have increased as a result of channel dredging and vessel traffic during the past half century.

- Previous land use and development activities on the Project site, including construction, operation, and decommissioning of a lumber mill and marine jetty from the early 1960s until the mid-to-late 2000s on the Project site.
- Additional land use activities in the Local Assessment Area, including farming from the late 19th century to the 1980s and periodic dredging of the South Arm of the Fraser River throughout the 20th century.
- The addition of overburden throughout the 20th century, including imported fill added in at least two events to build the dyke, and channel fill accumulating in the intertidal areas.

The above-noted factors would have influenced the integrity of any previously unidentified paleontological, archaeological, and historical resources within the Local Assessment Area. Regarding paleontological resources specifically, if fossils were present and remain in the Local Assessment Area, they are deeply buried (i.e., between 200 and 1000 metres) below existing surface sediments.

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ABBREVIATIONS, ACRONYMS, AND GLOSSARY

HROA	Heritage Resources Overview Assessment
BC	British Columbia
BCEAA	British Columbia *Environmental Assessment Act*
BP	Before Present. A dating convention usually associated with radiocarbon dating, with present being accepted as AD 1950 by convention.
CAD	Consultative Areas Database
CEAA	*Canadian Environmental Assessment Act*, 2012
CEA Agency	Canadian Environmental Assessment Agency
CHR	Community Heritage Register
CHRP	Canadian Register of Historic Places
EA	Environmental Assessment
EAO	British Columbia Environmental Assessment Office
FLNRORD	British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development
HCA	*Heritage Conservation Act*
LAA	Local Assessment Area
Legacy Site	An archaeological site where all physical evidence has been recovered or removed, and/or a site which is not subject to provisions of the *Heritage Conservation Act*.
LGA	*Local Government Act*
LNG	Liquefied Natural Gas
PHR	Provincial Heritage Register
Project	Tilbury Marine Jetty Project
Proponent	WesPac Midstream-Vancouver LLC
RAA	Regional Assessment Area
RAAD	Remote Access to Archaeological Data
VC	Valued Component
WesPac	WesPac Midstream-Vancouver LLC
WesPac Midstream	WesPac Midstream LLC

1.0 INTRODUCTION

1.1 Project Background

WesPac Midstream-Vancouver LLC ("WesPac") proposes to construct and operate a marine jetty for loading Liquefied Natural Gas (LNG) onto LNG carriers and LNG barges (the "Project") on Tilbury Island along the South Arm of the Fraser River, in Delta, British Columbia (BC) (Appendix A, Figure 1). The Project site is situated adjacent to the existing FortisBC Tilbury LNG Liquefaction Plant (Tilbury LNG Plant) and Varsteel / Dominion Pipe (Varsteel), approximately 21 km from the mouth of the Fraser River (Sand Heads), and 300 m downriver from Seaspan Ferries' Tilbury terminal (Appendix A, Figures 2 and 3).

This heritage resources baseline report describes the results of the Heritage Resources Overview Assessment (HROA), that is, the heritage resource conditions for the Project based on existing records. For the purposes of this HROA the technical study area is composed of a Local Assessment Area (LAA) and a Regional Assessment Area (RAA). The LAA consists of the Project site, including onshore and offshore components, and a 100 m buffer around the Project site (Appendix A, Figure 4). The RAA consists of the portion of the Fraser River Delta situated one kilometer inland from the north and south shores of the South Arm of the Fraser River, stretching from Annacis Island west to the mouth of the Fraser River at Sand Heads (Appendix A, Figure 4). The RAA captures the 5,000 years of human occupation along this section of the Fraser River.

1.2 Heritage Resources Overview Assessment

This HROA draws on readily available data on heritage resources and the environment to summarize the state of existing heritage resource conditions for the Project. For the purposes of this HROA, the Heritage Resources Valued Component (VC) comprises the following subcomponents: paleontological resources, archaeological resources, and historical resources. For clarity with respect to the *Canadian Environmental Assessment Act* (CEAA), 2012 (S.C. 2012, c. 19, s.52) subsections 5(1) and 5(2), the Heritage Resources VC considers "physical and cultural heritage" and "any structure, site or thing that is of historical, archaeological, palaeontological, or architectural significance", but excludes non-physical (intangible) Aboriginal cultural heritage, which will be assessed as part of the Current Use of Lands and Resources for Traditional Purposes VC (CEA Agency 2015).

The Project site could potentially contain heritage resources that are valued by the public. Heritage resources are important to Aboriginal groups and may be associated with the current use of lands and resources for traditional purposes or the exercise of Aboriginal Interests. Aboriginal groups have expressed Aboriginal Interests in specific locations that are near or at the Project site and that were used in the past. These are discussed in Section 3.4 of this report.

For the purposes of this baseline report, heritage resources include, but are not limited to, physical evidence of ancient flora and fauna (i.e., fossils; paleontological resources); artifacts, features, materials or other physical evidence of human habitation or use prior to A.D. 1846 (archaeological resources); burial places and human remains with archaeological or historical value (archaeological and historical resources); Aboriginal rock paintings or Aboriginal rock carvings that have archaeological or historical value (archaeological and historical resources); heritage wrecks (i.e., vessels or aircraft) or historical objects from a heritage wreck [*Heritage Conservation Act* (HCA), RSBC 1996, c. 187, S.13; (historical resources)] (CEA Agency 2015; BC Archaeology Branch 1998).

Paleontological sites are locations where ancient organisms, or traces of their existence, have been preserved in the geological record as fossils (Fossil Management Review Technical Working Group 2004). Fossils usually

comprise the remnants of more resilient structural elements, such as bones, teeth, shells and woody parts, but can also be expressed as imprints of soft body parts, tracks, and traces of an organism's interaction with the environment.

Archaeological sites are locations which contain physical remains of past human activities for which scientific methods of inquiry (i.e., survey, excavation, data analysis and interpretation) provide the main sources of information (BC Archaeology Branch 1990). Archaeological sites can represent pre-contact / prehistoric Aboriginal occupations and activities, which pre-date contact with Europeans, or post-contact Aboriginal sites and occupations. For this study "archaeological" refers to sites that pre-date A.D. 1846, which are automatically protected under the HCA. Ship or aircraft wrecks, after two or more years have passed since they were wrecked or abandoned, are also automatically protected under the HCA.

Historical resources are defined as any structure, site or thing that is of historical or architectural significance (e.g., structures, engineering works, architectural features and artifacts) occurring post-A.D. 1846, as defined by the *British Columbia Archaeological Impact Assessment Guidelines* (BC Archaeology Branch 1998) and heritage values as identified in interviews with local and regional historical societies, museums, and other organizations as well as local residents. Historical sites and locations in BC are primarily attributable to post-contact Euro-Canadian settlement and land use, but also include habitations and other evidence left by Aboriginal peoples during that time period.

Existing conditions for heritage resources were obtained through consultation with Aboriginal groups, research institutions, and government agencies (e.g., BC Archaeology Branch). Information on the location and nature of previously recorded heritage resources within the LAA and RAA were obtained through a desk-top review of existing resources, including:

- Reports on the local and regional environment
- Paleontological databases, maps, and scientific reports
- Reports on the local and regional prehistory and history
- Reports on traditional use of the regional environment by Aboriginal groups
- Ethnographies on regional Aboriginal groups
- Historical data, mapping, photographs, and aerial photographs
- The Provincial Heritage Register (PHR)
- The British Columbia Archaeology Branch's Provincial Archaeological Report Library
- Marine casualty lists
- Resources available in Golder's library

The HROA was conducted in accordance with the *British Columbia Archaeological Impact Assessment Guidelines* (BC Archaeology Branch 1998) and *Archaeological Overview Assessment as General Land Use Planning Tools – Provincial Standards and Guidelines* (BC Archaeology Branch 2009). This HROA:

- Describes known heritage resources in the LAA and RAA using existing documentation
- Identifies and evaluates heritage resource potential within the LAA and RAA

1.3 Potential Impacts to Heritage Resources

The Heritage Resources VC may be affected by Project-related activities that alter heritage sites. Interactions could include physical disturbance, rendering heritage sites inaccessible, or making them more accessible and susceptible to vandalism and unauthorized collection. Any form of alteration to heritage sites can be permanent and irreversible. Project activities and physical works with the potential to interact with heritage resources would occur during ground-altering activities associated with the construction, operation, and decommissioning phases.

Potential effects during the construction phase would result from the following:

- Vegetation clearing and landscaping
- Surface stripping, grading and excavation
- Pile driving
- Dredging
- Paving
- Temporary placement of stockpiled materials and fill (compaction)
- Changes in drainage patterns (erosion or sedimentation)

Potential effects during the operations phase would result from the following:

- Maintenance dredging of the Project berth after the annual freshet period
- Erosion or sedimentation caused by jetties and/or vessel traffic
- Increased public access or conversely, restricted access to heritage resources

Potential effects during the decommissioning phase would result from the following:

- Removal of onshore and offshore facilities
- Pulling and removal of pile foundations
- Foreshore protection and re-planting vegetation

A summary of the Heritage Resources VC's subcomponents, potential effects, indicators, and measureable parameters are provided in Table 1. The primary potential adverse effects that are anticipated as a result of Project activities are changes to heritage resource integrity and accessibility.

Table 1: Heritage Resources Potential Effects, Proposed Indicators and Measureable Parameters

VC/PC/ Subcomponent	Potential Adverse Project Effect	Indicator (s)	Measureable Parameters
Heritage Resources: • Paleontological Resources • Archaeological Resources • Historical Resources	• Damage or destruction of heritage resources as a result of Project activities, including horizontal and vertical displacement, compaction of deposits and changes in soil chemistry. • Hindering or increasing access to paleontological, archaeological, or historical sites.	• Disturbance to paleontological, archaeological, or historical sites, features, and objects. • Changes in the level of accessibility to paleontological, archaeological, or historical sites, features, and objects.	• Number of paleontological, archaeological, or historical sites, features and objects affected. • Volume of deposits bearing heritage resources that may be affected by the Project

1.4 Aboriginal Communities, Treaty Lands and Asserted Traditional Territories Near the Project

Aboriginal groups that have communities in close proximity to the Project include Musqueam Indian Band and Tsawwassen First Nation (Tsawwassen First Nation Final Agreement 2007; Musqueam Band Council 1984; Musqueam Indian Band 1976; Appendix A, Figure 1). The established or asserted traditional territories of other Aboriginal groups overlap the Project site. These include:

- Cowichan Nation Alliance (i.e., Cowichan Tribes; Halalt First Nation; Penelakut Tribe; and Stz'uminus First Nation)
- Hwlitsum
- Kwantlen First Nation
- Lake Cowichan First Nation
- Lyackson First Nation
- Tsleil-Waututh Nation
- Semiahmoo First Nation
- Katzie First Nation
- Squamish Nation
- First Nations of the Stó:lō Nation
- First Nations of the Stó:lō Tribal Council

Many of these Aboriginal groups have expressed Aboriginal Interests in specific locations that are near or at the Project site and that were used in the past. As was noted above, this will be discussed in Section 3.4 of this report.

1.5 Permits and Legislation

1.5.1 *Canadian Environmental Assessment Act* (CEAA), 2012

CEAA, 2012 requires assessment of effects related to changes to the environment on "physical and cultural heritage" and "any structure, site or thing that is of historical, archaeological, paleontological or architectural significance." CEA Agency policies and procedures concerning heritage resources are described in *Technical Guidance for Assessing Physical and Cultural Heritage or any Structure, Site or Thing that is of Historical, Archaeological, Paleontological or Architectural Significance under CEAA 2012* (CEA Agency 2015). This guide addresses 5(1)(c)(ii) "physical and cultural heritage," 5(1)(c)(iv) "any structure, site, or thing that is of historical, archaeological, paleontological or architectural significance," 5(2)(b)(ii) "physical and cultural heritage," and 5(2)(b)(iii) "any structure, site or thing that is of historical, archaeological, paleontological, or architectural significance." It recommends that heritage resources should be assessed in relation to the mandates, objectives, and intents of existing legislation and policies on heritage found at various government levels (i.e., federal, provincial, municipal, or territorial). Consequently, for the assessment of heritage resources in BC under CEAA, 2012, the requirements of provincial legislation also need to be met.

1.5.2 British Columbia *Environmental Assessment Act* (BC EAA)

BC EAA requires assessment of adverse heritage effects resulting from a proposed project. Under BC EAA, the heritage resources assessment must describe (BC EAO 2015:38):

- Any effects of a change in the environment on physical and cultural heritage and / or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance to Aboriginal peoples.
- Any effects on any change to the environment directly linked or necessarily incidental to federal decisions on physical and cultural heritage and / or any structure, site or thing that is of historical, archaeological, paleontological or architectural significance.

1.5.3 British Columbia *Heritage Conservation Act* (HCA)

Heritage sites on non-federal lands in BC are administered by the Archaeology Branch and the Heritage Branch, in accordance with the HCA. The Archaeology Branch is the agency responsible for administering the HCA, for maintaining the Provincial Heritage Register, and for handling referrals from other provincial development agencies. The Heritage Branch exercises regulatory authority under the HCA regarding the protection and alteration of designated (i.e., protected) historical heritage sites. Section 13 of the HCA specifies that an individual (or corporation) must not "damage, excavate, dig in or alter, or remove any heritage object" from a heritage site, except in accordance with a permit issued by the Minister pursuant to Sections 12 and 14.

The HCA confers automatic protection upon heritage sites that pre-date A.D. 1846, or undated sites that could pre-date A.D. 1846, regardless of whether they are recorded in the Provincial Heritage Register, whether they are

located on Crown Land or private property, and whether they are in a disturbed or intact context. Section 9 (2)(c) of the HCA allows protection of historical heritage sites under the BC *Local Government Act* (RSBC 1996, c. 323) or the *Vancouver Charter* (SBC 1953, c. 55). Post-A.D. 1846 historical heritage sites can be protected by Ministerial Order, Designation by an Order-in-Council, or a municipal by-law, but most historical sites are not protected in BC.

The requirements and procedures for heritage resource assessments undertaken for development projects are described in the *British Columbia Archaeological Impact Assessment Guidelines* (BC Archaeology Branch 1998). The procedures for the respectful treatment and handling of found human remains that are protected under the HCA are provided in the *Found Human Remains* policy (BC Archaeology Branch 1999).

Heritage resources assessment and management provisions in the HCA are compatible with the requirements of the BC EAA.

1.5.4 Local Government By-laws

Post-A.D. 1846 historical heritage sites that are not protected by the HCA may be protected by by-law under the *Local Government Act* and included on local government's Community Heritage Register (CHR). These historical heritage sites may include buildings, industrial remains, trees, landscape features, properties, and heritage districts. A CHR generates a degree of recognition for these historical heritage sites; however, without local government legislation (such as a heritage designation by-law, heritage revitalization agreement by-law, or heritage restrictive covenant), inclusion on a CHR does not provide protection for these sites.

The Corporation of Delta (2016), within which the LAA and a portion of the RAA are situated, has enacted a by-law to ensure long-term preservation and maintenance of Designated Heritage Properties. Any changes to Designated Heritage Properties must meet requirements set out in the protection by-law and require Council approval. Further, on March 9, 1999, Council established the Delta Heritage Register, the official register of sites of heritage significance in Delta. Properties listed in the register trigger a referral to the Heritage Advisory Commission during the review process for any type of application affecting the heritage property (Corporation of Delta 2016).

The Corporation of Delta (2016) has also developed a number of tools to protect heritage properties or heritage conservation areas that are receiving or are eligible to receive heritage incentives. These include the: Heritage Conservation Covenant, Heritage Revitalization Agreement, Heritage Alteration Permit, and Temporary Protection Order.

The City of Richmond (2016), within which a portion of the RAA is situated, has enacted two heritage by-laws over the past decade. They include the *Richmond Heritage Commission* (By-law No. 7906, May 9, 2005) and *Heritage Procedures* (By-law No. 8400, May 4, 2009). The *Richmond Heritage Commission,* which consists of nine members of the public, was enacted to advise Richmond City Council on heritage conservation and promotion matters as well as to undertake and provide support for activities that benefit and advance heritage in the City of Richmond. *Heritage Procedures* was enacted to establish application procedures in respect of heritage conservation by-laws, agreements and permits and to delegate Richmond City Council power to facilitate conservation. Heritage Inventories for Richmond were completed in 1984 and 1989, with updates included up to 2002; this information is also referred to as the City's Heritage Register (City of Richmond 2016).

Similar to the Corporation of Delta, the City of Richmond has developed a Heritage Alteration Permit and Heritage Revitalization Agreement to protect designated heritage properties. The Director of Development and Director, Building Approvals, work closely with the *Richmond Heritage Commission* to ensure that all development occurring within or near designated heritage properties has been approved.

The Canadian Register of Historic Places is Canada's definitive source of information on historic places. Federal, provincial, and territorial governments have worked together since 2001 to produce the register. The register is a work in progress and new listings are added continuously.

1.5.5 British Columbia Fossil Management Framework

The Province of British Columbia recognizes that paleontological resources have heritage, scientific, and educational value as "fossils represent the historical record of the evolution and development of life on Earth" (Fossil Management Review Technical Working Group 2004). While fossil collecting in British Columbia has been unregulated and there has been no clear policy for fossil management, the Province recognizes the need to protect important fossil finds and the interests of stakeholders. Currently, the development of a Fossil Management Framework is being led by the Heritage Branch, Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) based on the following principles (BC Fossil Management Office 2018):

- Fossils and fossil sites are important to British Columbia as heritage resources.
- The order of priority for fossil management is science, natural heritage, education, and where appropriate, commercial use.
- The order of priority for extraction or excavation of fossils is science, natural heritage, education and, where appropriate, commercial use. Non-extractive commercial use has precedent over extractive commercial use.
- A fossil management framework that recognizes the heritage value of fossils, the need to protect significant fossil sites and the interests of stakeholders is necessary.

Regulatory protection for paleontological sites was limited until 1997, when they were included under the BC *Mineral Tenure Act*. In 2005, a new regulation took effect that identifies fossils as "not a mineral" under the BC *Mineral Tenure Act*, effectively preventing the rights to mine, extract, and sell fossils being obtained through new mineral claims. The Framework is designed to achieve the following outcomes (BC Fossil Management Office 2018):

- Raise awareness of the importance and the need to manage British Columbia's fossil resource.
- Ensure that the stewardship of British Columbia's fossil resource is consistent with the scientific, heritage and educational value of fossils.
- Encourage developers as well as commercial and industrial operators to apply responsible management practices that will allow for the recovery and preservation of important fossils.

While consultation regarding the Fossil Management Framework continues, some regulatory protection has been provided for fossils in Crown land under the *Lands Act* and permits are required for the removal from Crown Land of vertebrate skeletal fossils or fossil tracks. There are no explicit administrative controls or legal instruments that provide automatic protection and management of such resources on private land, although protection can be provided under certain conditions, for example through designation as a Provincial heritage site or heritage object by issuing an Order-in-Council under Section 9 of the HCA.

In the absence of further legislative protection and resource management guidelines for paleontological sites, ethical guidelines found in Ludvigsen and Beard's (1994) *West Coast Fossils: A Guide to the Ancient Life of Vancouver Island* and the British Columbia Paleontological Alliance's (2016) *Policy on Fossil Collecting and Regulation* have been adopted for this assessment.

1.5.6 Aboriginal Heritage Policy and Permitting Systems

Many BC Aboriginal groups have developed their own heritage policies and permitting systems. In general, the scope of these policies reflects a desire to have some measure of oversight with archaeological research in each respective Aboriginal group's territory so that particular cultural protocols are observed, particularly as they relate to human remains and spiritual locations. While aspects of these policies parallel the HCA, many diverge when it comes to the definition of what constitutes a "cultural resource"; most Aboriginal group heritage policies take a broader view of heritage resources than the HCA (Mason 2011).

A review of the Consultative Areas Database (CAD) maintained by the Province of British Columbia identified 19 Aboriginal groups whose established or asserted traditional territories overlap the Project; these were listed above in Section 1.4 of this report. A number of these Aboriginal groups / organizations that were listed have heritage policies and permitting systems in place, including: Musqueam Indian Band, Squamish Nation, Seyem'Qwantlen Business Group (Kwantlen First Nation), Stó:lō Research and Resource Management Centre, and Tsleil-Waututh Nation. Golder has applied for First Nations Permits from these groups. Musqueam Heritage Research / Investigation Permit MIB-2018-111-AOA, Squamish Nation Archaeological Investigation Permit 15-0134, Seyem'Qwantlen Business Group Single Use Heritage Investigation Permit SQ 2016-30, Stó:lō Heritage Investigation Permit 2015-118, and Tsleil-Waututh Nation Cultural Heritage Investigation Permit 2015-050 have been received.

2.0 METHODS

A review of existing sources of information pertaining to local and regional natural history, prehistory, history, built heritage, and other heritage resources was completed for the LAA and RAA. Detailed topographic and orthographic maps were reviewed to identify areas of past and present land development, and locations such as streams or elevated landforms that may have higher palaeontological and archaeological potential than the surrounding terrain. Readily available reports on the environment, Aboriginal group land use, and archaeology of the LAA and RAA were also reviewed. Historical aerial photographs obtained from the University of British Columbia's Geographic Information Centre were examined to understand historical land use and to identify areas of past disturbance. Available historical maps were consulted to determine historical vegetation, locations of minor drainages, and Aboriginal sites. Provincial and local government heritage registers were searched to identify recorded archaeological or historical heritage sites in the LAA and RAA. Golder's cultural heritage resource database, heritage wreck database, and radiocarbon sample database were also consulted. The results of the literature and data review are detailed in Section 3.0 of this report.

This HROA was conducted to document and identify known heritage resources within the LAA and RAA and to evaluate the potential of encountering and affecting as yet undocumented heritage resources. The term "potential" refers to the assessed likelihood that heritage resources are or were at one time present in the LAA and RAA. The potential of encountering heritage resources was assessed based on a review of the following data:

- **Paleontological Resources** – Regional databases, maps (DataBC. 2018), and scientific reports.
- **Archaeological Resources** – Provincial Heritage Register; Provincial Archaeological Report Library; ethnographic reports; historical and surficial geology maps; historical vegetation maps (North and Teversham 1979, 1984). In addition, the Stó:lō Research and Resource Management Centre conducted a review of their in-house heritage resource database pertaining to the Project LAA. This database includes locations of cultural heritage resources, including registered archaeological sites and Aboriginal cultural landscape features, place names, and travel routes. The results of this review are included in Appendix B.
- **Historical Resources** – Provincial Heritage Register; Delta Heritage Register; City of Richmond Heritage Inventory, Canadian Register of Historic Places; National Historic Site Register; historical reports; historical land use records; historical maps; historical vegetation maps (North and Teversham 1979, 1984); historical aerial photographs; historical stream data of the lower Fraser River (Proctor 1978; Fisheries and Oceans Canada 2013); Golder's proprietary historical shipwreck records and database (Northern Maritime Research 2002); records of vessel and aircraft casualties.

The data analysis for this HROA involved compiling and mapping background information to assess heritage resource potential within the LAA and RAA. Environmental variables (e.g., slope; aspect; vegetation classes; soil types; distance to various water bodies including the Pacific Ocean, rivers, streams, sloughs, and bogs; and trails) as well as archaeological, ethnographic, and historic information (e.g., site deposits, site locations, land use areas and named places) were examined in order to determine the likelihood that heritage resource sites are, or were at one time, present in the LAA and RAA.

The primary variables considered during the heritage resource potential assessment included:

- 100 m proximity to waterways, including historical slough channels that have since been in-filled
- Past occurrence of land-altering activities

- Depositional characteristics and locations of previously documented archaeological and historical heritage sites
- Aboriginal travel routes, resource extraction areas, and places

It should be noted that although the Project LAA may have heritage resource potential, the integrity of the underlying deposits must be carefully considered. Previous ground disturbance activities and the placement of fill influence the preservation and probability of identifying heritage resources. A perspective of the subsurface deposits at the Project site was gained through the review of relevant and available geotechnical reports.

For the purposes of the historical shipwreck research, the area of the RAA was reduced to include only the main or South Arm of the Fraser River to the western-most extent of Lulu Island; Garry Point. This reduced area was selected to represent an extension of the same riverine environment and navigable river channel as is found at the LAA, while removing consideration of the many recorded wrecking events in the more environmentally dynamic and exposed open river mouth, which extends from Garry Point to Sandheads, the surrounding banks, and into the adjacent Strait of Georgia.

A preliminary field reconnaissance (PFR) was not conducted as part of this review, however, images from a site visit of the shoreline area were reviewed and provided some insight regarding the potential for historical wrecks to be present in the intertidal area.

3.0 RESULTS

This section presents the findings of the HROA. In the subsections below, background information on the past and present physical environment, local ethnographic data, traditionally known places, previous paleontological, archaeological, and historical research, and paleontological, archaeological, and historical sites are detailed. The contribution of these data to assessing heritage resource potential in the LAA and RAA is discussed within each subsection. This information is then considered together in Section 4.0 of this report, the assessment of the overall heritage resource potential for the Project.

3.1 Physical Environment

This HROA reviewed available physical environmental data, which included physiography and surficial geology, past sea level, and the formation and maintenance of the Fraser River and its associated sloughs. The results are provided in the subsections below and are discussed in light of their contribution to the assessment of heritage resource potential within the LAA and RAA.

3.1.1 Physiography and Surficial Geology

The LAA and RAA are situated within the Fraser River Delta, a geomorphic formation resulting from sediments accumulating at the mouth of the Fraser River (which is situated within the Georgia Depression) faster than the Strait of Georgia marine processes can disperse them. The Fraser River Delta is underlain by Tertiary period (i.e., 66 to 2.6 million years ago) sedimentary rocks that can reach a thickness of 2500 to 4000 metres in the Lower Mainland and 6000 metres in northwest Washington State (Clague 1998; Clague et al. 1998). These sedimentary rocks are dominated by Paleocene-Eocene epoch (i.e., 66 to 33.9 million years ago) sandstone, conglomerate, shale and partly cemented sandy gravels, clay or clay shale deposits (Clague 1998; Johnston 1923). Quaternary period (i.e., 2.6 million years ago to the present) sediments reaching a maximum of several hundred metres in thickness overlie the bedrock (Clague 1998; Clague and Luternauer 1983). Depths to the top of the bedrock range from 200 to 1000 metres with an average of 500 metres (Clague et al. 1998).

The Fraser River Delta began to form, near present-day New Westminster, approximately 10,500 years BP, when glacial sediments began to accumulate in a palaeobay of the lower Pitt River drainage (Clague 1998; Locher 2006; Appendix A, Figure 5). Through continuous sediment deposition, the delta expanded westward into the Strait of Georgia over the past 8,000 years (Clague et al. 1983; Appendix A, Figure 5). Around 5,000 years BP, sediment deposition ceased in Boundary Bay and commenced in the Strait of Georgia (Clague et al. 1991, 1998; Appendix A, Figure 5). It was also around this time that islands situated within the RAA, including Tilbury, developed and stabilized. Nearly 3,000 years later, the Delta's westward growth closed the passage between Boundary Bay and the Strait of Georgia (Jol and Roberts 1988; Appendix A, Figure 5). Since this time, the environment has been much more stable, enabling the maintenance of the overall shape and extent of the delta and the islands it contains.

As is illustrated in Appendix A, Figure 6, and summarized in Appendix C, the LAA is situated overtop Fraser River sediments while the RAA is primarily situated overtop Fraser River sediments with some Salish sediments (Armstrong and Hicock 1976). The Fraser River sediments are deltaic and distributary channel fill sediments which overlay and cut estuarine sediments; in some parts of the delta they are overlain by overbank sediments. Specifically, the LAA is composed of F_c sediments, which are described as overbank silty to silt clay loam

overlying deltaic and distributary channel fill. The remaining Fraser River sediments within the RAA vary from sandy silt to clay loam and are described in Appendix A, Figure 6, and in Appendix C. Bog, swamp, and shallow lake Salish sediments are minimally present within the RAA. They consist of peat and / or organic sandy loam to clay loam and are described in Appendix A, Figure 6, and Appendix C.

A closer examination of the soils within the RAA identified them to be poorly drained fine to medium sandy and silty deltaic deposits. The specific soil types are summarized in Appendix C. Specifically the LAA consists of Blundell soil, which has a high organic content. As is indicated by the soil descriptions in Appendix C, with drainage improvements, soils within the RAA are best suited for growing agricultural crops. This use is confirmed through a review of historical aerial photographs (see Section 3.11 of this report) and other documents.

Considering the poor drainage of these soils and the likely seasonal flooding that occurred within the RAA during the precontact period, the islands and shorelines within the RAA were probably inhabited during different parts of the year for different lengths of time to procure a variety of resources (see Section 3.4 of this report).

Prior to the 20th century when the Delta was constrained by dykes and dredging occurred regularly to create navigable shipping channels (Barrie 2000), the Delta was prone to erosion by continuous channel shifting. The documented lateral and downstream migration of the river channel bends alternately eroded and deposited sediments along the Fraser River banks (D. Ham 2005). Nonetheless, cultural sites may still exist in portions of the RAA where lateral migration and erosion of sediments has been limited.

Channel dredging practices and vessel wake during the past century likely accelerated sediment erosion in areas where lateral migration and erosion of sediments through natural processes had previously been limited (Eldridge 1991b). These actions influence the preservation of heritage resources within the LAA and RAA.

The historic occupation of the area required the development of dykes to protect the land and drainage systems to enable industrial and residential construction, occupancy and farming activities. Dyking was a private enterprise prior to 1894. Following the 1894 flood, the provincial government acknowledged the inadequacy of privately constructed dykes and developed an integrated dyke system (Siemens 1966). Subsequent to another devastating flood in 1948, a more comprehensive system of dykes and flood protection was constructed.

3.1.2 Sea Level

Geological processes that altered the past sea level contribute to the assessment of heritage resource potential within the LAA and RAA. A review of sea level data for the lower Fraser River region suggests that the RAA was covered by 2 km thick ice during the height of the Late Wisconsin glaciation (*circa* 25,000 to 21,000 years ago). Evidence of human occupation within the RAA during this time is highly unlikely.

Approximately 13,000 years ago, during initial de-glaciation, the sea level was as much as 200 m above present (Clague et al. 1983). It was at this time, that the ice began to retreat and the sea began to advance into the isostatically-depressed Fraser basin; isolated ice sheets remained inland until 11,000 to 10,000 years BP (H. Williams and Robert 1988). As the ice sheets continued to recede, the land began to rebound rapidly, resulting in the emergence of the coastal lowlands at approximately 11,000 BP (Clague et al. 1983; H. Williams and Robert 1988). By approximately 8,000 to 9,000 BP, the sea level was approximately 12 m below present (Armstrong 1981; Clague et al. 1983; H. Williams and Roberts 1988).

Between 7,000 and 7,500 years ago, the sea level once again began to rise and stabilized between 5,500 and 5,000 BP. Sedimentation kept pace with the rising sea level throughout the early- to mid-Holocene, expanding the Fraser River Delta (H. Williams and Robert 1988; Appendix A, Figure 6). Clague et al. (1983) suggest that the sea rose to within 2 m of its present level by 5,000 BP, and that the sea level has remained relatively stable over the past 2,000 years, with local fluctuations of no more than 1 m (Clague 1998; Appendix A, Figure 6). During this time period, despite seasonally documented flooding events, the LAA and the majority of the RAA were situated above sea level and were accessible to precontact and post-contact Aboriginal groups.

3.1.3 Rivers, Sloughs and Marine and Freshwater Resources

A portion of the mouth of the Fraser River and the westernmost section of the South Arm are included within the RAA. Today, the Fraser bifurcates at the eastern end of Lulu Island; the South Arm continues as the principal channel carrying most of the river flow through the Delta. Before channelling and dyking, the Fraser River would have overflowed its banks every freshet and during periods of heavy precipitation. Such flooding events would have influenced the character of the lowland plant communities (see Section 4.2 of this report) available to past populations, and hence the timing and length of occupation period of the groups within the RAA (Appendix A, Figure 7).

The Fraser River is one of the largest salmon spawning rivers in the world; all five species of Pacific salmon use it to access spawning beds spanning the Fraser Delta to the interior. Other spawning species found in the river include white sturgeon, eulachon, herring, and trout (BC Ministry of Environment 2016). Spawning season begins pre-freshet for sturgeon and eulachon; however, the most important migration, both in terms of numbers and as a human food source, is salmon which historically peak in August and early September. Additional fish species that inhabit the sloughs and tributaries of the Fraser include: suckers, sticklebacks, sculpins, perches, and chub and dace (i.e., minnows) (BC Ministry of Environment 2016).

In addition to the existing and relic Fraser River channels, a number of sloughs are situated within the RAA. In Delta, these include: Tilbury Slough, Deas Slough, Crescent Slough, Cohilukthan Slough, Tamboline Slough, and London Slough (Appendix A, Figure 8). Woodward Slough, Finn Slough and Gilmour Slough are situated within the RAA on the Richmond side of the river. The banks of these slough channels, which are slightly raised above the surrounding poorly drained land, were preferentially selected as settlement and activity sites during the precontact and historic periods (Appendix A, Figure 8).

During the Fraser River annual salmon runs, massive amounts of fish could be easily caught, dried, smoked and preserved for the winter, or traded. Many Coast Salish oral stories focus on salmon, the origin of the salmon and the powerful salmon spirit peoples (Maud 1978:61). Fishing for sockeye began in July using trawl and dip nets from canoes, before moving upriver as the season progressed (Suttles 1955:22, 1990b:457). In the lower reaches of the Fraser near the RAA, side channels and sloughs were often used to construct tidal pounds and weirs to catch salmon and sturgeon (Suttles 1990a:457). Fish meat and bones were usually consumed; however, fish bones could also be soaked and shaped into utensils and fishing implements (Stewart 1996:82).

Sea mammals, such as harbour seals, California and northern sea lions, river otters, and the northern fur seal, may have travelled the river as far as the salt water reached (Northcote 1974). Seal hunting was a common practice for Coast Salish peoples living on the sea and along the Lower Fraser River, and was accomplished by either clubbing on land, or netting or harpooning from a canoe (Suttles 1952:234).

Archaeological midden evidence in and near the region demonstrates extensive shellfish use. Butterclams, native littlenecks, bay mussels, horseclams and basket cockles are some of the most commonly represented species (Croes et al. 2013).

A number of precontact archaeological sites, recognized historical heritage sites, and traditionally known locations have been recorded along the shores of the Fraser and the slough channels within the RAA (Appendix A, Figure 8). This river has linked people and resources from the coast to the interior for nearly 5,000 years (Sections 3.4 and 3.5 of this report; Appendix A, Figure 8). As such, there is potential that as yet unidentified heritage resources may be present within the LAA and RAA.

3.2 Terrestrial Biological Environment

Aboriginal knowledge of seasonality and the distribution of animal and vegetation communities influenced past travel, settlement, and subsistence patterns in the RAA (Turner and Jones 2000). Landscape management was practiced to promote the propagation of certain plant communities that were sources of food, fuel, and medicine. It was also used to manipulate supportive animal habitats to increase hunting success rates (Turner 1999; Turner and Jones 2000). Understanding the use of available ecological resources is pivotal to understanding site formation processes, past regional subsistence patterns, and the potential to identify heritage resources within the RAA.

3.2.1 Historic Ecological Communities and Terrestrial Floral and Faunal Resources

Historical vegetation maps of the southwestern Fraser lowlands (North and Teversham 1979, 1984) are based on survey work by the Royal Engineers and the Province in 1858-1863 and 1873-1877, before the majority of historical effects on vegetation (e.g., farming, deforestation, dyke building, slough and bog drainage, peat mining) were manifest. Appendix A, Figure 7 illustrates the historical vegetation for the LAA and RAA. A combination of ecosystems is present; however, the RAA is dominated by grass, scrub, shrub, and moss communities. These include: grassland, grass with shrubs, alder scrub, willow scrub, bog (specifically Burns Bog), mixed coniferous forest, and spruce forest. The LAA consists of grass with shrubs and mixed coniferous forest. Today, vegetation in the RAA consists of grasses and other introduced plant species, with the exception of riparian areas and other minimally-affected areas where native vegetation, including trees and shrubs, remains.

Evidence of tree and plant use is scarce in the archaeological record within the RAA. Organic material, particularly plant fibre, rarely survives in archaeological contexts unless it is preserved in a wet, anaerobic environment (e.g., riverine, bog, wetlands) or in association with burned cultural features such as hearths and cooking ovens. Examples of ‘wet site’ artifacts recovered in the region include: basketry, matting, cordage, stakes, wedges, fishing nets, hooks, harpoons, and tumplines.

In terrestrial archaeological contexts, faunal remains are more likely than plant fibre to survive, particularly in middens where the presence of shell neutralizes the soil and allows bone preservation. While we do not know with certainty the terrestrial species that were available to the Aboriginal peoples who inhabited the RAA before 6,000 BP, regional archaeological sites, including the Glenrose Cannery site (DgRr-0006) and the St. Mungo site (DgRr-0002), both located on the South Arm of the Fraser River, provide insight into species availability from 5,500 BP to present. The regional archaeological record suggests that past Aboriginal peoples commonly procured: elk, mule deer, bear, raccoon, skunk, timber wolf, beaver, muskrat, mink, rabbit, skunk, small rodents, birds of prey, ducks, geese, swans, other migrating birds, and spruce grouse (Ham 1987; Stewart 1973; Suttles 1955:23-25; Suttles 1951; Duff 1952a).

3.3 Paleontological Resources within the LAA and RAA

British Columbia has a rich and diverse variety of fossils and fossil deposits that resulted from the complex geological processes that formed the northwest coast of North America (BC Fossil Management Office 2018). These paleontological resources are concentrated on Vancouver Island, in Haida Gwaii, in the Princeton-Merritt-Kamloops area, in the southeastern and northeastern portions of the province, and in the Central Interior Plateau (BC Fossil Management Office 2018). Paleontological research within the Fraser River Delta has been limited to date in comparison to these other areas. This limited research is in part due to the dynamic nature of this environment and the deep bedrock deposits (i.e., 200 to 1000 metres below existing sediments). Even with human modifications to its landscape (e.g., dyke and drainage channel construction and maintenance, river channel dredging) over the past century, flooding and sediment deposition regularly occurs on the Delta.

As was noted above in Section 3.1 of this report, the bedrock within the LAA and RAA consists of Tertiary and Quaternary age conglomerates, sandstones, shale, and partly cemented sandy gravels, clay or clay shale deposits (Clague 1998; Johnston 1923) that can span 2500 to 4000 metres in thickness (Clague 1998; Clague et al. 1998). Given the sedimentary nature of these bedrock deposits, there is potential for fossils (e.g., shells, plant imprints, fish skeletons) to be identified within the LAA or RAA. However, given the depth of the bedrock (i.e., 200 to 1000 metres) below existing sediments, it is unlikely that such resources, if they exist within the LAA, will be encountered during Project-related construction, operation, and decommissioning activities. No Important Fossil Areas are mapped within 75 km of the RAA (BCData 2018).

3.4 Coast Salish Ethnography

All of the groups with Aboriginal Interests in or near the Project site are speakers of Coast Salish languages: Halq'eméylem / Hul'q'umi'num' / hən̓q̓əmin̓əm̓, SENĆOŦEN and Sḵwx̱wú7mesh sníchim. These groups are related culturally and linguistically, and, collectively, their culture is known as Central Coast Salish (Barnett 1955; Hill-Tout 1897; Kennedy and Bouchard 1976; Suttles 1990a). Regardless of the language spoken, Central Coast Salish groups followed similar settlement and subsistence patterns during the precontact and historic periods. The following section provides a brief overview of the historically documented subsistence and settlement approaches of Coast Salish peoples.

Observations of Central Coast Salish groups began in the early 1800s when Simon Fraser first explored the west coast (Lamb 1960), and continued with Charles Hill-Tout (published between 1895 and 1911; Maud 1978), Homer Barnett (1938, 1955; mid-1930s), Wilson Duff (1952a, 1952b, summers of 1949 and 1950), Diamond Jenness, and Wayne Suttles (Jenness 1955; Suttles 1955, summer of 1952). Recently, an abundance of hən̓q̓əmin̓əm̓ cultural information became available with the publication of the Stó:lō Nation historical atlas (K. Carlson 2001). Considered together, these ethnographic data provide insight into how Central Coast Salish peoples interacted with and viewed their surrounding landscape, which in turn informs the assessment of heritage resource potential within the LAA and RAA.

3.4.1 Overview of Central Coast Salish Seasonal Subsistence Round

It has been well documented that Central Coast Salish subsistence activities occurred in a seasonal round. Locations where these activities took place varied depending on the resource and the season, and involved some or all of the members of a family or village group travelling to canoe accessible camps or villages.

The summer months were the most important in the subsistence economy due to large, usually predictable runs of spawning salmon in the Fraser River and its tributaries (Duff 1952a; Ham 1982; Suttles 1990a). Groups came to fish during the runs beginning on the lower river in July, with many travelling upriver to the lower end of the canyon as the season progressed into the fall (Suttles 1990a:457). It is likely that a segment of the population also remained at permanent / winter villages during this time. White sturgeon, were also caught and consumed in larger numbers during June and July when they moved into shallow river sloughs to spawn (Duff 1952a). Archaeological evidence associated with fish harvesting and processing includes midden deposits containing fish bones and remnants of tools (e.g., bone or antler barbed points from harpoons and leisters, stone fish hook shanks, small bone points for rakes or gorge hooks, mauls, clubs) and other equipment used for fishing (e.g., bone rings for dip nets, net gauges, net sinkers, weirs, traps, canoes, nets), catch-processing (e.g., ground slate knives, wooden drying racks), or storage (e.g., wooden racks, baskets) (Ham 1982; Ham et al. 1986; Mitchell 1971; Suttles 1990a, 1990b).

A variety of plant resources were also collected in the summer and autumn months. These trees, sprouts and stems, bulbs and roots, berries and fruits, and nuts provided sustenance, were used as medicines, and in construction. Berry harvesting (e.g., cranberry, blueberry, huckleberry; Duff 1952a; Suttles 1990a) was an important gathering activity during the summer months, while root vegetable harvesting (e.g., wapato, Pacific silverweed, rice-root, springback clover, Nootka lupine and brake fern rhizome; Suttles 1955, 2005) and wild crabapple collection was important during the autumn. Archaeological traces of plant harvesting and processing include: charred seeds, charcoal, fire-cracked rock, digging sticks, and basketry.

The autumn subsistence and settlement pattern was, in many ways, a continuation of the summer pattern as salmon were still plentiful. By late September, however, emphasis on the salmon fishery began to wane as other economic activities, such as hunting and berry picking, gathered momentum. Most hunting took place in the autumn as animals tended to be the fattest at this time of year. The variety of terrestrial mammal species summarized in Section 4.2 of this report were targeted at this time as were waterfowl and some terrestrial birds (e.g., spruce grouse) (Duff 1952a; Suttles 1951).

Hunting methods varied, with hunting dogs often used in the procurement of bear, deer and elk (Barnett 1955:97; Duff 1952a:71; McLachlan 1998:183). Deer could be hunted from canoe, caught in a pitfall, with a snare, or with atlatls or yellow cedar bow and arrows, and in netting (Lamb 1960:98; Barnett 1955; Duff 1952a). Elk and bear were hunted with yellow cedar bow and arrow and were either taken by individual hunters, or cooperatively (Suttles 1990a:458, 1955:24). Archaeological evidence of hunting activities may be recovered from midden deposits and include animal bones, or remnants of hunting and processing tools such as stone bifaces. Archaeological traces of hunting traps (i.e., pit-fall depressions, stakes) may still be observed on the landscape.

Larger groups of people came together at the winter villages, where social, rather than subsistence pursuits were the focus. Stored food, including salmon and dried berries, were consumed in large quantities (Duff 1952a; Suttles 1955) and any hunting and fishing activities were limited to locally available species such as deer, elk, ducks, and steelhead trout (Ham 1982:33; Jenness 1955:8; Patenaude 1985:62; Suttles 1955). Bear hunting was more frequent during the winter when these animals could be easily smoked out of their dens (Duff 1952a; Suttles 1955).

In the spring, fresh plant foods played an important role and were a welcome change from consuming the stored winter food that was now depleted. The shoots of salmonberry, thimbleberry, the round stalk of the cow-parsnip, and other green shoots were selected (Duff 1952a). Large-scale fishing also started again. Spawning eulachon entered the Fraser River from late April until the end of May (Drake and Wilson 1992; Duff 1952a; Suttles 1955).

These fish were caught in large numbers and provided an important addition to the spring diet. Marine mammals that travelled up the Fraser to hunt the eulachon were also procured in the spring.

It appears that Coast Salish peoples collected a variety of bivalves throughout the year. While there were likely peak times when some species were easier to collect and / or more abundant, bivalves would have been a reliable resource that could have been procured at low tide any time of the year; however, the ethnographic record does not indicate during which seasons bivalve species were preferentially collected. Their abundance and ease of procurement is demonstrated by the vast middens that characterize most coastal archaeology sites.

Precontact, contact-period, and historic Central Coast Salish groups occupied portions of the RAA on a seasonal basis, with some people living there longer. As such, there is potential to identify evidence of their camps / villages, activity areas, hunting and fishing tools and / or equipment, and waste disposal (e.g., middens) within the LAA and RAA. As is noted in Section 3.7 of this report, archaeological site DgRs-017, a known village location, is situated across the river from the LAA.

3.4.2 Coast Salish Dwellings

3.4.2.1 The Plank House

The plank house and the plank house “winter or permanent” village represent the main Coast Salish dwelling and settlement type. While it was the most prevalent, it was not the only type of structure that was inhabited and its overall construction was more variable than originally thought. In addition to being a dwelling, the plank house acted as a food processing and storage area, workshop, theater, fortress, and recreation and spiritual centre (Suttles 1991).

Plank houses of the Strait of Georgia Coast Salish were of two types: “the shed (single-pitched) roof and the gabled roof” (Barnett 1955:35). Near the mouth of the Fraser River, shed roof (single-pitch) plank houses were the most common dwelling. Shed-roofed houses were almost always built with the front door on the high side, facing the water, whereas the aspect of gabled-roof houses varied (Barnett 1955).

The frame of a plank house was constructed from substantial posts, supporting beams, and rafters (Suttles 1991). In addition to the smaller poles supporting the interior structure, parallel sets of upright poles held the removable cedar planks, which comprised the plank house walls. These planks were placed horizontally to the exterior of the house frame, whereas the roof planks were placed transversely to allow for water run-off (Suttles 1991). Roof planks were usually hollowed out, and installed with a bracket-shaped cross-section so that they could be overlapped and locked together (Suttles 1991). Early pictures of Northwest Coast houses show partitions within the houses designating the sleeping areas (which would consist of sleeping platforms and matting dividers) of immediate families (Suttles 1991).

Plank houses varied in size, but typically ranged from between 7 and 15 metres in width, and between 15 and 30 metres in length (Jenness 1955; Suttles 1990a). The plank house could be expanded at need, by adding more support posts and planks. The flexible structure of this type of home was advantageous for living in unpredictable areas like the Fraser River floodplain, where groups may need to evacuate and relocate quickly (Suttles 1991).

3.4.2.2 Subterranean Houses

Some families also had underground houses, primarily for infirm persons or used as sleeping chambers during extremely cold periods (Barnett 1955). Subterranean house roofs were supported by one post in the centre, with beams radiating outward to the sides of the roughly square excavation hole. Poles, mats, and earth were piled on top of the beams and a notched log ladder was placed at the centre or side of the entrance hole (Barnett 1955).

3.4.2.3 Summer Houses

No single dwelling type was used during the warmer seasons; however, the most common temporary seasonal shelter consisted of bough covered lean-tos or slender pole frames draped with sewn rush mats (Barnett 1955). The variety of documented warm weather dwelling types ranged from these lean-tos to structures having plank house frameworks that were either covered with planks or bark. Wall and roof planks were typically transported between the summer dwelling locations and the winter locations. For temporary shelters, special roof boards were sometimes transported from location to location.

Remains of dwellings, if present in the LAA and RAA, would likely represent plank houses or temporary seasonal structures. Archaeological traces of these structures could include midden ridges, house floors (excavated or compacted areas of midden), post moulds, hearths, or other features (Ham et al. 1986:58-69). Post hole sizes for the house frame may be expected to exceed 25 centimetres in diameter, while the smaller poles for wall support and interior structural elements could be as small as 5 centimetres in diameter (Ham et al. 1986:69-70; Mason 1994:91). Smaller post moulds, often angled, might indicate light structures such as lean-to shelters or drying frames (Barnett 1955:40; Ham et al. 1986:70).

3.4.3 Coast Salish Material Culture

Typical Coast Salish household items included wrapped lattice pack baskets; redcedar bark baskets and mats; wooden dishes and spoons made out of red alder, western redcedar, or big-leaf maple; digging sticks made from western yew; and clothing made from thinly shredded western redcedar bark, dressed skin, or spun wool (Barnett 1955:270; Lamb 1960:99; MacLachlan 1998:176; Suttles 1990a:463). Wood, stone, bone, antler and sinew were used as raw materials for the manufacture of harpoons, knives, hand mauls, blades, beads, needles, projectile points, fish hooks, awls, tool handles, spindle whorls, pendants and charms (Stewart 1973:84). Antler was used to craft wedges for wood working, as soft hammers for flaking lithic tools, as barbed harpoon heads, or as hafts (Stewart 1973).

Given that the majority of Coast Salish material cultural items were manufactured from organics, they do not typically preserve well in the archaeological record. The preservation of wood, bone, antler, and shell items is largely dependent upon site conditions, particularly drainage, soil type, and soil pH. Shell middens typically preserve wood, bone, antler, and shell artifacts as the carbonic acid (H_2CO_3) introduced by rainfall percolating through the midden is neutralized by the calcium carbonate ($CaCO_3$) which dissolves out of the shell-rich midden matrix. The anaerobic conditions that characterize wet sites also preserve these organic materials; however, once they are removed from their wet site environment, artifacts made from these materials must be stored in similar conditions or else they will deteriorate rapidly (Croes 1976).

3.4.4 Central Coast Salish Land Use: Traditionally Known Travel Routes and Locations

Central Coast Salish peoples or their ancestors have occupied the RAA on a seasonal basis for approximately 5,000 years. They were and continue to be closely linked to their surrounding landscape and as such, they know when and where to procure the resources that they need, and when during the year certain areas are (in)accessible. This information has been shared from one generation to the next.

This section uses traditional Central Coast Salish knowledge of the Lower Fraser River to discuss documented land use patterns within the LAA and RAA. The data presented below and illustrated in Appendix A, Figure 8 have been compiled from ethnographies, historical atlases, Aboriginal publications and databases, and archaeological reports. The information summarized includes known and modelled travel routes and locations. The names assigned to these locations do not necessarily refer to fixed geographical points on the landscape; rather they refer to general areas and / or activities. Variations in the spellings of individual locations result from different translations or languages / dialects.

3.4.4.1 Travel Routes

The Fraser River was the principal travel route within the RAA, providing access by water to and from the Georgia Strait, throughout the various waterways of the Fraser River valley, and west as far as the Fraser Canyon. Travel routes, also included trail networks which were integral to Aboriginal subsistence, settlement, and exchange systems. Some trails linked village sites with resource collection localities, summer camps, and special purpose sites. Others supported important exchange networks with neighboring families or groups. Knowledge held by present-day communities helps to identify these landscape features.

The results of the Stó:lō Research and Resource Management Centre heritage resource database query (Appendix B) identified one known travel and communication route, the Fraser River itself, referred to as Stó:lō. In addition, the Stó:lō model places trails along both banks of the Fraser River (Table 3; Appendix A, Figure 8). Areas that travel routes traverse are described by Neary (2011) (Table 4; Appendix A, Figure 8).

Table 2: Central Coast Salish Travel Routes within the LAA

Travel Route	Identifier	Description	Reference
Stó:lō (existing waterway)	2012i47s119	Sxwōxwiyám: Xéyt, Fraser River, “river.” Relate to core and integral elements of Stó:lō cultural traditions and identity. Sxwōxwiyám form a connection and articulation among the collective identity and ancestral relations shared between the Stó:lō broadly, as connected to villages and tribes at more local levels. Often these places are directly related to Transformer Narratives.	Rozen 1979; Stó:lō TUS; HTG (Hul’qumi’num Treaty Group: Cowichan Tribes, Chemainus, Penelakut, Lyackson, Halalt and Lake Cowichan) 2005
Trail Route (model)	2014r72s56	Speculated trail routes along left and right banks of Fraser River.	Stó:lō TUS

3.4.4.2 Locations

Table 4 summarizes traditional place names, and known activities at locations within the RAA, which are plotted on Appendix A, Figure 8. These locations provide valuable insight as to where we may expect to find heritage resources within the LAA and RAA. As illustrated in Appendix A, Figure 8, they tend to cluster near the mouth and along the north and south shores of the South Arm of the Fraser River.

Figure 8.1 illustrates that no known locations are situated within the LAA. The locations within the RAA that are closest to the LAA include the large documented settlement known as Tl'ektínes (DgRs-017), directly across the Fraser River from the Project site (Brealey 2010). Few named places are located along the south bank of the Fraser near the Project site, the closest upstream being xʷməθəntp a black haw tree (*Crataegus douglasii*) resource extraction area, located approximately 7 km away, and pətxəməθxʷ, meadow land, located on Deas Island, approximately 4 km downstream (Appendix A, Figure 8.3).

Table 3: Coast Salish Locations within the RAA

Name	Identifier	Figure Reference	Translation/Description/Comments	Reference
ʎəqtinəs Kli'ka-te'h-nus Klik-a-the-nus Tl'uqtinus laktinas	DgRs-017 237	8.1	"Long shore, long chest, beach." This was the "terrible large village" observed by the first Hudson's Bay Company traders on the South Arm. On Gravesend Reach, in the vicinity of the north end of the George Massey Tunnel. East of Woodward's Landing on the south shore of Lulu Island. Settlement site, including some year-round. Resource gathering and fishing area: berries, reeds, salmon, sturgeon.	Brealey 2010 HTG 2005 McHalsie in K. Carlson 2001: 136 Musqueam Indian Band 2018 Neary 2011 PMV 2015 RAAD Rozen 1979 Suttles 2005 Tsawwassen First Nation et al. 2010
Dl'akti'nes[1]	n/a	8.3	Woodward's Landing, where Ladner ferry was.	McHalsie in K. Carlson 2001: 136;
Stó:lō staɬəẇ	n/a	8.1 8.3	River Fraser River from Spuzzum Creek to the mouth of the river.	HTG 2005 Musqueam Indian Band 2018 Rozen 1979 SRRMC 2017

[1] This is the same traditional place name as ʎəqtinəs, Kli'ka-te'h-nus, etc., preceding it in the table, but is placed by McHalsie at Woodward's Landing, about 3.5 km downstream from the location of archaeological site DgRs-017 (see Figures 8.1 and 8.3).

Name	Identifier	Figure Reference	Translation/Description/Comments	Reference
q̓ʷeyaʔχʷ stalə̓w̓		8.2	The main channel of the Fraser River at Steveston.	Musqueam Indian Band 2018
Chōchō'âlets	n/a	8.2	"Way out at the end of the river." Mouth of Fraser River	McHalsie in K. Carlson 2001: 136
q̓ʷeyaʔχʷ Qw'eya'xw	DgRt-001	8.2	“Boiling water”. A permanent house site, at Garry Point, Steveston. Garry Point	McHalsie in K. Carlson 2001: 136 HTG 2005 Musqueam Indian Band 2018 Rozen 1979.
qʷɬey̓əm Q'e'yum	n/a	8.2	“Driftwood place, driftwood log”. A smaller ancillary campsite located east of Garry Point.	McHalsie in K. Carlson 2001: 136 Musqueam Indian Band 2018 Rozen 1979 Suttles 2005
Kwi-thay-um	DgRt-008	8.2	n/a	RAAD
ʔəleqsən Ulqéqsun Uleksen	n/a	8.2 8.4	Small point of land. The northwestern point of Westham Island, or the south end of Westham Island.	HTG 2005 McHalsie in K. Carlson 2001: 136 Musqueam Indian Band 2018 Rozen 1979
Maʔqˀᵚm	n/a	8.1	Burns bog.	Tsawwassen First Nation et al. 2010

Name	Identifier	Figure Reference	Translation/Description/Comments	Reference
pəɬχəneməxʷ pətxənéməx Pelhx̲enáaw'- Mexw	n/a	8.3	"Meadow land, prairie, meadow country". An area a little above [upstream from] Ladner. The western end, meadow area, of Deas Island.	HTG 2005 McHalsie in K. Carlson 2001: 136 Musqueam Indian Band 2018 Rozen 1979 Suttles 2005
sxalá'wis	n/a	8.5	Crescent slough, located southwest of Burns Bog.	Simon Pierre in Duff 1952c
ðiðilºx°qºn	DgRs-041	8.5	Ladner Landing site. On the south shore of the south Arm of the Fraser river.	Tsawwassen First Nation et al. 2010
sc̓əlәxʷqə̓n̓ Sc'lúlux'qun Sts'elexwken Sts'uluhwqun	n/a	8.5	"Going upriver to the top end; go upstream; throat." Ladner. Cohilukthan slough, which runs from Tsawwassen through Ladner to the Fraser River. There was a camping site in the Ladner area, on the south bank of the Fraser River south arm.	HTG 2005 McHalsie in K. Carlson 2001: 136 Musqueam Indian Band 2018 Rozen 1979 Suttles 2005
šxʷɬic̓əm χʷtixºm Hwlhits'um	DgRs-35	8.6	"Cut inside out, inside, cut." The name may come from the practice of cutting rushes to let salmon pass through. Canoe Pass. Brunswick Point.	HTG 2005 Musqueam Indian Band 2018 Suttles 2005 Tsawwassen First Nation et al. 2010
sxºwaʔfºn scəẇaθən Sts'uwathun	n/a	8.6	"Facing the sea." Tsawwassen, associated with Tsawwassen First Nation Lands and archaeological site DgRs-002.	HTG 2005 Musqueam Indian Band 2018 Suttles 2005

Name	Identifier	Figure Reference	Translation/Description/Comments	Reference
				Tsawwassen First Nation et al. 2010
she?sºmkºm	n/a	8.6	May be a reference to a canoe "bumping in (shallow) water." A passage through Roberts Bank leading to the entrance of Canoe Passage, just south of the mouth of the Fraser River. An important spear fishing area for salmon and sturgeon.	Tsawwassen 2001-2002 Tsawwassen First Nation et al. 2010
n/a	60	8.1, 8.3	n/a	Neary 2011
n/a	200	8.3	Deas Slough.	Neary 2011
n/a	237	8.1	Settlement on south shore of Lulu Island upstream of Woodward's Landing.	Neary 2011
n/a	295	8.1, 8.3	n/a	Neary 2011

3.5 Archaeology of the Fraser River Delta Region: 5,500 BP to present

Archaeological research in the southern Strait of Georgia region over the past century, particularly in the Lower Mainland near Vancouver, has helped to build a regional chronology spanning approximately 8,500 years (Matson 1976, 1992). The development of this sequence resulted from the efforts of Borden (1950, 1954, 1970), R. Carlson (1960), Mitchell (1971, 1990) and Matson (1974). Others have and continue to expand on this early work, further enhancing our understanding of precontact Aboriginal settlement and subsistence patterns, socialization networks, and use and views of the landscape.

Table 5 provides a summary of the occupation of the southern Strait of Georgia region over the past 5,500 years. As was suggested by the geological, geomorphological, and environmental information presented in Sections 3.1 and 3.2 of this report, this is the period during which the Delta became stable enough to support human occupation. The four culture types that span this period trace changing cultural choices as evidenced in the archaeological record through material culture remains. This includes:

- a switch from chipped to ground lithic tools as a refined wood working technology developed
- specialization in the procurement (e.g., net and harpoon technology), processing, and storage of salmon on a large-scale
- solidification of a seasonal subsistence strategy centred on resource abundance and availability
- development of large dwellings and villages
- production of a greater number of articles of adornment on “exotic” materials, which were used to indicate status

Local and regional variations of this generalized cultural sequence have been documented throughout the Lower Mainland. This summary is merely meant to provide a basic overview of our current understanding of the occupation of the Lower Fraser River Delta, specifically the LAA and RAA, since the region became geomorphologically stable over the past 5,500 years.

Table 4: Archaeological Sequence of the Fraser River Delta: 5,500 BP to Present

Culture Phase and Time Range	Site Examples	Characteristics	References
Charles / St. Mungo 5,500 to 3,300 BP	Crescent Beach (DgRr-001) St. Mungo Cannery (DgRr-002) Glenrose Cannery (DgRr-006)	■ Introduction of new tool types that suggest a well-developed wood working technology: ground slate celts; bone and antler wedges. ■ Recovered faunal remains suggest a combined terrestrial and marine subsistence economy. There is a clear adaptation to coastal resources including salmon. ■ Organic materials including basketry, cordage, cedar bark clothing, and carved wood recovered from wet site components dating to this period.	Ham et al. 1986 Eldridge 1991a Mason 1994 Matson and Coupland 1994 Pratt 1992

Culture Phase and Time Range	Site Examples	Characteristics	References
Locarno Beach 3,500 / 3,300 to 2,500 BP	Locarno Beach (DhRt-006) Musqueam NE (oldest component, DhRt-004)	■ Lithic assemblage is dominated by chipped stone tools. These include lanceolate and shouldered points, microblades, one piece and composite harpoon heads. ■ Ground stone tools have also been recovered and include abraders, wedges, slate knives, and grinding slabs. ■ Cordage, basketry, and wood artifacts have been recovered from wet site components dating to this period. ■ Steatite, coal, and bone artifacts have been recovered from some sites, as have labrets. ■ Cairn burials have been identified. ■ Recovered faunal remains suggest a subsistence economy based on the intensified procurement of large land mammals and salmon; these were supplemented by shellfish, birds, and sea mammals. There is evidence that salmon were being processed and stored for later consumption.	Mitchell 1971, 1990 Borden 1976 Patenaude 1985 Bernick 1989, 1991 Archer and Bernick 1990 Matson 1992 Williams 2013
Marpole 2,500 to 1,400 BP	Point Grey (DhRt-005) St. Mungo (DgRr-002) Glenrose Cannery (DgRr-006) Marpole (DhRs-1) Nottingham Farm (DgRs-056)	■ Lithic assemblages are characterized by a decrease in the proportion of chipped stone tools with a concomitant increase by proportion and refinement of ground stone tools used for wood working. ■ The non-toggling, unilaterally-barbed harpoon point is considered a diagnostic artifact. ■ Native copper ornaments are prevalent, as are midden burials with grave inclusions such as shell or slate disc beads. ■ Distinctive stone sculpture includes seated human figurine bowls, decorated stone bowls, and incised siltstone objects. ■ Houses were likely composed of a heavy timber frame upon which cedar planks were lashed and assembled in the row-housing style or, as extremely large single structures.	Borden 1954, 1970 Clark 2013 Coupland 1991 Mitchell 1971, 1990 Burley 1980

Culture Phase and Time Range	Site Examples	Characteristics	References
		■ Villages were large and composed of houses arranged facing the shore, with midden refuse deposits between and behind the houses. ■ This observed cultural development is believed to be linked to the procurement, processing, and storage of surplus salmon for consumption during leaner times of the year (i.e., winter and early spring). ■ People moved seasonally to preferred resource procurement locations.	
Developed Coast Salish 1,400 to 200 BP	Stselax (DhRt-002) Montague Harbour (DfRu-013)	■ Although archaeologists define a single culture type during this period of extensive change and culture contact, a number of regional variants have been recognized: Late, San Juan, Strait of Georgia, Gulf of Georgia, Stselax. ■ Defining archaeological characteristics include small, triangular flaked basalt points; thin, ground slate points and knives; unilaterally barbed bone points; composite toggling harpoon heads; and large, well-made ground stone adzes. ■ Subsistence and settlement locations were again dominated by the salmon fishery; emphasis was placed on the procurement, processing, and storage of large numbers of salmon for later consumption. Evidence of marine and terrestrial hunting, plant gathering, and shellfish harvesting has also been identified. ■ Row and single dwellings have been documented. ■ Seasonal patterns of settlement were typified by the large winter village, some large summer gathering areas, and smaller spring, summer, and fall camps.	Borden 1954 Carlson 1960 Mitchell 1971, 1990 Fladmark 1982 Ham 1982 Easton 1985 Matson 1992 Matson and Coupland 1994

3.6 Previous Archaeological Research within the LAA

Background research conducted for this desktop study did not identify any previous heritage resource investigations of the Project site. The closest, and subsequently, the most recent heritage resource investigation near the LAA was that completed by Stantec in 2013 on the Fortis BC property on Hopcott Road adjacent to the Project site (Stantec 2014; Appendix A, Figure 8).

Stantec's (2014) archaeological impact assessment was completed in advance of construction of a LNG storage facility. An approximate 4.3 hectare area comprised of ploughed field and landscaped lawn was assessed; 107 machine tests were spaced at 10 to 40 m intervals within the assessed area. It was determined that the assessed area had been significantly impacted by previous land use and development. Archaeological sites were not identified (Stantec 2014).

The results of Stantec's (2014) archaeological impact assessment combined with an examination of historic aerial (Section 4.10 of this report) and modern day photography suggest that the Project site is also likely impacted by previous land use and development activities (e.g., consists of buildings, asphalt, and gravel surfaces). These past activities, which included farming, and construction, operation, and decommissioning of a lumber mill, would have influenced the integrity of any previously unidentified archaeological and historical sites within the LAA, if present.

3.7 Previous Archaeological Research and Known Archaeological Sites within the RAA

A number of archaeological assessments have been completed within Delta and Richmond over the past half century to update municipal heritage inventories and in support of large infrastructure projects such as dykes and major roads. These larger regional studies include portions of the RAA, and are summarized in Table 6 below.

Table 5: Previous Archaeological Research within the RAA

Investigation Year(s)	HCA Permit #	Description of Study	Reference
1973	1973-0028f	Archaeological field reconnaissance of the shorelines of Lulu and Westham Islands near the mouth of the Fraser River. This inspection was to determine if there were potential conflicts between deposits of archaeological significance and proposed Flood Control Programs. Archival research and informant interviews were conducted. Field investigations were conducted in locations of possible archaeological deposits.	Simonsen 1974
1974	1974-0001c	Archaeological field reconnaissance of the shorelines of Lulu and Westham Islands near the mouth of the Fraser River. This inspection was to determine if there were potential conflicts between deposits of archaeological significance and proposed Flood Control Programs. Archival research and informant interviews were conducted. Thorough field investigations were conducted in locations of possible archaeological deposits.	Carl 1974

Investigation Year(s)	HCA Permit #	Description of Study	Reference
1978	1978-0006a	An evaluation of intact archaeological resources within Borden grids DhRt, DgRt, DhRs, DgRs, DhRr, and DgRr. This project filled in missing data for known archaeological sites. Sixty-six sites were evaluated during this study, 37 of which were assessed as completely destroyed. Recommendations were put forth for salvage excavations, monitoring, conservation plans and public education for the ground-truthed archaeological sites.	Ham 1979
1980-1981	n/a	Heritage inventory of the Fraser River estuary. Archaeological sites, historical buildings and structures, objects, and trails were identified through library research, field observations, and discussions with local Aboriginal groups, heritage groups, and municipal agencies.	Parsons 1981
1986	1986-0019	Archaeological overview assessment of Richmond. Included Sea Island and all but the eastern portion of Lulu Island. Many sites were identified along sloughs or historical sloughs, which have since been used to model archaeological site potential.	Ham 1987
1993	1993-0032	Intertidal archaeological wet site survey of portions of the lower Fraser River downstream from Douglas Island at the mouth of the Pitt River. Despite the dredging, dyking, and filling that occurred over the past century, there is still potential to identify archaeological wet sites along the Fraser River.	Eldridge and Mackie 1993
2000, 2004-2013	2000-0068, 2004-0052	Archaeological inventory and impact assessment for the South Fraser Perimeter Road.	Golder 2013

During these assessments, a number of archaeological sites that were previously identified were revisited and a number of new sites were recorded. Those located within the RAA are summarized in Table 7 below and illustrated in Appendix A, Figure 8. These 16 sites include six within Delta and 11 within Richmond. Three of the Delta sites (DgRs-113, DgRs-114, DgRt-027) and one Richmond site (DgRs-084) are heritage wreck sites, representing postcontact marine shipwrecks. Two of the Richmond sites (DgRt-001 and DgRt-008) are classified as legacy sites[2] and require no further management. The remaining 10 sites represent occupations from the precontact, postcontact, and historic periods; a number of these sites are multi-component in nature, with evidence of more than one occupation during a single period or occupations during different periods.

The majority of precontact sites likely represent seasonal resource extraction sites and camps. Fishing, hunting, berry picking, and plant gathering were common activities occurring at or near these sites, some of which would have been occupied for longer periods of times than others, as is evidenced by the different density and types of material culture items recovered. The recorded postcontact and historic sites likely represent transient fishing camps to longer term, more permanent settlements. The longer term occupations are inferred by the structural remains identified at these sites.

[2] A Legacy Site is designation applied by the Archaeology Branch in British Columbia to any archaeological site where all physical evidence has been recovered or removed, and/or a site which is not subject to provisions of the *Heritage Conservation Act*.

Although no archaeological sites have been identified in the LAA, these data suggest that it is possible that as yet unknown short-term precontact to historic camp and resource extraction sites could be present in the LAA.

Table 6: Known Archaeological Sites within the RAA

Municipality	Archaeological Site Identifier	Site Name	Figure Reference	Description / Characteristics	Comments
Delta	DgRr-023	n/a	8.1	■ Precontact, fish weir, surface lithics. ■ Historic building, surface materials.	■ Ground slate knife and Japanese domestic ceramics (possibly 90 years old) recovered. ■ Structure and design of the fishing weir could not be ascertained.
	DgRr-039	n/a	8.1	■ Precontact, surface lithics and shell midden.	■ Area confirmed to be a fill site as the lot has about 5 metres of historic debris, traces of natural shell fragments, and crushed gravels. ■ Imported archaeological materials; origin unknown.
	DgRs-113	Deas Slough Vessel – unidentified	8.3	■ Postcontact, marine shipwreck.	■ Located in Deas Slough, partially exposed intertidal water. Wooden hull and decks extant with no superstructure. Thought to be a former naval auxiliary vessel, 31 m in length. Abandoned sometime before 1963 based on historical aerial photographs.
	DgRs-114	Deas Slough Barge – unidentified	8.3	■ Postcontact, marine shipwreck.	■ Located along the northwest bank of Deas Slough in shallow intertidal water. Wooden hull of the scow-ended barge, 27 m x 9 m, is largely overgrown. Abandoned after 1963 and before 1974, based on historical aerial photographs.
	DgRs-040	n/a	8.3	■ Precontact, single stake, likely associated with weir.	■ Eroded from intertidal river bank.
	DgRs-041	Ladner Basketry Site / Ladner Landing Site / Sts'elexwken / sc̓əlaxʷqə̓n̓	8.5	■ Precontact, surface material, subsurface shell midden.	■ Site is about 300 metres south of the Ladner Yacht Club on Chilukthan Slough. ■ Site disturbed by looting, dredging, infrastructure development and maintenance. ■ Basketry and pebble tools recovered.
	DgRt-027	*Sunny Island*, fish packer, 1929	8.2, 8.4	■ Postcontact, marine shipwreck.	■ Located in intertidal marsh on south side of Ewen Slough. The vessel is identified as the *Sunny Island*, built as a fish packer by Jirokichi Arimoto in 1929 in Ritherdon Bay, and subsequently used to deliver

Municipality	Archaeological Site Identifier	Site Name	Figure Reference	Description / Characteristics	Comments
					herring and salmon to salteries. Abandoned after 1937 and before 1946, based on historical aerial photographs.
	DgRs-35	Brunswick Cannery No. 2	8.6	■ Postcontact, Cannery site, with prehistoric component hypothesized	■ Cannery built 1897, active to 1928; used for boat repair and fish camp to c, 1981.
Richmond	DgRr-025	Don Island	8.1	■ Precontact, surface refuse, fire broken rock. ■ Postcontact, subsurface refuse.	■ Scatter of early 20th century Japanese crockery, glass, and butter clam fragments. ■ Wooden pilings and earthen dyke observed. ■ Don Island was home to a community of Japanese fisher families between 1901 and the beginning of World War II.
	DgRr-041	Ewen Cannery / Lion Island	8.1	■ Postcontact, building, surface refuse, subsurface refuse.	■ Home to the Ewen Cannery between 1885 and 1930. Remains of the canning complex and Chinese bunkhouse at the eastern end of the island and the Japanese fishing camp at the western end.
	DgRs-039	n/a	8.1	■ Precontact, fishing weir, surface lithics. ■ Historic, surface refuse.	■ Weir stakes aligned with a right angle bend. Parallel and adjacent to rows of planks and milled lumber stakes on either side of canal outflow at lower intertidal zone, possibly historic.
	DgRs-017	Kli'ka-te'h-nus / Tl'ektines / Ƛəqtinəs / Richmond Dump Site	8.1	■ Precontact, surface fire broken rock, subsurface lithics, fishing weir.	■ In 1973, Carl noted that the main portion of this site had been either destroyed by past development activity, or is now covered by approximately 10 feet of sanitary land fill. ■ One set of at least 10 wooden stakes are aligned nearly in a straight row. Another concentration of approximately 14 stakes is present on the west side of the same outflow. Miscellaneous stakes observed along entire frontage of site (mid-to-late 1800s occupation, or historic/related to dyke building?).

Municipality	Archaeological Site Identifier	Site Name	Figure Reference	Description / Characteristics	Comments
	DgRs-028	Featherstone's Potato Patch	8.2, 8.3	■ Precontact, surface lithics.	■ Site likely associated with old slough. ■ Recovered broken boiling stones.
	DgRs-032	Crown Zellerbach Site	8.2, 8.3	■ Precontact, surface.	■ Located at the Crown Packing Plant. ■ Plant constructed in the mid-1950s. ■ Two hand maul fragments identified.
	DgRs-124	Shady Island main channel wreck	8.2	■ Postcontact, marine shipwreck.	■ Carvel-planked hull abandoned on main channel side of Shady Island after 1959 and before 1963. ■ Likely burned prior to 1969. ■ Remains measure 25 m by 7.5 m.

	DgRs-084	Steveston Channel Abandoned Fishboats and scow barges	8.2	■ Postcontact, marine shipwreck.	■ A recorded heritage wreck site with multiple wreck features in shallow water or the intertidal on the north shore of Steveston (Shady) Island including:
					  ■ Two motorized wooden hulls, likely salmon gillnetters;
					  ■ Nine scow-form barges ranging between 14 m and 35 m in length, and between 6 m and 19 m in breadth.

	DgRt-001, Legacy	q̓ʷeyaʔχʷ / Qw'eya'xw Garry Point Site	8.2	■ Precontact, habitation. ■ Postcontact, building.	■ In 1973, the site was covered by a protective layer of river sand. Any proposed dyking would cause disturbance to archaeological deposits (Simonsen 1974). ■ Further testing required to verify the presence of this archaeological site. It is buried under deposits and dyke structure.
	DgRt-008, Legacy	Steveston Wye Site / Kwi-thay-um	8.2	■ Precontact, human remains, habitation. ■ Historic, building.	■ Kwi-thay-um = having driftwood logs on beach ■ Recovery of 1920 to 1940 Japanese pottery fragments.
	DgRt-017	n/a	8.2	■ Historic, subsurface refuse.	■ n/a

3.8 Historical Land Use and Occupation within the LAA and RAA

This section summarizes the postcontact and historical use of the RAA, particularly as it relates to settlement and land use activities, including agriculture, industry, and the development of transportation infrastructure. All of these activities have significantly affected the natural landscape within the RAA. Specifically, the soils and sediments have been disturbed and altered, affecting the integrity of any unidentified heritage resources and sites situated along the north and south shores of the South Arm of the Fraser River.

3.8.1 European Exploration and Settlement of the Lower Fraser River

Notwithstanding the hypothetical early investigations of Sir Francis Drake and Juan de Fuca in the late 16th century, European exploration of the northwest coast of North America commenced in the last half of the 18th century. The Fraser River Delta was first observed and recorded by Narvaez and Elisa in 1791 (Philips 2003); however, it was not until long after 1827, when the Hudson's Bay Company established its first outpost on the Fraser River at Fort Langley, that Europeans began to settle Lulu and Sea Islands and the southern shore of the South Arm of the Fraser River, known today as Delta (Philips 2003). From the late 18th to the early 19th century, emphasis had been placed on exploiting fur resources in the northern portion of the province (Ross 1979).

The earliest settlers of Delta and Richmond were involved in agricultural pursuits, the salmon fishery and canning industry, or the logging industry on the Lower Fraser. Settlement in the region increased after it was officially surveyed in 1859 (Philips 2003). Around the same time, paddlewheel boats began to navigate the Fraser River, transporting people and goods at a much faster pace than canoes, between the Lower Mainland, Vancouver Island, and the United States (Ross 1979).

Delta and Richmond both became incorporated as municipalities in 1879. Each consisted of a number of smaller, often ethnic communities that developed alongside early agricultural and industrial centres. These communities were not fully integrated and connected within the larger municipalities of Delta and Richmond until road and rail infrastructure improved and communication networks developed in the early-to-mid 20th century. In Delta, the communities within the RAA included: Annieville / North Delta (in the north and eastern portion of the Delta), Sunbury (situated between North Delta Heights and Tilbury Island), Ladner (at the crossroads of Elliot Street / Arthur Drive and 47A Avenue / Ladner Trunk Road), and Port Guichon (at the crossroads of River Road West and 41B Street) (The Corporation of Delta n.d.) (Appendix A, Figure 8). In Richmond, the southern communities within the RAA included: Steveston (southwest portion of Lulu Island), Slough District (Steveston east to Finn, Green, and Horseshoe Sloughs), South Arm (from the Slough District east to the western reach of Tilbury Island), and East Richmond (from the western reach of Tilbury Island to the western reach of Annacis Island) (Ross 1979; Appendix A, Figure 8).

3.8.2 The Development of Agriculture on the Lower Fraser River

The grassy and deciduous lowlands on the South Arm of the Fraser River could easily be cleared during the mid-to-late 19th century for dwelling construction and to prepare the land for ploughing and the sowing of crops (Philips 2003; Ross 1979:23). The high moisture and organic content of these alluvial soils was preferred for growing crops to feed humans and livestock and were extremely productive given the temperate climate. To reduce the risk of losing crops and improved lands to the annual spring and winter floods, early settlers of the Lower Fraser built earthen dykes, ditches and irrigation canals (Ladner 1979). Ditch and dyke infrastructure permitted surficial

water runoff, and prevented excessive water seepage, while facilitating the development of road systems, expanding settlement and agricultural pursuits further inland from the South Arm of the Fraser River (Ladner 1979; Ross 1979:44).

Ditch and dyke infrastructure was regularly tested during the spring and winter floods. One of the worst floods on record occurred in 1894 (Hayes 2005); the resultant crop, livestock, and other land improvement losses prompted a series of municipal dyke systems to be constructed throughout present-day Delta and Richmond. In 1906, further repetitive spring flooding triggered the development of the Slough Scheme along the north and south shores of the South Arm of the Fraser River. A floating dredge was used to dig a canal approximately 10 m wide to extract sand and gravel to pack on the existing dyke. These sloughs helped to protect the improved fields and established settlements within the lowest lying areas along the Lower Fraser (Ross 1979:46). Ladner (1979:17) noted that “The soil on the ridges and along the river and slough banks was very much more productive than on the open prairie.”

Crops successfully cultivated in the Lower Fraser included hay, oats, barley, clover seed and timothy grass (Ladner 1979; Ross 1979:133). The soils within the region also supported strawberries, blueberries, and cranberries and a variety of vegetables including potatoes, tomatoes, carrots, lettuce, onions, and cabbage (Ross 1979). A number of dairies were also established during the early 20th century.

Technological advancements (e.g., irrigation and drainage; planting, sowing and tending crops; drought and water-resilient crops; antibiotics to maintain the health of livestock) have promoted better crop production and expanded the crops grown and the livestock tended within Delta and Richmond over the past half century. Both of these municipalities remain important agricultural producers within the lower mainland of BC. It appears however, that much of the RAA is situated on former agricultural lands that have been developed during the past several decades for various industrial and residential purposes.

3.8.3 The Development of the Salmon Fishery and Canneries on the Lower Fraser River

The seasonal abundance of salmon in the Lower Fraser from the spring to the fall (i.e., May to October) led to the development of a specialized fishery and the establishment of numerous canneries (the first of which was at Annieville in North Delta in 1870) to supply resources to work and labour camps in the interior and north of BC as well as overseas to Asia and Europe (Ross 1979). Within the RAA, canneries were concentrated in Ladner (Delta) and Steveston (Richmond) (Hayes 2005); additional canneries were located in Delta at Brunswick Point and Richmond at Garry Point. These canneries were supported by fishers, who were predominantly Aboriginal men at first, although they were gradually outnumbered by immigrants, many of whom were from Japan and Eastern Europe around the turn of the 20th century (Hayes 2005; Ladner 1979; Ross 1979). Other immigrants, particularly those from China [who also worked during the off-season on the railways and in mine and logging camps (Philips 2003)], and Aboriginal women worked inside the canneries (Ladner 1979; Ross 1979).

The cultural complexity of the working and living arrangements associated with the salmon fishery and canning industry has been researched and reported on at length. Each cannery was in fact its own complex including not only the fish canning and processing plant, but also the cannery office, net and equipment storage sheds, shipyard and boat works, and various bunkhouses for the workers of different cultural backgrounds. These canneries peaked in production in the early 1900s; however, by mid-century, many had been shut down and only a handful remained in operation.

3.8.4 Early Transportation on the Lower Fraser River

The Fraser River served as the main transportation corridor between the earliest established communities. As was noted above, canoes were replaced by steam-powered paddleboats in the late 1850s, and beginning in the 1870s tug boats were introduced (Drushka 1981). By the 1890s, flat-bottom and round-bottom river boats powered by oar and sail were common private conveyances (Yesaki 2003).

These boats were used to transport people and goods up and down the Fraser and to other nearby communities on Vancouver Island and in the United States. A number of ferry services were established along the Lower Fraser during the late 19th and early 20th centuries. In Delta, ferries were stationed at Sunbury, Ladner, Port Guichon, and Westham Island. In Richmond, ferries were stationed at Woodward's Landing, London's Landing, and Steveston. The ferry services continued to run well into the second half of the 20th century when they were finally replaced by improved road infrastructure, which included a number of bridges (i.e., Alex Fraser Bridge, Annacis Channel Bridge) and the George Massey Tunnel. As is noted in Section 3.8.5 below, industrial products continue to be transported by water vessels in the Lower Fraser to this day.

The construction of the dykes for farming was associated with the construction of roads on Lulu Island and in Delta (Ross 1979). Many of the settlers were keen on road construction given the drainage benefits derived from the accompanying ditches (Ross 1979). However, even with the drainage infrastructure in place, travel by horse or horse / oxen-drawn wagons was very slow going and often impeded by seasonally wet road conditions (Ross 1979). As a result, longer distance land transport of both people and goods along the Lower Fraser was usually by rail.

Rail construction in this region occurred between the 1880s and early 1900s. The construction of the Great Northern Railway (later the Canadian National Railway) in Delta took place during the first decade of the 1900s to serve the Annieville, St. Mungo, Glenrose, and Ladner canneries. This railway was built along the south shore of the South Arm of the Fraser River, notably passing through Annieville, Ladner, and Port Guichon (Corporation of Delta n.d.). The CPR completed the Vancouver and Lulu Island Electric Improvement Railway to serve the salmon canning industry on the south shores of Lulu island in 1902 (Ross 1979:57).

3.8.5 Modern Industry on the Lower Fraser: Production, Processing, and Transport of Lumber, LNG, Steel, and Cement

During the second half of the 20th century, additional farmland along the north and south shores of the South Arm of the Fraser River was developed for industrial use. Within the RAA, the primary industries included Weyerhaeuser Company Ltd.'s Northwest Hardwood Mill (on the Project site property), FortisBC Tilbury LNG Liquefaction Plant (adjacent on the east side of the Project site property), Varsteel / Dominion Pipe and Piling Works (adjacent on the west side of the Project site property), and Lehigh Hanson Cement Plant (adjacent to the east side of the Fortis BC plant) (Appendix A, Figure 2). The lumber, gas, steel, and cement products manufactured by these industries has primarily been transported via carriers and barges. While the sawmill and lumber yard closed down in the 2000s, the Fortis BC LNG plant is currently expanding its production and holding capacity, and the steel and cement works continue with their production.

3.9 Historical Heritage Properties and Landscapes within the RAA

Seventy-six historical heritage properties and landscapes were identified within the RAA during this desktop study (Appendix A, Figure 8). This includes 30 heritage properties and landscapes within Delta and 46 heritage properties and landscapes within Richmond (Appendix D). As can be discerned from Appendix D, many of these heritage properties and landscapes have been entered into the Provincial Heritage Register and assigned a provincial site registration (i.e., Borden) number. Others have been described and documented within the community heritage register.

The identified historical heritage properties have been preserved to document the early communities, industries, and social activities within Delta and Richmond. These heritage properties include individual family homes and barns, schools, churches, halls, and municipal government buildings. They represent early industry (e.g., canneries, agriculture), commerce (e.g., banks, hotels, stores), and communication and transportation infrastructure (e.g., rail and ferry terminals, telephone exchange). Considered together, some of these properties form larger heritage streetscapes (e.g., Steveston town centre), or landscapes (e.g., slough districts, dyke system, cannery row).

As illustrated in Appendix A, Figure 8, many of the historical heritage properties are situated near the north and south shores of the South Arm of the Fraser River. These properties, streetscapes, and landscapes are preserved despite growth in industries along these shores during the past half century, and the expansion of the town centres.

Historical heritage sites were not identified within the LAA. The closest historical heritage properties are located between 2 and 3 km to the south and west or north and east of the Project site property. Project-related construction, operation, and decommissioning activities are unlikely to affect these sites, and undocumented historical resources with the potential to be designated heritage properties (with the possible exception of heritage wrecks) are not anticipated within the LAA.

3.10 Historical Wrecking Events and Observed Abandonments in the RAA

Vessels or aircraft that were wrecked or abandoned two or more years ago are classified as heritage wreck sites. The historical record of wrecking events typically includes many more occurrences than those either recorded as an archaeological site in the Provincial Heritage Register or observed in person, or in aerial imagery. In many instances, the wreck was recovered, or salvaged, at the time of the event, and as such material remains no longer exist. The differences between the archaeological and historical wreck records may be attributed to:

- **Misleading historical information**: the report does not specify that a vessel was salvaged and recovered after the event, or the location of the event is incorrect or very vague.
- **Invisibility**: the wreck may be present but buried by water-born mobile sediments or by introduced fill. Alternatively, the wreck simply cannot be located underwater (i.e., not observable even at low tide) in the absence of underwater investigations.
- **Subsequent wreck removal**: due to dredging, flood / or erosion events. This results in wrecks being transported downstream. Alternatively, wrecks may have been subject to historical cleanup as foreshore “debris”.

Vessel abandonments usually occur when a vessel has reached the end of its serviceable life and is sunk at its moorage or is driven ashore in an intertidal area. In contrast to wrecking events, which are concentrated in areas of navigational hazard, abandonments are typically situated in areas away from strong river currents and vessel traffic, such as sloughs. Vessel abandonments are rarely recorded; typically more abandoned wrecks are observed than are identified in the historic record.

The following sections discuss the recorded wrecking events in the portion of the RAA situated between the west end of Annacis Island and Garry Point. Historical aerial photographs were reviewed for visual evidence of wrecks in the intertidal area. In each sub-section, heritage wrecks are discussed in the context of these historical and visual records.

3.10.1 Recorded Wrecking Events

Over 140 wrecking events were reported in the Fraser River basin within the past 120 years (Northern Maritime Research 2002). Many of these occurred in the interior of British Columbia, or within the Fraser River Delta, but outside the RAA (e.g., between Garry Point and Sandheads) (Figure 4). Table 8 summarizes the available information on the reported lost vessels within the RAA (Department of Transport 1981; Mills n.d; Nauticapedia 2016; Northern Maritime Research 2002; Rogers 1973, 1992). It should be noted that no vessel or aircraft losses were reported between Annacis Island and Garry Point in recent history (i.e., from 1991 to 2014; Transportation Safety Board of Canada 2014a, 2014b).

Table 7: Vessels Reported Lost in the South Arm of the Fraser River and Potentially Located in the RAA

Name, Registry	Date of Loss Y/M/D	Nature of Loss	Place of Loss	Size of Vessel in gross tons	Hull Material	Type of Vessel, Official Number Year Built (if known)
Swan New Westminster, B.C.	1894/09/29	Collision, either “partial” or “unk” [sic]	Canoe Pass	16.7	Wood	Steam screw, sloop 092774 1888
Cheam, Unknown	1906/??/??	Wrecked	Fraser River (?)	286	Wood	Steam stern-wheeler, 117153, 1905
Noname, Vancouver, B.C.	1911/10/23	Collision with *Iroquois,* foundered	Fraser River (?)	77	Wood	Steam screw, 126081, 1908
Ophir Vancouver, B.C.	1913/05/09	Fire at dock before being cast off and drifting to sandbar	Canoe Pass, Brunswick Cannery	212	Wood	Steam screw, schooner 122531, 1907
Townsend, Vancouver, B.C.	1957/03/14	Collision w/ scow, sank, blown up	Clearing channel for Deas Island Tunnel.	583	Wood	Dredge, 138170, 1904
Pal III, Vancouver, B.C.	1967/02/15	Fire	Deas Island Slough	7.6 (Net ton)	Wood	Unknown, 313784, 1961
Bonnie Prince, New Westminster, B.C.	1972/10/10	Sank	Fraser River	14	Wood	Fishing, 193424, 1951

Name, Registry	Date of Loss Y/M/D	Nature of Loss	Place of Loss	Size of Vessel in gross tons	Hull Material	Type of Vessel, Official Number Year Built (if known)
River Drifter, Vancouver, B.C.	1980/06/07	Fire	Fraser River (?)	Unknown	Unknown	Fishing, 13K19475Li, unknown
Galatia #1 Vancouver, B.C.	1982/11/03	Fire	Ladner Wharf	7	Unknown	Fishing, 13K16522Li unknown
Chasca, Vancouver, B.C.	1985/06/10	Fire/explosion	Deas Island Slough, Captain's Cove Marina	3.9	Unknown	Yacht, 13K93445Li, unknown
Tiptoes Vancouver, B.C.	1986/03/03	Fire/explosion	Steveston, Government dock	6.9	Unknown	Troller 08K10948Li unknown
Race Rock, Vancouver, B.C.	1996/03/17	Fire, abandoned, beached	South Arm Woodward's Landing	47.1	Wood	Seiner, 154434, 1927

A comparison of the four recorded heritage wreck sites identified in the Provincial Heritage Register (i.e., DgRs-084, DgRs-113, DgRs-114, and DgRt-027) to the information in Table 8 does not identify any potential matches. The results of the comparisons are provided below:

- **DgRs-084, Steveston Channel Fishboat and Barges – Unidentified** (Appendix A, Figure 8-2): This description could correspond with any of the smaller fishing boats listed as lost between 1979 and 1986 (including *River Drifter*, *Galatia #1*, *Chasca*, or *Tiptoes*). Further detailed research might resolve the question, but the wreck likely represents a non-recorded abandonment. There are no (scow form) barges listed in Table 8.
- **DgRs-113, Deas Slough Vessel – Unidentified** (Appendix A, Figure 8-3): Based on mid-20th century construction and abandonment in place predating 1963, there are no possible vessel matches listed in Table 8.
- **DgRs-114, Deas Slough Barge – Unidentified** (Appendix A, Figure 8-3): There are no (scow form) barges listed in Table 8.
- **DgRs-124, -- Shady Island main channel wreck – Unidentified** (Appendix A, Figure 8-3): Based on dimensions, only the *Ophir* represents a vessel a little longer than the 25 m of hull remaining at the site, but the time and place of the *Ophir*'s loss, 1913 in Canoe Pass, are distant enough from 1963 in the main channel that heritage wreck site DgRs-124 is not likely the *Ophir*.
- **DgRt-027, *Sunny Island*, fish packer, 1929** (Appendix A, Figures 8-2 and 8-4): There is no known historical record of the loss or abandonment of the *Sunny Island.* The vessel identity was determined by observation of official number, 155276, carved into the main beam of the wreck.

The next section builds on the written record of wrecked and abandoned vessel record by summarizing the review of historical aerial photographs.

3.10.2 Abandoned Wrecks Observed in Historical Aerial Photographs

To complement the written record on wrecked and abandoned vessels within the RAA, historical aerial photographs of the area between Deas Island and Annacis Island, spanning the years 1938 to 2009, and Steveston Harbour, spanning the years 1922 to 2014, were reviewed. Visible wrecks were not observed in the LAA. The following subsections describe the observed vessels within the RAA.

3.10.2.1 Deas Island to Annacis Island

The vessels observed in the historical aerial photographs of the portion of the RAA including Deas Island to Annacis Island are described below:

- The four previously noted recorded heritage wreck sites were variously identified within the imagery from 1938 onward: DgRs-084, DgRs-113, DgRs-114 and DgRt-027. These vessels are also observable in current Google Earth imagery (2016).
- One wreck was observed off Tilbury Island approximately 1.9 km upstream of the LAA (Appendix A, Figure 8-1). This wreck, apparently an abandoned scow-form barge, measuring approximately 26 metres x 7.5 metres, first appears in 1991 (FF9131-82). It was abandoned in place sometime between 1984 and 1991. The wreck is still evident in Google Earth imagery (2016), with the internal structure (four keelsons) visible due to the absence of deck planking; the upstream side wall appears to have collapsed.
- Directly across the main river channel, in the vicinity of Lion Island and Don Island and Annacis Channel, a number of wrecks are visible in both the historical aerial photographs and in Google Earth imagery (2016).
  - A substantial vessel is moored alongside a cannery dock on the north side of Lion Island; it is possibly grounded but is visible only in 1938 (A5985:16-20; A5938: 22-24). This vessel is likely the *C.F. Tolmie*, formerly a five-masted schooner, 72 metres in length, used in the trans-Pacific lumber trade before being converted to a floating herring saltery and “laid up in Annacis slough” for some time after 1928 and before she was converted into a log Barge by Gibson Brothers. She was wrecked at Macaulay Point, Victoria, in 1944 (Nauticapedia 2016).
  - Numerous vessels present and some possibly abandoned near Lion Island and near the shipyard in Annacis Channel in 1954 and 1963 (BC1672:42-43, BC1672:20-21; BC5063:236-240).
  - A sunken (intertidal) barge is visible between Don Island and Lion Island in 1974 (BC5581:230-233), but not after.
  - A sunken (intertidal) barge is visible on the north shore of Annacis Channel in 1979 (BC79009:121-122), and a sunken barge is observed at the same location in 1984 (BC84013:187), but not after.

3.10.2.2 Steveston Harbour

Aerial photographs of the Steveston area collected by the Department of Fisheries and Oceans between 1922 and 2014 (Golder 2015) were also reviewed. This select part of the RAA provided the opportunity to observe a number of intertidal wrecks or group of wrecks in a very active area of shipping, fishing and boat-building. Three

individual wrecks and one group of 12 wrecks were observed in the intertidal areas. They are summarized in Table 9 and illustrated in Appendix A, Figure 8-2.

Table 8: Wrecks Observed in Historical Aerial Photographs of the Steveston Harbour Area

Year	Garry Point Barge	Shady Island, Cannery Channel Wrecks (10 barges and a boat still visible in intertidal area in 2009)[3]	Shady Island, Main Channel Wreck[4]	Harlock Island Barge
1922	The Garry Point area is salt marsh without dykes – the Scottish Canadian Cannery complex is located on piles at the point (Yesaki et al. 1998).	Numerous barges and small vessel anchored, some may be abandoned.	None present.	Adjacent to where barge will be located are extensive Victoria Canning Co. structures (Newell 1989) on piles outside of dyked area.
1928	As previous.	Barges are observed “on” Shady Island, in organized groups clearly being stored in very high intertidal area.	As previous.	As previous.
1932	Barges observed on flats behind cannery at Garry Point.	As previous but with different vessels and / or placements.	As previous.	Barge is located just downstream of cannery structure.
1938	Area not covered.	As previous with some vessels (boats) definitely abandoned.	Groin (piles) where wreck will be located is now present. Downstream, one wreck is visible (between groins).	Cannery buildings are gone. Barge remains, although turned from 1932 orientation.
1946	Cannery has been reduced to pilings; no barges are visible behind.	As previous.	As previous.	As previous.
1950	Scotch Fir Pond is now open (to lumber mill) and abandoned barge and boat are visible on north shore of this channel.	Three barges are visible in place.	As previous.	Decking has started to deteriorate on barge revealing sidewalls and 2 keelsons.
1954	Neither boat nor barge are visible.	An abandoned boat is visible as well as the three barges.	As previous.	Barge still clearly visible.
1959	Barge is visible again, not boat.	Two barges are just visible. Note that an anchored vessel has same deck characteristics as Main Channel wreck in1963.	As previous.	Barge is being absorbed by salt marsh, looking more like indented landform than structure.
1963	Area not covered.	Three barges with two boats are visible.	Wreck appears with deck and deck openings (size shape and openings match boat anchored in channel in 1959), but no superstructure.	Part of the barge shape still visible in landform.

[3] Subsequent to this historical aerial photograph review, eight of the barges and one boat were added to heritage wreck site DgRs-84, all representing abandoned vessels in Cannery Channel.

[4] Subsequent to this historical aerial photograph review, the Shady Island, Main Channel Wreck was recorded as heritage wreck site DgRs-84.

Year	Garry Point Barge	Shady Island, Cannery Channel Wrecks (10 barges and a boat still visible in intertidal area in 2009)[3]	Shady Island, Main Channel Wreck[4]	Harlock Island Barge
1969	Barge is not visible.	One barge appears in place.	Wreck has moved to final position overlapping groin. Deck is gone exposing interior structure. Frames are blackened suggesting fire. Block of structure is visible downstream.	Foreshore is indented but no shape of barge is left (in place minimum 31 years).
1972	Area not covered.	Three boats newly appear just downstream of barges.	Area not covered.	Area not covered.
1974	Barge is visible with decking deteriorated to reveal four keelsons.	Two of three boats from 1972 are still visible.	Interior structure is further reduced to reveal large keelson. Block structure not visible.	As previous (1969).
1979	Deck planking is now completely absent.	Two of three boats from 1972 are still visible. Three barges are visible, and two others are close by but in a different alignment.	As above. Block structure buried?	Area not covered.
1982	As previous.	As previous.	Sediment accumulation has buried much of the wreck.	Area not covered.
1986	Area not covered.	One barge is abandoned in place.	As previous.	Area not covered.
1999	Area not covered.	Some barges not visible due to high tide. Piles have been moved farther north, into channel, leaving some barges behind. Boat which may be DgRs-84 is visible for first time.	Wreck appears to be grown over.	Area not covered.
2001	Interior structure exposed.	One barge has >50% of its deck buried.	As above. Block structure visible again.	Area not covered.
2009	Area not covered.	Eleven barges and boat visible.	Sediment removed and much of interior structure is exposed. Growth starting on upstream end.	Area not covered.
2014 Google Earth (2016)	Barge outline is barely visible under growth (in place minimum 64 years).	Five barges in upper intertidal are now grown over and unrecognizable (in place minimum 64 years). Other barges clearly visible (in place minimum 35 years). Boat is still visible (in place minimum 25 years).	Growth is starting in middle and downstream end of wreck (in place minimum 45 years).	Not recognizable (after minimum 92 years in place).

As demonstrated in Table 9, when barges are left in relatively undisturbed circumstances they can remain visible in the intertidal areas for more than 50 years. Barges have longer visibility than smaller boats; many boats are only visible for one aerial photograph cycle (approximately 5 years on average), probably due to the wrecks being floated off during high tides. Alternatively, if wrecks are not buried they may remain intact and visible longer in the lower intertidal. This review of a riverine environment indicates that barges will become overgrown in the upper intertidal after about 50 years.

Given the survival rate and expected visibility rate for barges and larger vessels, if these vessels were present in the intertidal portion of the LAA it is expected that they would be visible in the historical aerial photographs that were reviewed. The large number of barges and other vessels observed both in Steveston Harbour and the Lion and Annacis Island areas are not expected at Tilbury due to lower intensity in historic vessel traffic.

Notable in the review of historical aerial photographs are active dredging operations in 1963 and 1989. It is expected that dredging operations would have been conducted close to the shore of the LAA and / or piles driven along it and that wrecks located farther offshore would no longer be extant.

3.11 Analysis of Historical Aerial Photographs for the LAA and RAA

Aerial photographs spanning the period 1938 to 2009 were analyzed to identify changing anthropogenic use of the LAA and the portion of the RAA that stretches from Deas Island to the western end of Annacis Island. These photographs were further reviewed to note any changes in the topography and landscape that may influence the recognition and preservation of paleontological, archaeological, and historical resources. The aerial photographs were obtained from the University of British Columbia's Geographical Information Centre and were taken at a variety of heights, thus limiting the resolution of observable changes.

Appendix E summarizes the observed developmental and sedimentation changes within and near the LAA from 1938 to 2009. It appears that at least a portion of the Project site property contained within the LAA was farmed from the late 19th or early 20th century until the early 1980s. The dykes appear to have been recently built up shortly before the imagery taken in 1949. Construction of a marine jetty, sawmill, and lumber yard in the northern portion of the Project site property began in the early 1960s and was completed before the mid-1970s. Sawmill and lumber yard operations expanded into the southern portion of the Project site property in the late 1970s and early 1980s.

This was most recently the site of the Weyerhaeuser Company Ltd.'s Northwest Hardwood Mill. The mill was in operation until the mid-to-late 2000s.

Examining this series of aerial photographs identified active sedimentation and migration of bars within the LAA and RAA. Specifically, it indicated the importance of dredging in maintaining a navigable route in the South Arm of the Fraser River. These dredging activities, in addition to the construction and operation of the Weyerhaeuser marine jetty, sawmill, and lumber yard, likely impacted any previously undocumented near surface paleontological, archaeological, and historical resources, if present.

3.12 Review of River Process Assessments for the RAA

Archaeological sites located on the river banks and the riverbed may be impacted by hydrodynamic river processes driven primarily by river currents and tides that may erode and displace sediments, including archaeological or historical material, or may deposit sediments over older layers that possibly contain palaeontological, archaeological, and historical resources, if present. These processes are natural and on-going throughout the RAA, however, the processes may be modified by human activities such as dyke-building, jetty construction, river bank armouring, dredging (for navigation or construction material access), changes to watershed input from diversions or new outfalls, and vessel traffic (wakes).

In the review of historical aerial photographs, the build-up of intertidal material due to on-going river processes, likely affected by historical wharf construction, is evident on the north side of Tilbury Island in and near the LAA (Appendix E). No historical changes to the location of the opposite riverbank, on the north side of the river where site DgRs-17 is located, were observed, and changes at other locations in the RAA were not specifically reviewed. To generally assess how the development of the Project may affect river processes and known archaeological sites subject to erosion or sediment deposition in the RAA, Project-related reports addressing current conditions, modelled morphological changes of the riverbed, and vessel wakes were summarized (Ausenco 2015; Golder 2018; Tetra Tech 2018).

Current conditions in Gravesend Reach (the part of the river from the LAA and downstream approximately 4.5 km, see Appendix A, Figures 8-1 and 8-3) have been affected by heavy borrow dredging (for construction materials) that peaked in the 1990s with about 600,000 m^3 of riverbed being removed annually which created a general scouring and deepening trend (Golder 2018). Since 2001, average annual dredging has been reduced to 170,000 m^3. While seasonal and yearly changes in riverbed elevations can range up to several metres, over this period (since 2001) there has been an overall equilibrium established between scour and deposition. Modelling indicates that changes in scour and deposition rates due to project-related construction, including placement of offshore infrastructure, the dredged pocket, and vessel traffic (propeller wash and drawdown) will be localized to the areas of construction and operation and the riverbed located immediately downstream from these, and does not indicate changes to the opposite shore where archaeological site DgRs-17 is located (Golder 2018; Tetra Tech 2018).

Archaeological sites within the RAA that are located on the banks of the main channel where they are exposed to wake-generated waves include DgRr-23, DgRr-25, DgRr-41, DgRs-39, (all located upriver), and DgRs-17. Of the two known sites located downstream, DgRs-32 is protected by rip rap and armouring on the channel side of the Crown Zellerbach site, and DgRt-1 is a legacy site. The DgRs-17 location is therefore the only site potentially exposed to wakes from large vessels (LNG carriers) in transit to and from the Project site. Smaller vessels including tugs and LNG barges could potentially traverse upstream. Nevertheless, the wake study prepared by Ausenco indicates that wakes from projected vessel movements related to the project are not expected to have a significant incremental effect on existing wave conditions in the Fraser River (Ausenco 2015; Golder 2018).

3.13 Visible Features in Intertidal Area of the LAA

Doris Zibauer participated in a site visit as part of an environmental study conducted June 17, 2015. The intertidal area of the Project site was not directly accessed, but observations were made and photographs taken over the beach from points at the upstream and downstream ends of the LAA when the tide levels were estimated at between approximately 1.7 m and 1.5 m above chart datum.

Observations related to historical structural remains included loose piles of logs and milled timber mixed in with live brush in the uppermost intertidal area at the toe of the dyke. No articulated structure was observed in this debris. Immediately downstream of the Project site, extensive grass matts in soil were observed overlaying wooden (collapsed pile and plank) structures. This underlying structure us likely the remains of a wharf or ramp observed in historical aerial imagery and associated with the sawmill (see Appendix E, 1963). Scattered remains of jetty structure included paved fill, slab concrete and concrete piles were loosely stacked in some areas. Wooden pile stubs were also observed in the intertidal area. In the upper intertidal area was grassy with an

irregular edge over a muddy mid- and lower-intertidal area. No structure potentially representing a heritage wreck was observed in this area.

3.14 Review of Geotechnical Data from the LAA

Golder has conducted two geotechnical evaluations in and directly adjacent to the LAA (Golder 2014, 2016). The geotechnical evaluation of the proposed dyke upgrade on the property indicated that approximately 1 m of sand and gravel fill that was added to the dyke in 1977 (Golder 2014). Borehole tests confirmed this thickness between 0.9 m and 1.2 m. Below this layer of relatively recent fill was the dyke “core”, consisting of clayey silt to silty clay; also considered fill by the geotechnical engineers, and extending between 3 m and 4 m below the surface. No organic material, such as peat or organic sandy loam which might indicate an original surface, was reported in these layers (Golder 2014).

Borehole test samples were also extracted from offshore within the LAA (Golder 2016). The shallowest of these boreholes in offshore area were located in about 3 m of water depth below chart datum. The upper layer in these tests consisted of silty sand to sandy silt, inferred to be channel fill with a thickness of about 5 m to 7 m at the proposed bunkering terminal, tapering to nonexistent about 200 m away from riverbank (Golder 2016).

3.15 Summary of Historical Use of the LAA

The LAA was used for agricultural purposes from the late 19th century until the early 1980s. The analysis of aerial photographs indicated that construction of a marine jetty, sawmill, and lumber yard in the northern portion of the Project site property began in the early 1960s and was completed before the mid-1970s. Sawmill and lumber yard operations expanded into the southern portion of the Project site property in the late 1970s and early 1980s. The mill was in operation until the mid-to-late 2000s.

Dredging, in addition to the construction and operation of the Weyerhaeuser marine jetty, sawmill, and lumber yard, likely impacted any previously undocumented near surface archaeological resources. While the shoreline was not modified with artificial fill outside of the dyke (except within the footprint of the jetty), the historical presence of jetties at either end of the Project site appears to have stimulated sediment accumulation in the river between the dyke and the dredged portion of the channel (see Appendix E).

There are no historical heritage sites or landscapes located within the LAA. Heritage wrecks, which are protected under the HCA, were not observed within the LAA. Based on the location and condition of known heritage wrecks within the RAA and additional wrecks observed in the historical aerial photographs of the RAA, it is unlikely that there are undetected wrecks in the LAA owing to the lack of developed river access to this foreshore prior to the early 1960s, the absence of any protected shoreline inviting to vessel abandonment (at least prior to jetty construction occurring between 1963 and 1974), the lack of historical (including visual) evidence for the presence of wrecks, and the effects of periodic dredging activities in the navigation channel and adjacent to jetties.

4.0 DISCUSSION

4.1 Study Results

Given the site-specific and stationary nature of heritage resources, the LAA is the maximum area where potential direct and indirect Project effects on paleontological, archaeological, and historical resources are reasonably expected to occur. This desktop study has demonstrated that there has been extensive precontact and historic use of the shores of the LAA. As such, there is potential to encounter as yet unidentified paleontological, archaeological, and historical resources within the LAA; field work would be required to determine if present. However, the integrity of the underlying deposits and the likelihood of encountering these heritage resources during Project-related construction, operation, and decommissioning activities must be considered in light of the following:

- Historically documented sediment migration and erosion within the South Arm of the Fraser River. These processes have increased as a result of channel dredging and vessel traffic during the past half century.
- Previous land use and development activities on the Project site, including construction, operation, and decommissioning of a lumber mill and marine jetty from the early 1960s until the mid-to-late 2000s on the Project site.
- Additional land use activities in the LAA, including farming from the late 19th century to the 1980s and periodic dredging of the South Arm of the Fraser River throughout the 20th century.
- The addition of overburden throughout the 20th century, including imported fill added in at least two events to build the dyke, and channel fill accumulating in the intertidal areas.

The above-noted factors would have influenced the integrity of any previously unidentified paleontological, archaeological, and historical resources within the LAA. Regarding paleontological resources specifically, if fossils were present and remain in the LAA, they are likely deeply buried (i.e., between 200 and 1000 metres) below existing sediments.

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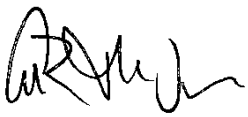

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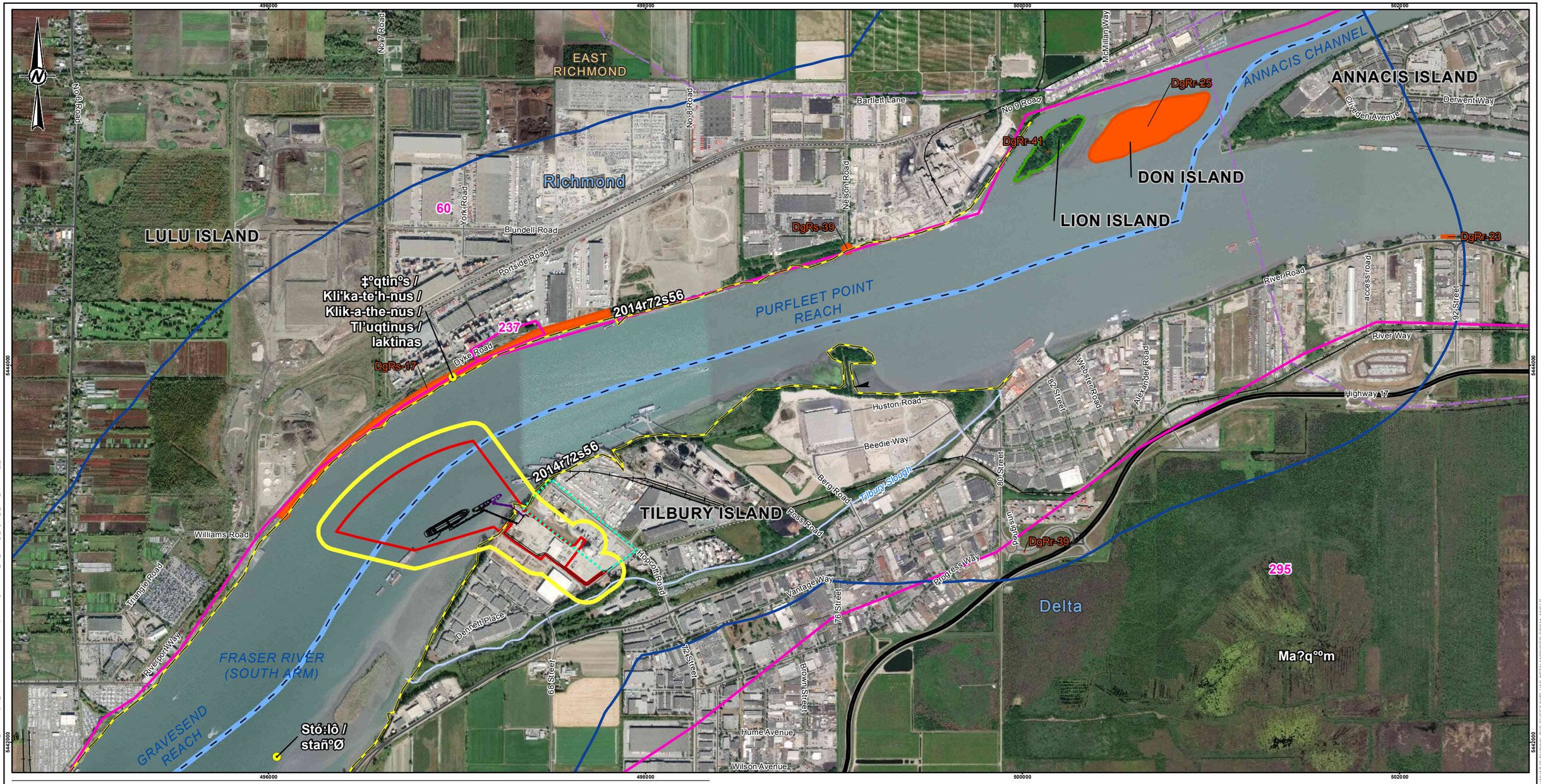

LEGEND

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- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

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CONSULTANT
Golder Associates

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3. HISTORICAL SITES DIGITIZED FROM IMAGERY.
4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

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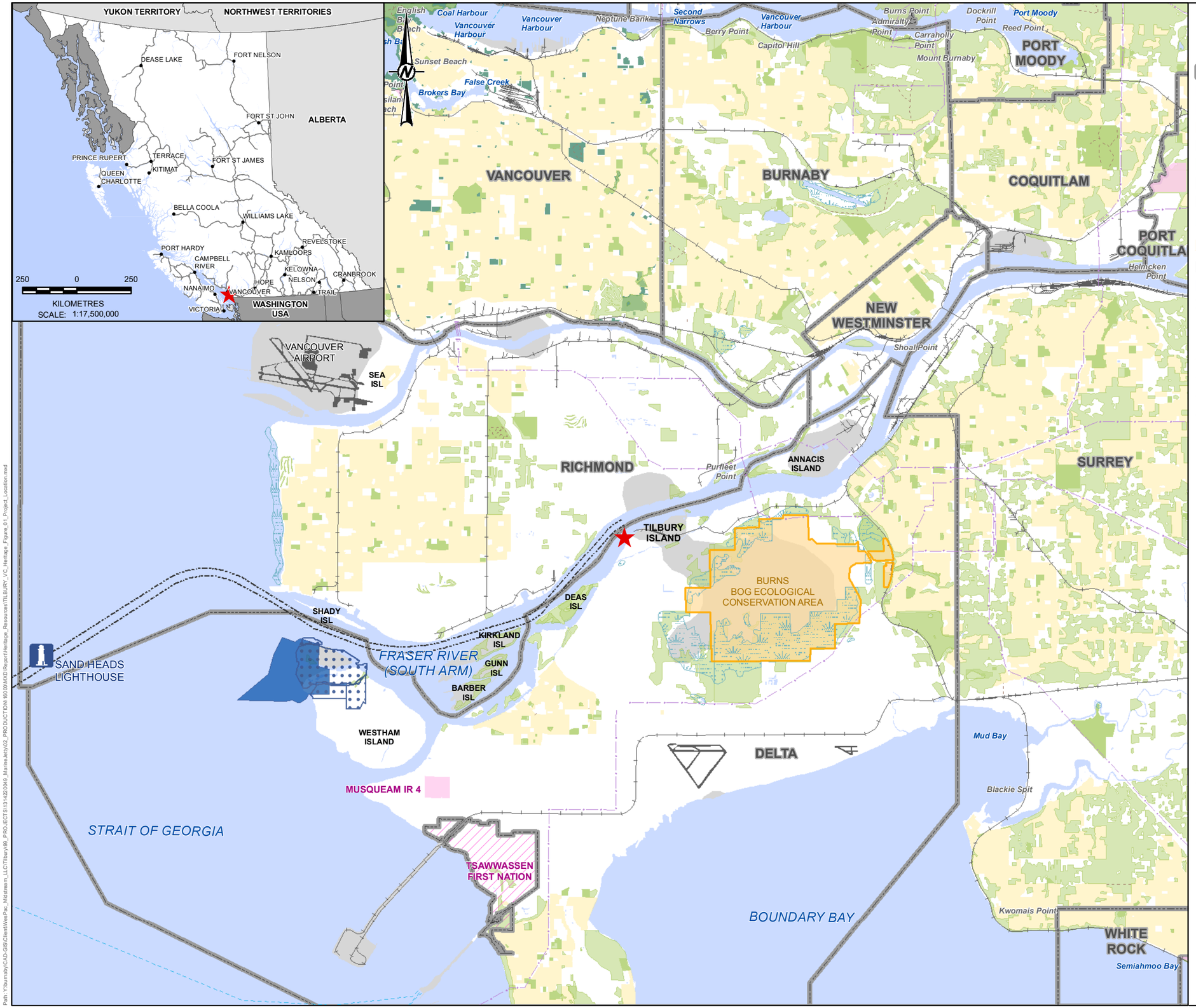
APPENDIX A

Figures



LEGEND

- PROJECT LOCATION
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LANDS
- URBAN AREA
- NON RESIDENTIAL AREA
- PARK / FOREST AREA
- GEORGE C. REIFEL MIGRATORY BIRD SANCTUARY
- ALAKSEN NATIONAL WILDLIFE AREA
- WETLAND
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- AIRPORT
- WATER
- FRASER RIVER SHIPPING CHANNEL
- WATERCOURSE
- FERRY ROUTE
- HIGHWAY
- ARTERIAL ROAD
- TRAIL
- RAILWAY
- POWER TRANSMISSION LINE
- SAND HEADS LIGHTHOUSE

2,500 0 2,500

SCALE 1:125,000 METRES

REFERENCE

1. PROVINCIAL BOUNDARY OBTAINED FROM GEOBASE®.
2. FISHING AREA, FIRST NATION RESERVES, TSAWWASSEN FIRST NATION LANDS AND MUNICIPAL BOUNDARIES OBTAINED BY B.C. MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS.
3. TRANSIT, RAILWAY, WATER, FOREST, PARKS AND URBAN AREA DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
PROJECT LOCATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	16000	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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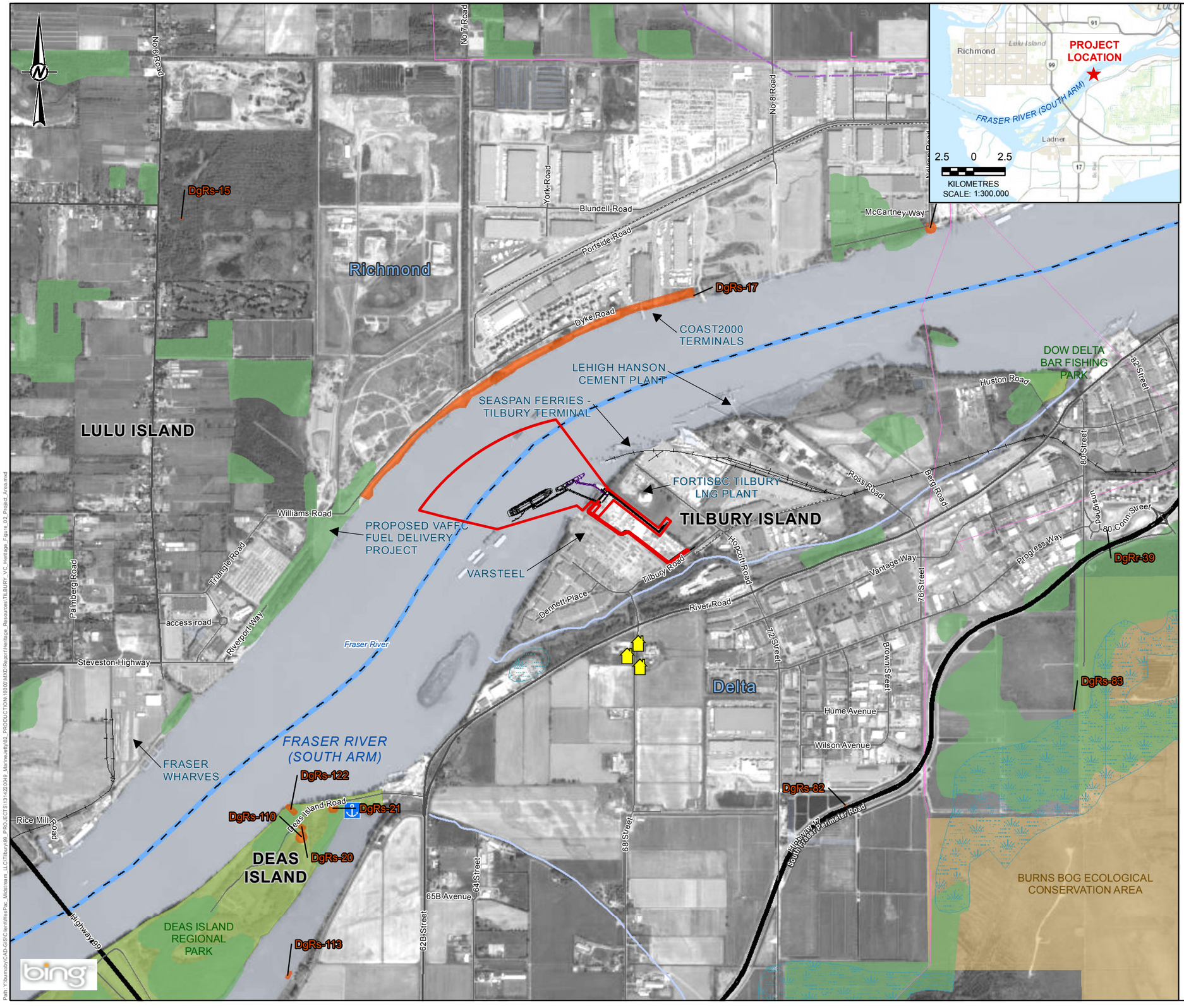

LEGEND

- PROJECT BOUNDARY
- PRELIMINARY BERTH CONCEPT PROJECT LAYOUT
- MUNICIPAL BOUNDARY
- ARCHAEOLOGICAL SITE
- PARK / FOREST AREA
- WETLAND
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- WATER
- HIGH PRESSURE PIPELINE
- POWER TRANSMISSION LINE
- WATERCOURSE
- ARTERIAL ROAD
- Highway
- RAILWAY
- MARINA
- CLOSEST PERMANENT RESIDENCE

400 0 400

SCALE 1:20,000 METRES

REFERENCE

1. PRELIMINARY BERTH CONCEPT FROM AUSENCO-100761-0000-W-K50-A 04-17-2015.
2. HIGH PRESSURE PIPELINE OBTAINED FROM IHS ENERGY INC.
3. TRANSIT, RAILWAY, POWER LINE AND WATER DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
4. ARCHAEOLOGICAL SITES AND MUNICIPAL BOUNDARIES OBTAINED BY B.C. MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS.
5. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. TOPO BASEMAP © ESRI AND ITS LICENSORS. ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
PROJECT SITE AND SURROUNDING AREA

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO. 13-1422-0049 | CONTROL 16000 | Rev. 0 | FIGURE **2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI B

0 25mm

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LULU ISLAND

Dyke Road

FRASER RIVER
(SOUTH ARM)

APPROACH CHANNEL AND
BERTH POCKET
DREDGED TO -11.0m CD

CONCEPTUAL
DEPARTURE

CONCEPTUAL
APPROACH

APPROACH CHANNEL
DREDGED TO -9.5m CD

BERTH POCKET
DREDGED TO -11.0m CD

ACCESS TRESTLE

PROPOSED LNG TRANSFER PIPELINE

PROPOSED ACCESS ROAD

PROPOSED
LNG TRANSFER
PUMP

PROPOSED
FORTISBC
BOIL OFF GAS
COMPRESSOR

PROPOSED
FORTISBC
LNG STORAGE
TANK

Hopcott Road

TILBURY ISLAND

Tilbury Road

MacDonald Road

Dennett Place

River Road

bing

LEGEND

- PROJECT BOUNDARY
- FORTISBC LNG PLANT
- PARCEL
- PROPOSED LAYOUT
- DIKE/BERM
- DREDGE POCKET
- 90,000M^3 VESSEL MOVEMENT
- FRASER RIVER SHIPPING CHANNEL
- MAJOR ROAD
- ROAD
- RAILWAY
- BATHYMETRY (0.5m)

100 0 100

SCALE 1:5,000 METRES

REFERENCE

1. PRELIMINARY BERTH CONCEPT, SHIP AND FORTIS BC STRUCTURES FROM AUSENCO-100761-0000-W-K50-A 04-17-2015.
2. BATHYMETRY ELEVATIONS RELATIVE TO CHART DATUM.
3. PARCEL DATA CONTAINS INFORMATION LICENCED UNDER THE OPEN GOVERNMENT LICENCE – BRITISH COLUMBIA.
4. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. TOPO BASEMAP © ESRI AND ITS LICENSORS. ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
PROJECT CONFIGURATION

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO. 13-1422-0049 | CONTROL 16000 | Rev. 0 | FIGURE 3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

0 25mm

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INSET MAP

FRASER RIVER (SOUTH ARM)

100 0 100
METRES
SCALE: 1:18,000

bing

VANCOUVER
SEA ISLAND
LULU ISLAND
RICHMOND
ANNACIS ISLAND
TILBURY ISLAND
BURNS BOG ECOLOGICAL CONSERVATION AREA
DEAS ISLAND
DEAS ISLAND REGIONAL PARK
GARRY POINT
SHADY ISLAND
KIRKLAND ISLAND
GUNN ISLAND
BARBER ISLAND
LADNER HARBOUR PARK
WELLINGTON POINT PARK
WESTHAM ISLAND
DELTA
MUSQUEAM IR 4
TSAWWASSEN FIRST NATION
SAND HEADS LIGHTHOUSE
FRASER RIVER (SOUTH ARM)
CANOE PASS
STRAIT OF GEORGIA
BOUNDARY BAY

LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES LAA
- HERITAGE RESOURCES RAA
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LANDS
- RESIDENTIAL AREA
- PARK / FOREST AREA
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- WETLAND
- WATER
- WATERCOURSE
- ROAD
- RAILWAY
- SAND HEADS LIGHTHOUSE

2 0 2
SCALE 1:85,000 METRES

REFERENCE

1. INDIAN RESERVES, TSAWWASSEN FIRST NATION LANDS AND MUNICIPAL BOUNDARIES OBTAINED BY B.C. MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS.
2. RAILWAY, WATER, FOREST, PARKS, WATERCOURSE, WATERBODY AND RESIDENTIAL AREA DATA OBTAINED FROM CANVEC © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
3. IMAGERY OBTAINED FROM BING MAPS FOR ARCGIS PUBLISHED BY MICROSOFT CORPORATION, REDMOND, WA, MAY 2009. TOPO BASEMAP © ESRI AND ITS LICENSORS. ALL RIGHTS RESERVED.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
HERITAGE RESOURCES LOCAL ASSESSMENT AREA AND REGIONAL ASSESSMENT AREA

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	CH
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	16000	0	**4**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI B

0 25mm

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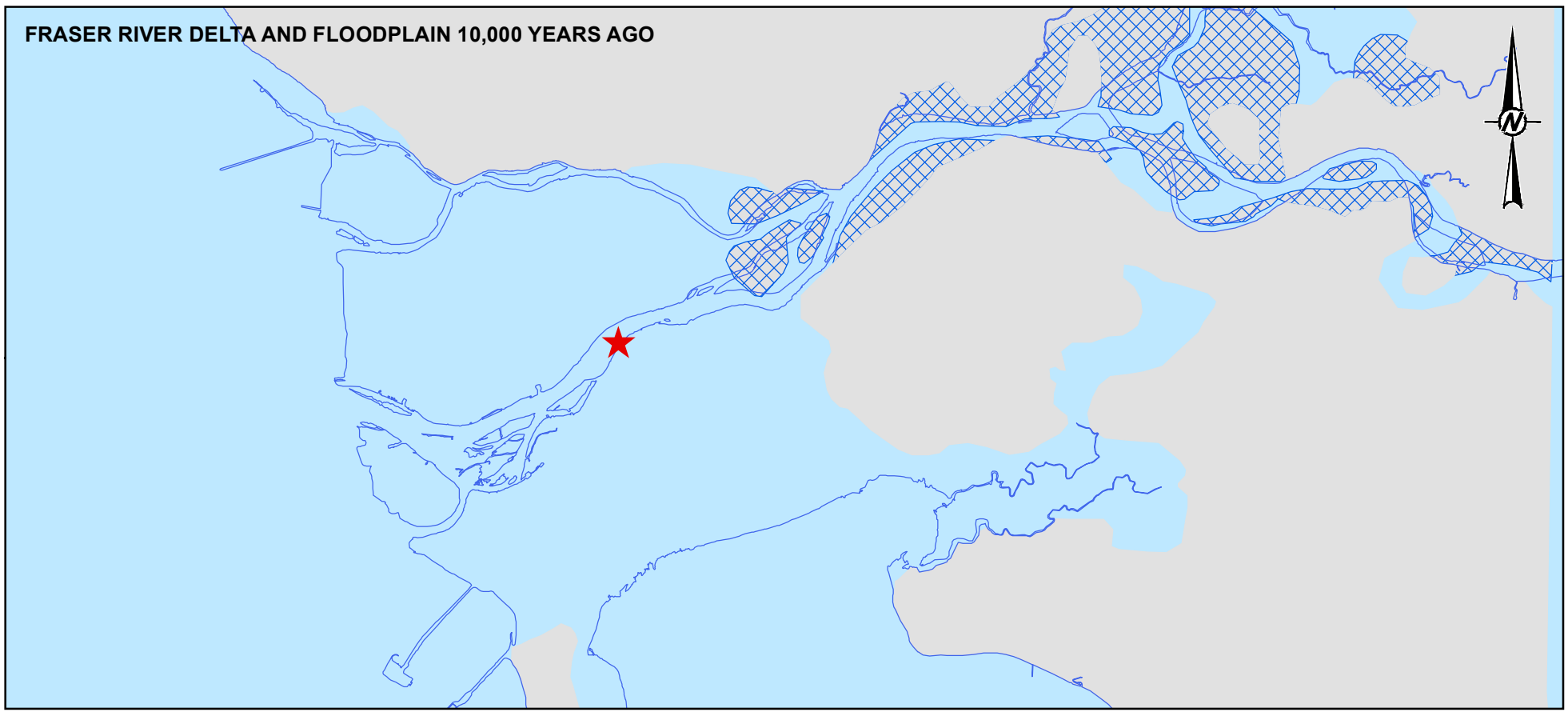
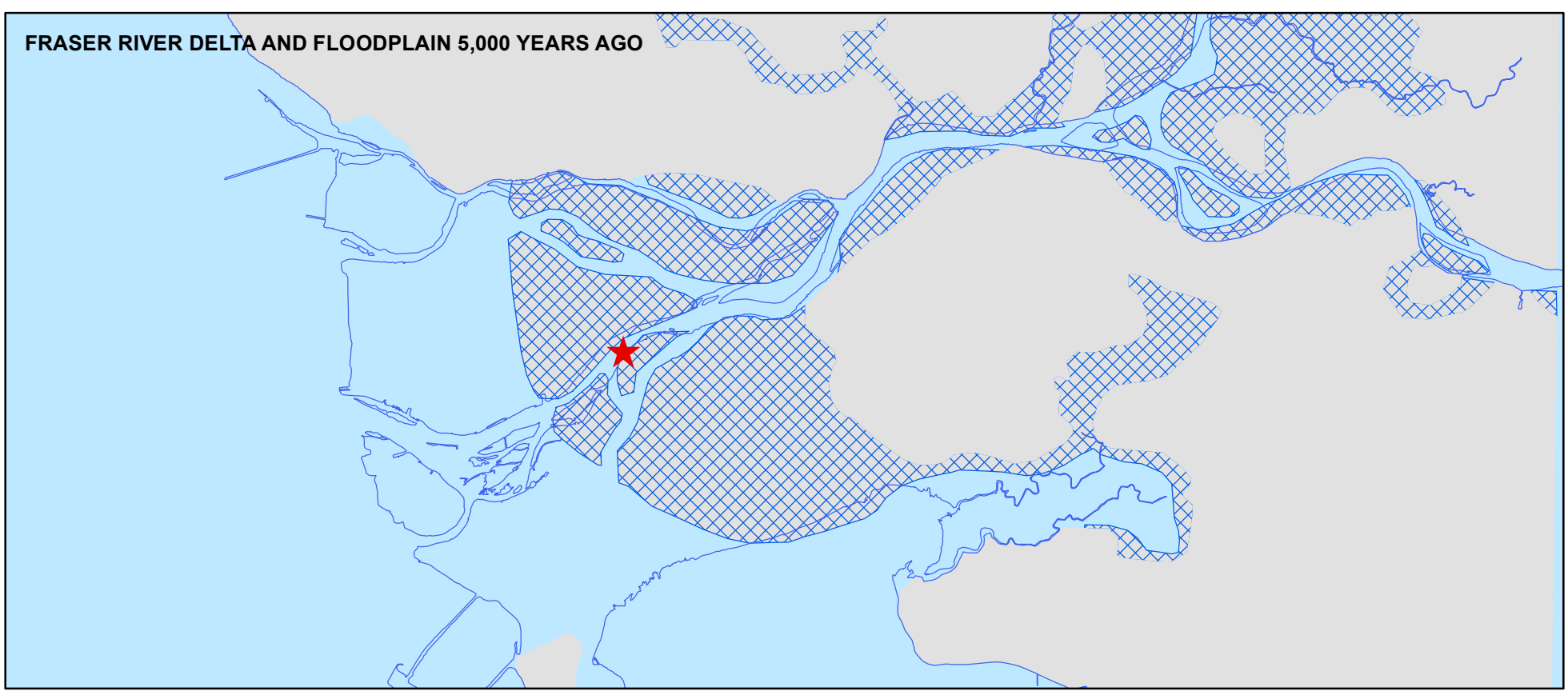
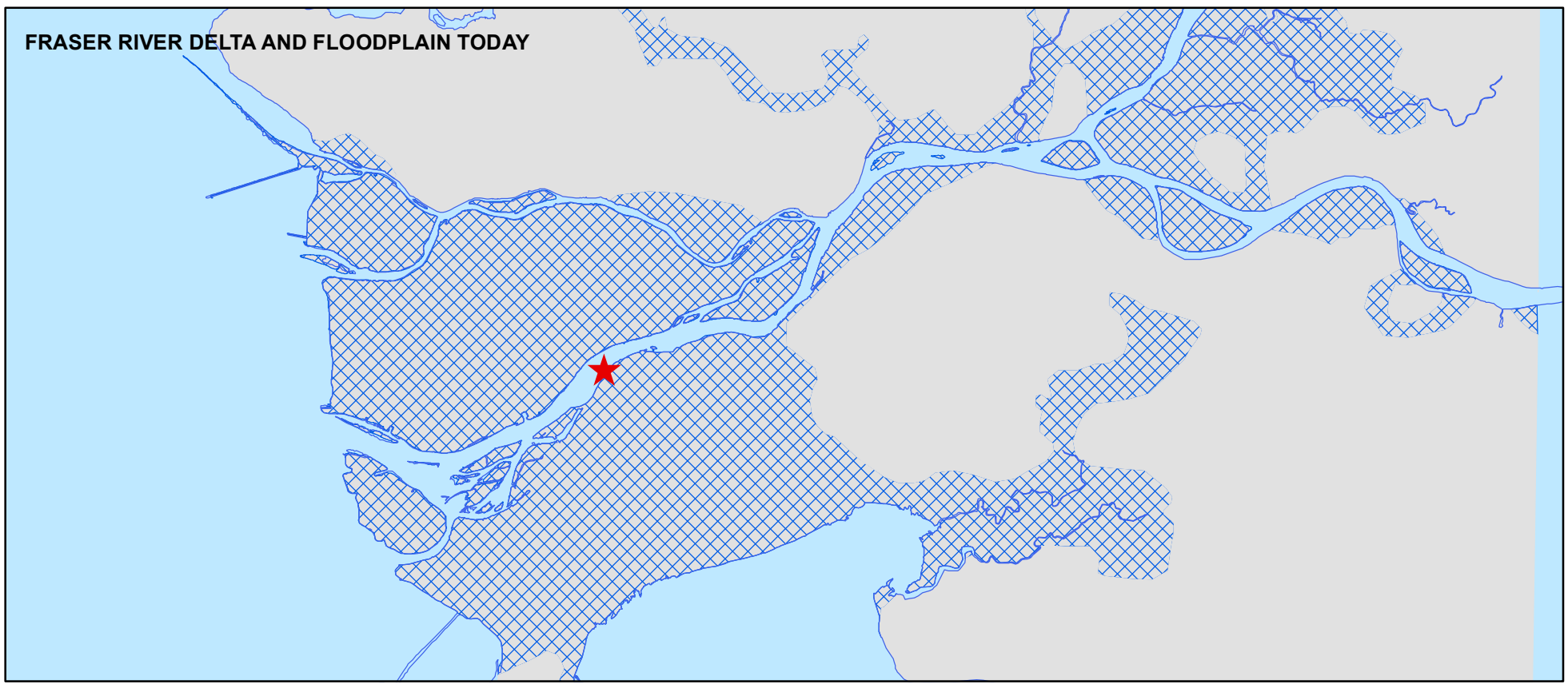
PATH: Y:\burnaby\CAD-GIS\Client\WesPac_Midstream_LLC\Tilbury\99_PROJECTS\1314220049_MarineJetty\02_PRODUCTION\16000\MXD\Report\Heritage_Resources\TILBURY_VC_Heritage_Figure_05_Fraser_River_Floodplain.mxd PRINTED ON: 2018-08-14 AT: 10:00:25 PM







LEGEND

- PROJECT LOCATION
- PRESENT DAY SHORELINE
- FRASER RIVER DELTA AND FLOODPLAIN
- LAND

5 0 5

1:250,000 KILOMETRES

REFERENCE(S)

1. FRASER RIVER FLOODPLAIN DIGITIZED FROM CLAGUE ET AL (1983).
2. PRESENT DAY SHORELINE OBTAINED FROM ESRI CANADA.
3. CANADA/U.S.A BORDER OBTAINED FROM GEOGRATIS ®.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
FRASER RIVER FLOODPLAIN PROGRESSION OVER TIME

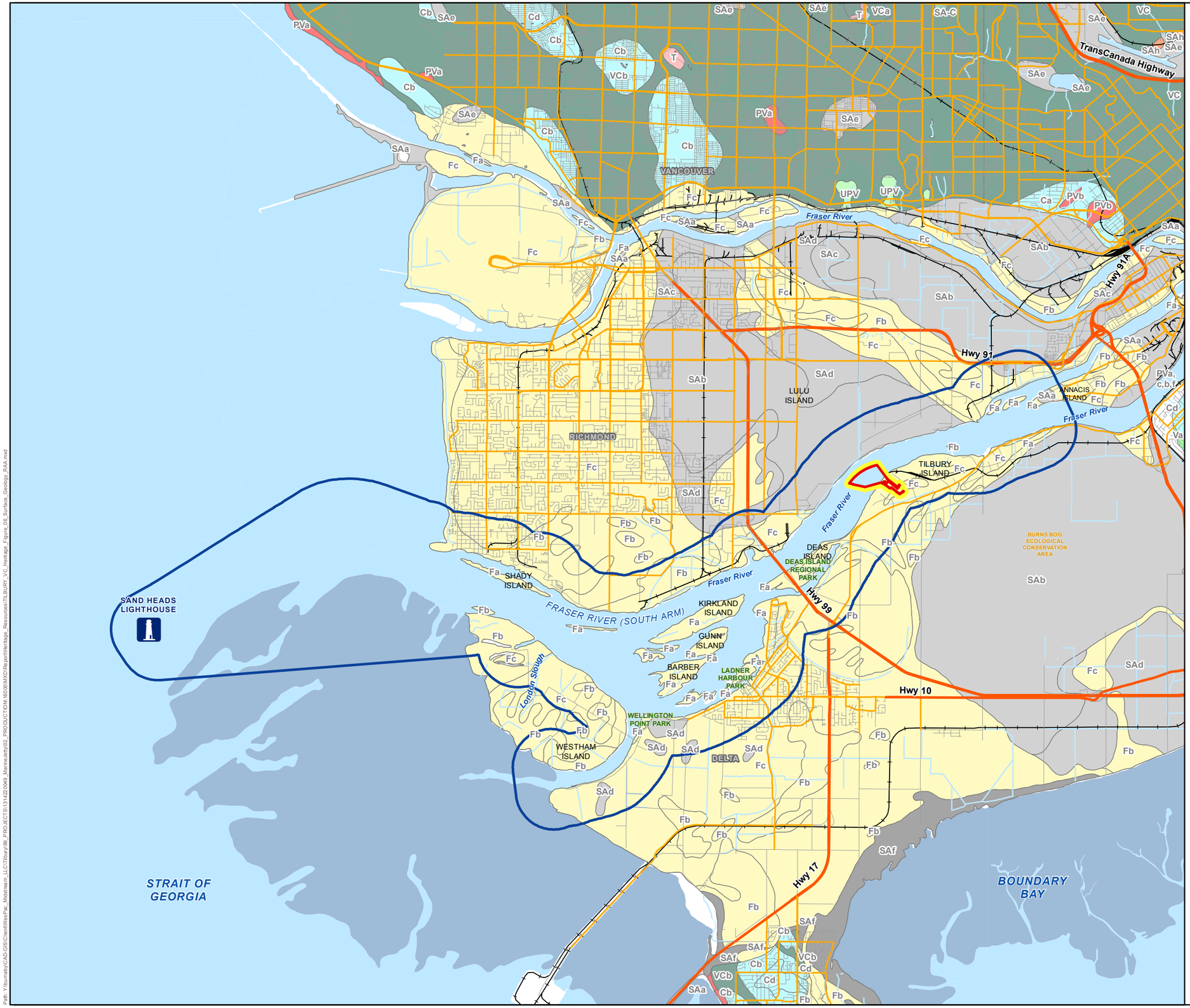
CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
DESIGNED	LF
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

0 25mm



LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES LAA
- HERITAGE RESOURCES RAA
- INTERTIDAL AREA
- WATERBODY
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- RAILWAY
- WATERCOURSE

2,500 0 2,500

SCALE 1:100,000 METRES

REFERENCE

1.ROAD, RAILWAY, NAMED FEATURES, WATERCOURSE, INTERTIDAL AREA, AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
2. CANADA/U.S.A. BORDER OBTAINED FROM GEOBASE ®.
3.SURFICIAL GEOLOGY OBTAINED FROM GEOLOGICAL SURVEY OF CANADA.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
SURFICIAL GEOLOGY OF THE RAA

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO. 13-1422-0049 | CONTROL 16000 | Rev. 0 | FIGURE **6**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

25mm

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SURFICIAL GEOLOGY LEGEND

QUATERNARY

POSTGLACIAL

SALISH SEDIMENTS

SAa — Landfill including sand, gravel, till, crushed stone, and refuse

SAb-e — Bog, swamp, and shallow lake deposits: SAb, lowland peat up to 14 m thick, in part overlying Fb, c; SAc, lowland peat up to 1 m thick underlying Fb (up to 2 m thick); SAd, lowland organic sandy loam to clay loam 15 to 45 cm thick overlying SAg and Fd; SAe, upland peat up to 8 m or more thick

SAf,g — Marine shore sediments (beach deposits): Saf, sand to sandy loam up to 2 m thick overlying estuarine, fossiliferous, fine sand and clayey silt, 10 to 185 m thick (Fe of Lithologic Units and Environments of Deposition); SAg, medium to coarse sand and gravel up to 8 m thick

SAh-k — Lowland and mountain stream deltaic, channel fill, and overbank sediments: SAh, lowland stream channel fill and overbank sandy loam to clay loam, also organic sediments up to 8 m thick; SAi, mountain stream marine deltaic medium to coarse gravel and minor sand up to 15 m or more thick; SAj, mountain stream channel fill sand and gravel up to 8 m thick; SAk, lowland stream channel fill sand to gravel and minor silt and clay up to 5 m thick

SAm-p — Slope deposits, colluvial sediments deposited by mass wasting processes: SAm, slopewash sand, up to 4 m thick, resting on Fc,d and Sa,j; SAn, slopewash clayey silt and silty clay up to 2 m thick, overlying Sa; SAo, fan and landslide gravel, sand and rubble, up to 15+ m thick, overlying Fraser River Sediments (Fg,h) and Salish lacustrine deposits (SAq,r); SAp, landslide and fan gravel and rubble up to 10 m thick, overlying Sumas Drift (Sa,c,f) and Fort Langley Sediments

An unmapped mantle of gravelly colluvium, 0.5 to 2.0 m thick is widespread throughout the mountainous parts of the map area, especially above 250 m elevation. In many places it is intermixed with glacial ablation till and other glacial sediments. Consequently the areas mapped as bedrock (T and PT) normally do not exhibit rock at the surface in more than 5 percent of the area indicated

SAq,s — Lacustrine deposits: SAq, silt to clay, normally less than 5 m thick, in places overlying SAr or Fraser River Sediments (probably Fe); SAr, sand to sandy loam, up to 5 m thick, also overlying Fe?; SAs, fine sand up to 8 m thick forming beaches and spits

North of Vedder Canal both SAq and SAr are intermixed with SAj and Fg; the most abundent unit is the one mapped

SAt — Eolian deposits: SAt, windblown sand, silt, and silt loam, 1 to 8 m thick

Eolian deposits have been mapped as a separate unit where they are more than 1 m thick. In addition most pre-Salish Sediments exposed east of 122°25' W are mantled by windblown sand and silt 5 cm to 1 m thick. Included are areas mapped as T and PT up to at least 1000 m elevation

FRASER RIVER SEDIMENTS

Fa-h — Deltaic and distributary channel fill sediments overlying and cutting estuarine sediments and overlain in part of the area by overbank sediments: Fa, channel deposits, fine to medium sand and minor silt occurring along present day river channels; Fb, overbank sandy to silt loam up to 2 m thick overlying 15 m or more of Fd; Fc, overbank silty to silt clay loam normally up to 2 m thick overlying 15 m or more of Fd; Fd*, deltaic and distributary channel fill (includes tidal flat deposits) sandy to silt loam, 10 to 40 m thick interbedded fine to medium sand and minor silt beds; may also contain organic and fossiliferous material; Fe*, estuarine fine sand to clayey silt, in places fossiliferous; probably underlies extensive areas in Sumas and Matsqui valleys; thickness may vary from 10 to 150 m; Ff*, channel and floodplain sand and gravel, up to 60 m thick, underlying Fd,g,h; may be in part Sumas outwash (Sa,j); Fg, channelled deposits (expressed at surface by ridges and swales), silty clay loam, silt loam, silty clay, and minor organic sediments, up to 10 m thick, overlie Ff and Fe; Fh, channelled deposits similar to Fg but coarser textured, sandy loam and loamy sand

POSTGLACIAL AND PLEISTOCENE

SA-C — Marine shore and fluvial sand up to 8 m thick, Cb in parts has been reworked and redeposited by lowland streams (SAh)

PLEISTOCENE

SUMAS DRIFT

Sa-e — Outwash, ice-contact, and deltaic deposits: Sa, outwash sand and gravel up to 30 m thick; Sb, ice-contact gravel and sand containing till lenses and clasts of glaciomarine stony clayey silt, 2 to 5 m thick overlying FLc,d; Sc, ice-contact gravel and sand containing till lenses and clasts of glaciomarine stony clayey silt, 2 to 5 m thick overlying FLb,e; Sd, ice-contact gravel and sand containing till lenses and clasts of glaciomarine stony clayey silt, more than 5 m thick; Se, raised proglacial deltaic gravel and sand up to 40 m thick

Sh — Glaciolacustrine deposits: Sh, silt, clayey silt, silty clay, and sand, minor gravel, 5 to 35 m thick

Sf,g — Lodgment and minor flow till: Sf, sandy till and substratified drift, 2 to 10 m thick; Sg, sandy till and substratified drift 0.5 to 2 m thick, in most places overlying Fort Langley glaciomarine sediments (FLc)

Sj — Advance glaciofluvial deposits: Sj, gravel and sand up to 40 m thick, proglacial channel fill, floodplain, and deltaic sediments probably all included here

FORT LANGLEY FORMATION

FLa-e — Glacial and deltaic sediments: FLa, lodgment and flow till with sandy loam matrix containing clasts of FLc; FLb, outwash and ice-contact gravel and sand containing clasts of FLa, c; FLc, glaciomarine stony clayey silt to silty sand 8 to 90 m thick, commonly thinly bedded and containing marine shells; FLd, marine silty clay to fine sand commonly containing marine shells; FLe, proglacial deltaic gravel and sand

CAPILANO SEDIMENTS

Ca-e — Raised marine, deltaic, and fluvial deposits: Ca, raised marine beach, spit, bar, and lag veneer, poorly sorted sand to gravel (except in bar deposits) normally less than 1 m thick but up to 8 m thick, mantling older sediments and containing fossil marine shell casts up to 175 m above sea level; Cb, raised beach medium to coarse sand 1 to 5 m thick containing fossil marine shell casts; Cc, raised deltaic and channel fill medium sand to cobble gravel up to 15 m thick deposited by proglacial streams and commonly underlain by silty to silty clay loam; Cd, marine and glaciomarine stony (including till-like deposits) to stoneless silt loam to clay loam with minor sand and silt normally less than 3 m thick but up to 30 m thick, containing marine shells. These deposits thicken from west to east. Ce, mainly marine silt loam to clay loam with minor sand, silt, and stony glaciomarine material (see Cd), up to 60+ m thick. In many of the upland areas sediments mapped as Cc and Cd are mantled by a thin veneer (less than 1 m) of Ca

VASHON DRIFT AND CAPILANO SEDIMENTS

VC — Glacial drift including: lodgment and minor flow till, lenses and interbeds of substratified glaciofluvial sand to gravel, and lenses and interbeds of glaciolacustrine laminated stony silt; up to 25 m thick but in most places less than 8 m thick (correlates with Va,b); overlain by glaciomarine and marine deposits similar to Cd normally less than 3 m but in places up to 10 m thick. Marine derived lag gravel normally less than 1 m thick containing marine shell casts has been found mantling till and glaciomarine deposits up to 175 m above sea level; above 175 m till is mantled by bouldery gravel that may be in part ablation till, in part colluvium, and in part marine shore in origin

VASHON DRIFT

Va,b — Till, glaciofluvial, glaciolacustrine, and ice-contact deposits: Va, lodgment till (with sandy loam matrix) and minor flow till containing lenses and interbeds of glaciolacustrine laminated stony silt; Vb, glaciofluvial sandy gravel and gravelly sand outwash and ice-contact deposits

PRE-VASHON DEPOSITS

PVa-h — Glacial, nonglacial, and glaciomarine sediments: PVa, Quadra fluvial channel fill and floodplain deposits, crossbedded sand containing minor silt and gravel lenses and interbeds; PVb, Quadra (?) glaciofluvial deposits, deltaic, and crossbedded sand to gravel (may be in part Vb): PVc, Quadra marine interbedded fine sand to clayey silt believed to be off shore equivalents of PVa; PVd, Coquitlam till, glaciomarine (?), and glaciolacustrine deposits; PVe, Cowichan Head fluvial, organic colluvial, and bog and swamp sediments; PVf, Semiahmoo till, glaciofluvial, glaciomarine, and glaciolacustrine deposits; PVg*, Highbury fluvial and bog and swamp deposits; PVh*, Westlynn glaciofluvial sandy gravel

UNDIVIDED PRE-VASHON DEPOSITS

UPV — Till, glaciofluvial, glaciolacustrine, fluvial, marine, and organic sediments

TERTIARY

T — Tertiary bedrock including sandstone, siltstone, shale, conglomerate, and minor volcanic rocks; where bedrock is not at the surface it is overlain by glacial deposits and colluvium

PRE-TERTIARY

PT — Mesozoic bedrock including granitic and associated rock types; where bedrock is not at the surface it is overlain by glacial deposits and colluvium

NOTE
REFER TO FIGURE 5B

REFERENCE
SURFICIAL GEOLOGY OBTAINED FROM GEOLOGICAL SURVEY OF CANADA.

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
SURFICIAL GEOLOGY OF THE RAA LEGEND

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO. 13-1422-0049 | CONTROL 16000 | Rev. 0 | FIGURE **6A**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM: ANSI B

25mm

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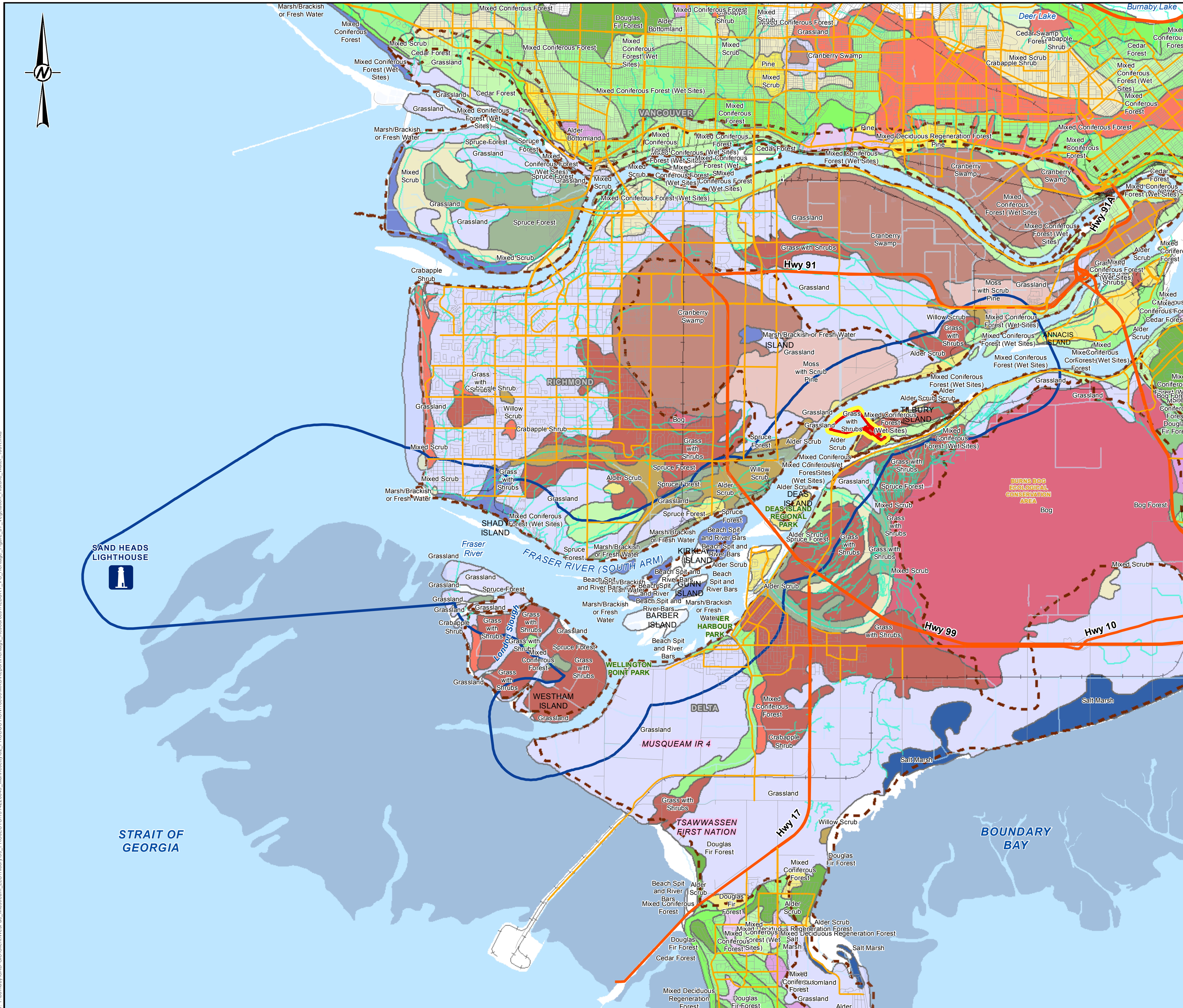

LEGEND

SAND HEADS LIGHTHOUSE

- PROJECT BOUNDARY
- HERITAGE RESOURCES LAA
- HERITAGE RESOURCES RAA
- HIGHWAY
- MAJOR ROAD
- LOCAL ROAD
- WATERCOURSE
- INTERTIDAL AREA
- WATERBODY
- CANADA/U.S.A BORDER
- HISTORICAL STREAM

HISTORICAL VEGETATION
- HISTORICAL VEGETATION NOT AVAILABLE

CONIFEROUS FOREST
- BOG FOREST
- CEDAR FOREST
- CEDAR SWAMP FOREST
- DOUGLAS FIR FOREST
- SPRUCE FOREST
- MIXED CONIFEROUS FOREST
- MIXED CONIFEROUS FOREST (WET SITES)

DECIDUOUS FOREST
- ALDER BOTTOMLAND
- MAPLE BOTTOMLAND
- COTTONWOOD FOREST
- MIXED DECIDUOUS REGENERATION FOREST
- MIXED WOODLAND
- MIXED DECIDUOUS-CONIFEROUS FOREST

SCRUB FOREST
- ALDER SCRUB
- PINE SCRUB
- WILLOW SCRUB
- MIXED SCRUB

GRASS
- GRASSLAND
- MARSH/BRACKISH OR FRESH WATER
- SALT MARSH

SHRUBS/MOSS
- BOG
- MOSS WITH SCRUB PINE
- CRABAPPLE SHRUB
- CRANBERRY SWAMP
- GRASS WITH SHRUBS
- HISTORICAL SOIL POLYGON

SOIL CODE - SOIL NAME

A-SL	ALDERWOOD SANDY LOAM
L-C	LADNER CLAY
P	PEAT

2,500 0 2,500

SCALE 1:100,000 METRES

REFERENCE

1. ROAD, RAILWAY, WATERCOURSE, INTERTIDAL AREA AND WATERBODY DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
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3. HISTORICAL VEGETATION DIGITIZED FROM THE VEGETATION OF THE SOUTHWESTERN FRASER LOWLAND, 1858-1880.

PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM - VANCOUVER LLC

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
HISTORICAL VEGETATION WITHIN THE RAA

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	16000	0	7

INSET MAP

FRASER RIVER (SOUTH ARM)

100 0 100
METRES
SCALE: 1:18,000

bing

VANCOUVER
SEA ISLAND
LULU ISLAND
RICHMOND
ANNACIS ISLAND
BURNS BOG ECOLOGICAL CONSERVATION AREA
DEAS ISLAND REGIONAL PARK
LADNER HARBOUR PARK
WELLINGTON POINT PARK
DELTA
Boundary Bay Airport
Kings Links Golf Course

FIGURE 8.1 TILBURY ISLAND
FIGURE 8.2 SHADY ISLAND
FIGURE 8.3 KIRKLAND ISLAND
FIGURE 8.4 BARBER ISLAND
FIGURE 8.5 WESTHAM ISLAND
FIGURE 8.6

GARRY POINT
SAND HEADS LIGHTHOUSE
FRASER RIVER (SOUTH ARM)
CANOE PASS
MUSQUEAM IR 4
TSAWWASSEN FIRST NATION
STRAIT OF GEORGIA
BOUNDARY BAY

LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES LAA
- HERITAGE RESOURCES RAA
- FIGURE EXTENT
- MUNICIPAL BOUNDARY
- INDIAN RESERVE
- TSAWWASSEN FIRST NATION LANDS
- RESIDENTIAL AREA
- PARK / FOREST AREA
- BURNS BOG ECOLOGICAL CONSERVATION AREA
- WETLAND
- WATER
- WATERCOURSE
- ROAD
- RAILWAY
- SAND HEADS LIGHTHOUSE

2 0 2
SCALE 1:85,000 METRES

REFERENCE

1. INDIAN RESERVES, TSAWWASSEN FIRST NATION LANDS AND MUNICIPAL BOUNDARIES OBTAINED BY B.C. MINISTRY OF FORESTS, LANDS AND NATURAL RESOURCE OPERATIONS.
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PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA OVERVIEW

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
PREPARED	JP
DESIGN	LF
REVIEW	ARM
APPROVED	CM

PROJECT NO.	CONTROL	Rev.	FIGURE
13-1422-0049	16000	0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET HAS BEEN MODIFIED FROM ANSI B
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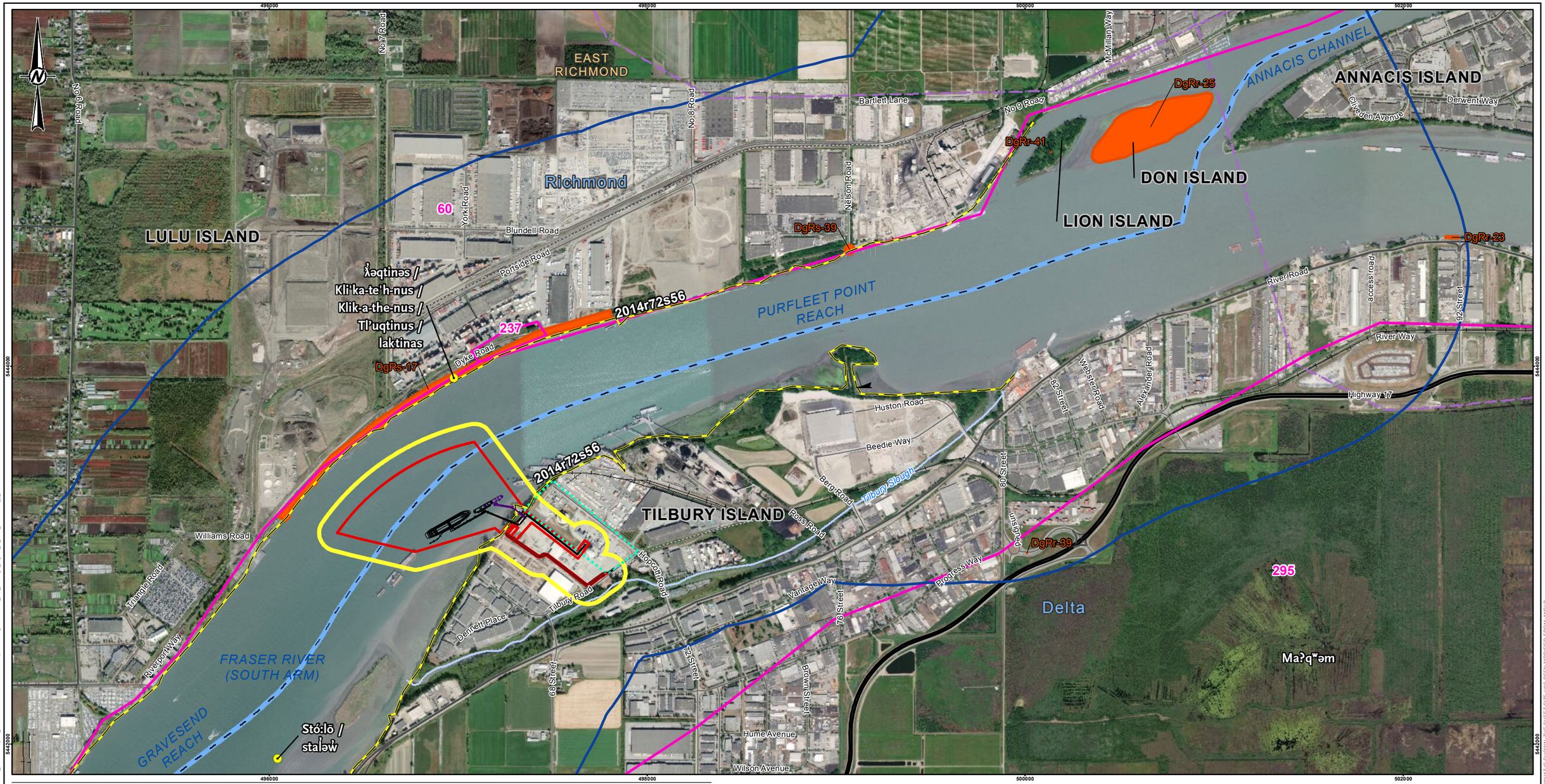

LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
DESIGNED	CM
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.1**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

25mm

0

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484000
486000
488000
490000
5442000
5440000

GARRY POINT
q̓ʷeyaʔχʷ / Qwʼeyaʼxw
STEVESTON
STEVESTON BAR
CANNERY CHANNEL
Richmond
SOUTH ARM
LULU ISLAND
SLOUGH DISTRICT
SHADY ISLAND
HARLOCK ISLAND
REIFEL ISLAND
Chōchō'âlets
q̓ʷeyaʔχʷ staləẇ
ʔəleqsən / Ulqéqsun / Uleksen
Delta
DgRt-1
DgRt-5
DgRt-6
DgRt-7
DgRt-8 / Kwi-thay-um
DgRt-9
DgRt-12
DgRt-17
DgRt-18
DgRt-19
DgRt-20
DgRt-21
DgRt-22
DgRt-23
DgRt-24
DgRt-25
DgRt-26
DgRt-27
DgRs-12
DgRs-23
DgRs-26
DgRs-29
DgRs-31
DgRs-32
DgRs-37
DgRs-51
DgRs-77
DgRs-84
DgRs-124
A
B
C
D
E
F
G
H
I
J
K
L
M
60
Steveston Highway
Ryan Road
Finn Road
Dyke Road
Robertson Road
Monteith Road
Moncton Street
Pintail Drive
Kingfisher Drive
Helmcken Road
Hollymount Drive
Springthorne Crescent
7th Avenue
No 1 Road
No 2 Road
No 3 Road
No 4 Road
McKenzie Road
Gilbert Road
Trites Road
Garden City Road
Woodward Slough
Finn / Gilmour Slough

LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
DESIGNED	CM
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

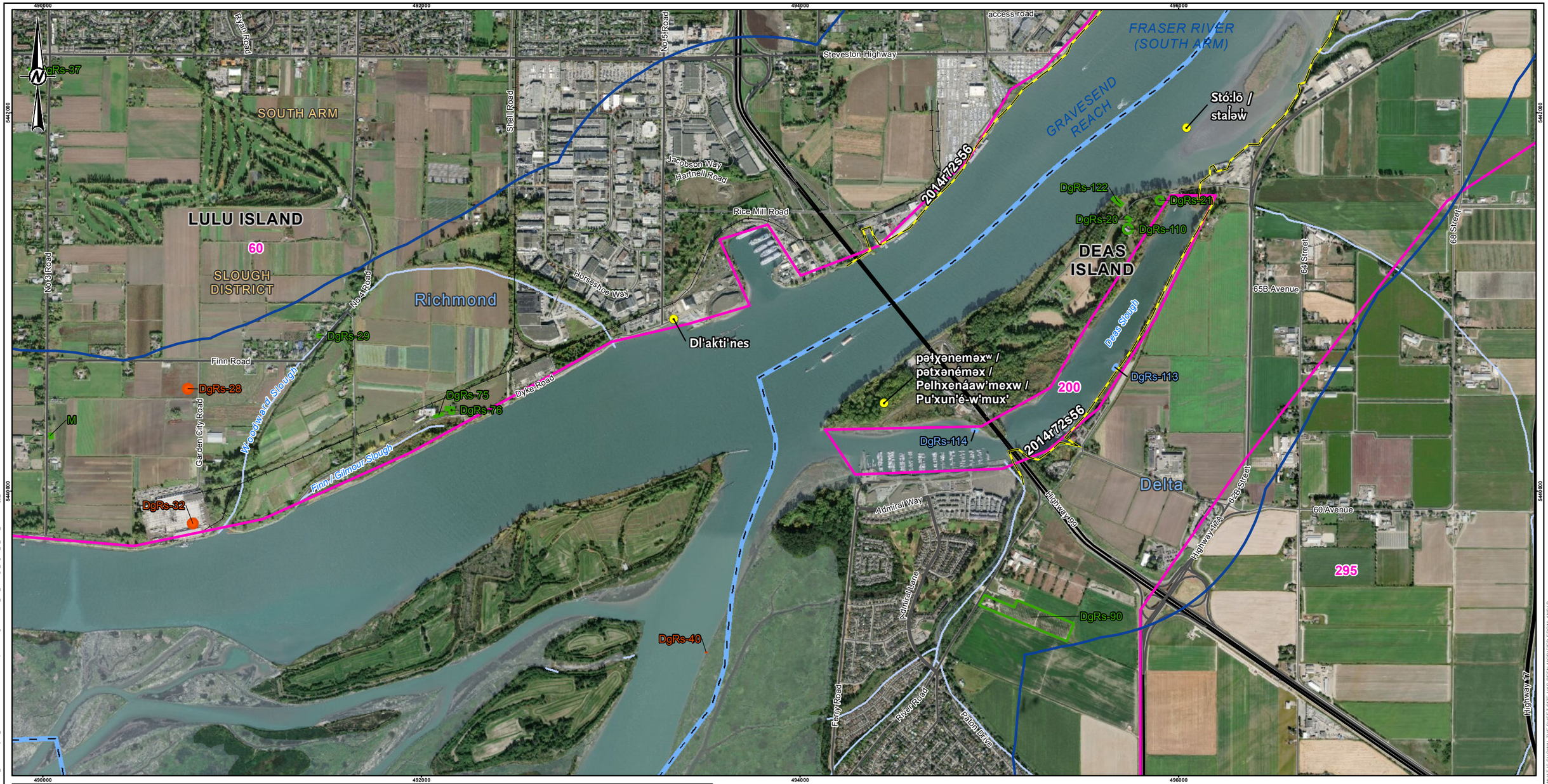
PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.2**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
25mm
0

PATH: Y:\burnaby\CAD-GIS\Client\WesPac_Midstream_LLC\Tilbury99_PROJECT\s1314220049_Marine Jetty\02_PRODUCTION\170000MXD\Report\Heritage\TILBURY_VC_Heritage_Figure_8_Prev_Archaeology_Studies.mxd PRINTED ON: 2018-11-23 AT: 9:00:28 AM



LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

CONSULTANT
Golder Associates

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DESIGNED	CM
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.3**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

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CONSULTANT
Golder Associates

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DESIGNED	CM
PREPARED	JP
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APPROVED	CM

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.4**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

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WESPAC MIDSTREAM-VANCOUVER LLC.

CONSULTANT
Golder Associates

YYYY-MM-DD	2018-08-14
DESIGNED	CM
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.5**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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LEGEND

- PROJECT BOUNDARY
- HERITAGE RESOURCES RAA
- HERITAGE RESOURCES LAA
- COAST SALISH AREA: 60, 200, 237, 295
- ARCHAEOLOGICAL SITE
- HISTORICAL HERITAGE SITE
- HERITAGE WRECK SITE
- PREVIOUS ARCHAEOLOGICAL STUDY
- TRAIL ROUTE (MODEL)
- APPROXIMATE OF TRADITIONAL PLACE NAME LOCATION
- WRECK OBSERVED IN HISTORICAL AERIAL IMAGERY
- MUNICIPAL BOUNDARY
- WATER
- WATERCOURSE
- HIGHWAY
- MAJOR ROAD
- ROAD
- POWER TRANSMISSION LINE
- RAILWAY
- LADNER HISTORICAL COMMUNITY

0 400 800
1:20,000 METRES

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3. HISTORICAL SITES DIGITIZED FROM IMAGERY.
4. ROADS OBTAINED FROM DATA BC.
5. REFER TO THE REPORT FOR TRADITIONAL LOCATIONS.
6. CANADA/U.S.A BORDER OBTAINED FROM NRCAN.
7. REFER TO APPENDIX D FOR HISTORIC SITE DESCRIPTIONS.
PROJECTION: UTM ZONE 10; DATUM: NAD 83

CLIENT
WESPAC MIDSTREAM-VANCOUVER LLC.

CONSULTANT
Golder Associates

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DESIGNED	CM
PREPARED	JP
REVIEWED	ARM
APPROVED	CM

PROJECT
TILBURY MARINE JETTY
DELTA, B.C.

TITLE
DOCUMENTED ARCHAEOLOGICAL AND HISTORICAL RESOURCES AND TRADITIONALLY KNOWN LOCATIONS WITHIN THE RAA

PROJECT NO.	CONTROL	REV.	FIGURE
13-1422-0049	16000	0	**8.6**

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APPENDIX B

SRRMC TUS Database Search Results – Datasheet

SRRMC TUS Database Search Result – Data Sheet
PROJECT: SHIP 2015-118 Sagarbarria – WesPac Tilbury Marine Jetty Project AOA
REQUESTED: Ryan Sagarbarria / Golder Associates Ltd.
DATE: November 24, 2015

The information provided in this report is the result of a digital database review for the above referenced project conducted by the Stó:lō Research and Resource Management Centre (SRRMC) on behalf of Golder Associates Ltd. This review is limited in scope and is not to be considered a comprehensive treatment of First Nations interests or concerns associated with the proposed project. This assessment focuses on the relationship between cultural heritage resources defined in the Stó:lō Heritage Policy and the proposed project plan(s). This report is intended to provide information useful to Golder Associates Ltd. and WesPac Midstream-Vancouver LLC in the archaeological overview assessment process. This report does not constitute consultation and does not in any way satisfy or complete the First Nation consultation requirements of Golder Associates Ltd. and WesPac Midstream-Vancouver LLC with the Stó:lō Nation, the Stó:lō Tribal Council, or any other First Nations or First Nations organizations.

***Findings*:**

1. *Sxwōxwiyám*
2. Halq'eméylem Place Name
3. Archaeological and Historic Sites
4. GIS-modeled Travel Route
5. High Archaeological Potential

***Sxwōxwiyám*: 1 within 2 km of Study Area (as depicted)**

Site ID	Description	Proximity to Study Area
2012i47s119 *Stó:lō*	*Sxwōxwiyám: Xéyt* – Fraser River; "river"	within

Sxwōxwiyám relate to core and integral elements of Stó:lō cultural traditions and identity. *Sxwōxwiyám* form a connection and articulation among the collective identity and ancestral relations shared between the Stó:lō, broadly, as connected to villages and tribes at more local levels. These types of cultural heritage sites are among the most highly significant types of sites recognized by the Stó:lō. Often these places are directly related to Transformer Narratives. The significance of *Sxwōxwiyám* to the Stó:lō community and the need to maintain their integrity with regard to all forms of potential impact cannot be overstated.

Halq'eméylem Place Name: 1 within 2 km of Study Area (as depicted)

Place Name	Comment	Proximity to Study Area
Stó:lō 2012i47s119	Fraser River; "river"	within

10-7201 Vedder Road
Chilliwack, BC V2R 4G5
604.824.2420 phone
604.824.0278 fax

www.srrmcentre.com
admin@srrmcentre.com

Places on the landscape with Halq'eméylem names are important to distinguish, in that they have the potential to provide insight into the cultural significance of a particular place, such as the significance of the geographic location itself, activities or events that took place there, or stories of the distant past, when the world was transformed into its present form (*sxwóxwiyám*). There are over 700 Halq'eméylem place names throughout S'ólh Téméxw. They also exist as places of power in a living landscape, upon which people seek spiritual power through various Stó:lō ceremonial and ritual activities.

Archaeological and Historic Sites: 6 within 2 km of Study Area (as depicted)

Borden ID	Site Type	Proximity to Study Area
DgRs-15	precontact surface plant fibre	1,875 m NW
DgRs-17	precontact subsurface lithics, surface firebroken rock, fishing weir	100 m NW
DgRs-20	historic building – Burr Villa	1,775 m SW
DgRs-21	historic building – Inverholme Schoolhouse	1,700 m SW
DgRs-82	precontact surface lithics and firebroken rock	1,575 m SE
DgRs-110	Delta Agricultural Exhibition Building	1,875 m SW

Archaeological sites are protected under the *Heritage Conservation Act* and the Stó:lō Heritage Policy. Avoidance is the preferred management option for archaeological sites under the Stó:lō Heritage Policy.

GIS-modeled Travel Route: 1 within 2 km of Study Area (as depicted)

Site ID	Location	Proximity to Study Area
2014r72s56	trail modelled E-W along north and south bank of Fraser River	within

GIS-modeled trails are travel routes that are either thought to exist, but their existence has not been verified, or modeled to exist based on other known factors such as the movement of people in a specific area. GIS-modeled trails require ground-truthing.

High Archaeological Potential

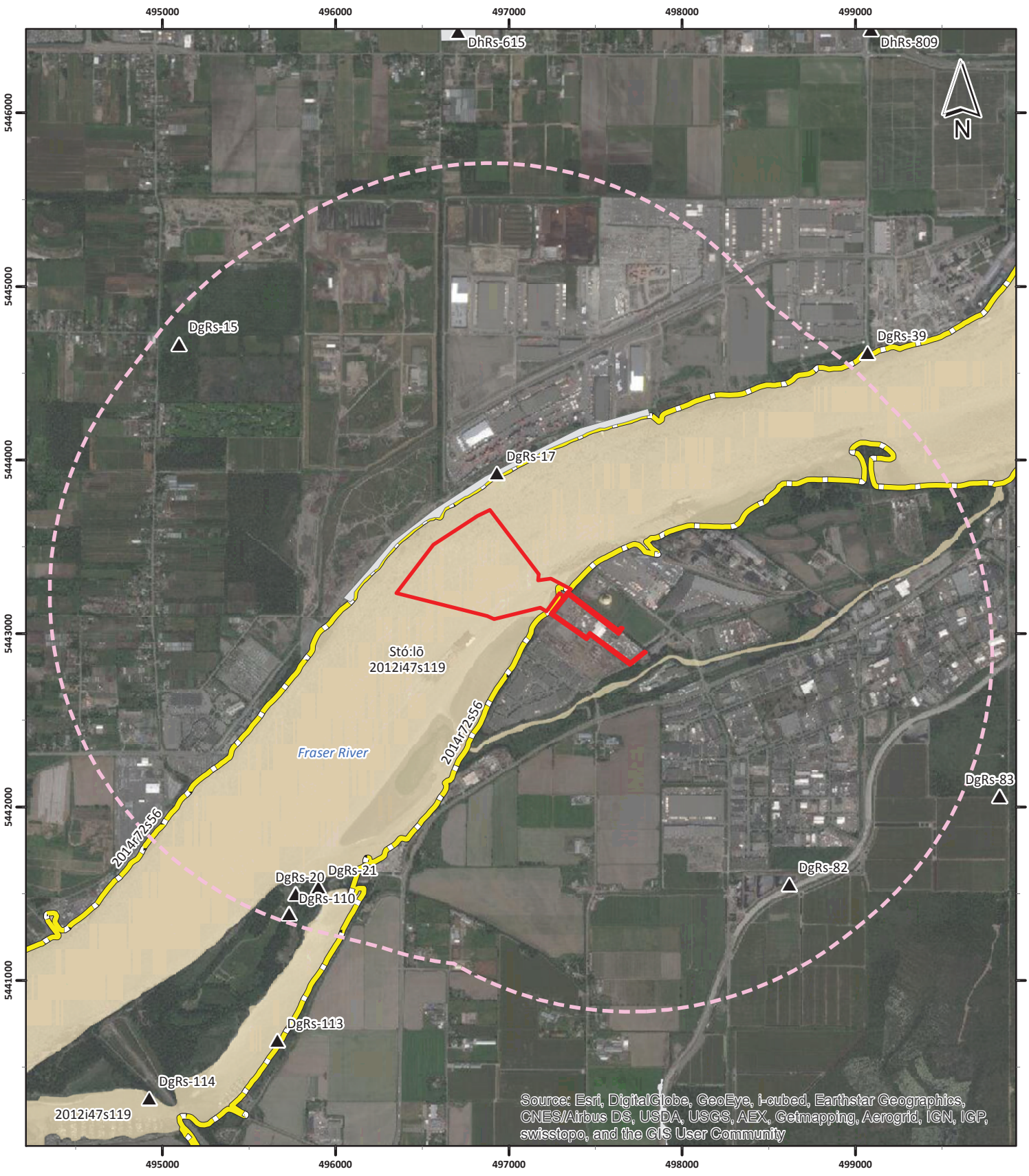
The Study Area has high archaeological potential because of its proximity to previously recorded archaeological site DgRs-17, a GIS-modeled travel route, Halq'emeylem Place Name, and cultural use area, and its proximity to the Fraser River.

If you have any questions about the content of this report, the Stó:lō Heritage Policy and/or its implementation, please contact me at (w) 604-824-2425, (c) 604-819-5271 or email at lisa.dojack@stolonation.bc.ca. Additional information regarding specific sites identified in this database evaluation is available for review in the archives on-site at the SRRMC in the Stó:lō Resource Management Centre office in Chilliwack.

Sincerely,

Lisa Dojack

Lisa Dojack, M.A.
Archaeologist
Stó:lō Research and Resource Management Centre



SRRMC TUS Database Search Result
PROJECT: SHIP 2015-118 Sagarbarria
WesPac Tilbury Marine Jetty Project AOA
REQUESTED: R. Sagarbarria / Golder

GIS: LMD
November 24, 2015

Study Area
2 km Buffer
GIS-Modeled Travel Route
Archaeological Site
Sxwoxwiyam/Halqemeylem Place Name

0 250 500 m

Stó:lō Research and Resource Management Centre

APPENDIX C

Soils and Sediments within the RAA

Table 1: Sediment Types within the LAA and RAA (Armstrong and Hicock 1976)

Sediment Type		Description	Project Area
Fraser River Sediments	F_a	Channel deposits of fine to medium sand and minor silt along present day river channels.	RAA
	F_b	Overbank sandy to silt loam up to 2 m thick overlying 15 m or more of F_d sediments.	RAA
	F_c	Overbank silty to silt clay loam up to 2 metres (m) thick and overlying 15 m or more of F_d sediments.	LAA, RAA
	F_d	Deltaic and distributary channel fill (includes tidal flat deposits) sandy to silt loam, 10 to 40 m thick interbedded fine to medium sand and minor silt beds; may also contain organic and fossiliferous material.	RAA
Salish Sediments	SA_a, SA_b, SA_d	Bog, swamp, and shallow lake deposits. SA_a consists of landfill including sand, gravel, till, crushed stone, and refuse. SA_b consists of lowland peat up to 14 m thick, in part overlying F_b and F_c. SA_d consists of lowland organic sandy loam to clay loam 15 to 45 cm thick overlying SA_g and F_d.	LAA

Table 2: Soil Types within the RAA (Luttmerding 1981)

Soil Type	Geographic Extent	Characteristics	Drainage
Blundell (BU)	Richmond and Delta.	15 to 40 cm of organic material over medium-textured deltaic deposits (i.e., silt loam and medium to fine sand).	Poor to very poor; high groundwater table.
Crescent (CT)	Westham and Crescent Islands, southern part of Richmond, southwest of Ladner.	Medium to moderately fine textured deltaic deposits underlain by saline sand. Among the best agricultural soils in the Lower Mainland.	Moderately poor to poor; high groundwater table.
Delta (DT)	Central and western Delta and central Richmond.	Medium to moderately fine textured deltaic deposits overlie medium or fine sand. Good agricultural soils used for a variety of crops (e.g., cereal grains, potatoes, vegetables, small fruits).	Poor; high groundwater table.
Ladner (L)	Delta and Richmond.	Moderately fine to fine-textured deltaic deposits. Underlain by sandy materials. Support a variety of agricultural crops. Annual crops grow well but perennials may be subject to rotting or destruction due to the poor drainage characteristics.	Moderately poor to poor; high groundwater table.
Lumbum (LM)	Lowlands of Richmond and Delta.	More than 160 cm of partially decomposed organic material. Agriculturally limited.	Very poor; high groundwater table.
Spetifore (SF)	Central and southern Delta.	Medium-textured deltaic deposits. Agriculturally limited.	Poor to very poor; high groundwater table.
Westham (WS)	Delta lowlands, Westham and Crescent Islands and southern Richmond.	Moderately fine to medium-textured deltaic deposits over sand. One of the better soils in the Lower Fraser Valley.	Poor to moderately poor; high groundwater table.
Tidal Flat (TF)	Areas lying outside the dykes which are subject to flooding by tidal action. Roberts Bank and near the mouth of the Fraser River.	Fine sandy to silty deposits.	Very poor.

APPENDIX D

Historical Heritage Properties and Landscapes with the RAA

Table 1: Delta Heritage Properties and Landscapes Within the RAA

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
4994 45 Avenue	DgRs-107 McKenzie Residence	Designated Heritage Site 2005 Corporation of Delta, 2010 Canadian Register	1921	Craftsman bungalow popular during the early 20th century.
5008 47A Avenue	DgRs-80 Ladner Baptist Church	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1902-1903, William Black	Early wood frame church distinguished by its Gothic Revival detailing and square corner tower with spire.
5018 47A Avenue	DgRs-88 Manual Training School / Bridgeport School West Annex	Designated Heritage Site 2008 Corporation of Delta, 2010 Canadian Register	1908	One storey front-gabled Craftsman-inspired structure. Displays the influence of popular Arts and Crafts style. Originally located in Richmond, the School was relocated to Ladner in 1992.
5048 47A Avenue	DgRs-112 Thirkle Residence	Heritage Inventory 2006 Corporation of Delta	n/a	n/a
5058 47A Avenue	DgRs-89 Fawcett Residence (First Residence)	Designated Heritage Site 2008 Corporation of Delta, 2010 Canadian Register	1910	One and one half storey cross-gabled Edwardian house. Built for Arthur Thompson Fawcett, a partner in Lanning, Fawcett & Wilson Ltd.
4820 48 Avenue	DgRs-92 Williamson Residence	Designated Heritage Site 2005 Corporation of Delta, 2010 Canadian Register	1892, Alfred DeRupe Taylor	Two storey Foursquare (Edwardian) house with a small Victorian cottage attached at the rear.
4826 48 Avenue	DgRs-91 Ellis Residence	Designated Heritage Site 2006 Corporation of Delta, 2010 Canadian Register	1920	Two and one half storey front-gabled, Arts and Crafts-style residence. Situated in a heritage conservation area amongst houses of similar age and style. Built for John Ellis, a successful local farmer.

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
4856 48 Avenue	DgRs-79 Roycroft / Grant Residence	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1904, David Price and Thomas Shortreed	Two storey wood frame Edwardian-era residence. Distinguished by an octagonal turret. Represents a transition between the elaborate Victorian residential styles and the more simplified designs of the Edwardian era. One of the grandest Edwardian-era homes in Delta built for Duncan B. Grant, partner in the Grant & Kerr Sawmill.
4960 48 Avenue	DgRs-93 Ladner United Church / St. Andrew's Presbyterian Church	Heritage Inventory 1999 Corporation of Delta	1893	n/a
4580 Arthur Drive	DgRs-64 Forrer Residence	Designated Heritage Site 2000 Corporation of Delta, 2006 Canadian Register	1890	One storey wood frame late Victorian cottage. Located between Chiloctin / Chilukthan Slough and Arthur Drive, both early north-south transportation routes.
4671 Arthur Drive	DgRs-95 Lambert Residence	Designated Heritage Site 2008 Corporation of Delta, 2010 Canadian Register	1915-1916, James Leonard	One and one half storey Arts and Crafts residence along the southern edge of Ladner village. Built for Cecil Overton Lambert. War time construction demonstrates the agricultural boom in the area.
4705 Arthur Drive	DgRs-25 John McKee Residence / McKee House / Rosetta	Designated Heritage Site 1983 Corporation of Delta, 2006 Canadian Register	1895, Thomas Kerr	Two storey wood frame late Victorian residence. Built for Thomas Kerr and sold to John and Margaret McKee in 1898. Located on an important early transportation corridor.
4907 Central Avenue	DgRs-46 Kyte Residence	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1927-1928	One storey, symmetrical wood frame structure built as a chicken brooder house but always used as a residence. Located near Ladner town centre, in the Delta Manor subdivision. Associated with Harold Percy Kyte.

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
4849 Chisholm Street	DgRs-106 Paterson and Benson Warehouse / Brackman-Ker Warehouse	Heritage Inventory, Legacy Site 1999 Corporation of Delta	1892	Originally built for J.A. Paterson and H.D. Benson. Sold the wharf and warehouse to Brackman-Ker Company of Victoria in 1904. Destroyed in a windstorm and subsequently removed in 2012.
4907 Chisholm Street	DgRs-105 The Lanning, Fawcett & Wilson Ltd. Store / The Big Store	Designated Heritage Site 2007 Corporation of Delta, 2010 Canadian Register	1907, J.B. Elliot	Two store, vernacular commercial structure located on a waterfront lot on Chisholm Street. Rear portion of building on piles over the water. Constructed for Marshall Smith.
4858 Delta Street	DgRs-23, DgRs-109 Delta Municipal Hall / Delta Museum and Archives / Ladner Clock Tower / Totem Pole	Designated Heritage Site 1983 Corporation of Delta, 2005 Canadian Register	1912, Archibald Campbell Hope, George Bowder	Located in the centre of historic Ladner village. Edwardian Arts and Crafts architecture.
4896 / 4898 Delta Street	DgRs-78 Bank of Montreal	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1919	Located within the historic commercial centre of Delta. Craftsman style. Closed as a bank in 1926. Used as a liquor store from 1929 to1970. Used as a Royal Canadian Legion Hall from 1970 to present.
5734 River Road	DgRs-90 Sheldrake Barn	Designated Heritage Site 2008 Corporation of Delta, 2010 Canadian Register	1912	Small side-gabled structure with a shed and hipped roof addition. An early agricultural outbuilding near Green Slough. Built by George Hubert Sheldrake and his wife Jennie Euphemia Sheldrake.
6001 River Road	DgRs-20 Burr Villa / Harry Burr House	Designated Heritage Site 1981 Corporation of Delta, 2006 Canadian Register	1905-1906, Fred Land, David Price	Wood frame Queen Anne Revival style residence. Originally built on the corner of 62B and River Road. Relocated to Deas Island Regional Park in 1982. Historically important within the Crescent Island community. Steamer landing and post office once at the Burr property.

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
6001 River Road	DgRs-21 Inverholme School	Designated Heritage Site 1983 Corporation of Delta, 2006 Canadian Register	1909, Hector Campbell	Example of the standard one-room design provided by the Provincial Department of Public Works. Separate boys' and girls' entrances. Moved from 72 Street south of Ladner Trunk Road in 1926 adjacent to the Paterson farm. Moved from Paterson farm to Deas Island Regional Park in 1982.
6001 River Road	DgRs-110 Delta Agricultural Exhibition Building / Delta Agricultural Hall	Heritage Inventory	n/a	Part of the heritage grouping at Deas Island Regional Park which includes Burr Villa and Inverholme School.
4126 River Road West	DgRs-58 Nicolich Residence	Designated Heritage Site 2000 Corporation of Delta, 2006 Canadian Register	1906	One and one half storey wood frame vernacular residence, located on a prominent corner lot in a low density residential part of Delta. Likely built at or before the time of the 1906 subdivision of the Wellington Farm property. Owned for many years by Tore Nicolich, a Croatian fisherman.
4170 River Road West	DgRs-103 Scopinich Residence	Designated Heritage Site 2005 Corporation of Delta, 2010 Canadian Register	1914	Two storey Foursquare house. Illustrates early residential development along the Fraser River waterfront driven by the cannery and fishing industries.
4604 River Road West	DgRs-34 Thomas Kerr Residence	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1899	One and one half storey wood frame vernacular dwelling. One of the oldest surviving houses in Delta associated with Thomas Weir Kerr, partner in the Grant & Kerr Sawmill. Home built to be near the sawmill. Located across from the industrial waterfront and the dyke system that lines the Fraser River.

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
4395 Savoy Street	DgRs-61 Sherman Residence	Designated Heritage Site 2000 Corporation of Delta, 2006 Canadian Register	1894	One and one half storey plus basement wood frame, vernacular late Victorian residence. Built for Thompson Sherman and his wife Hortensia Sherman.
4443 Savoy Street	DgRs-104 Dujmovich Residence	Heritage Inventory 1999 Corporation of Delta		
4481 Savoy Street	DgRs-22 Victoria Terminal Railway and Ferry Company Station / Fisherman's Co-op Hall	Designated Heritage Site 2005 Corporation of Delta, 2006 Canadian Register	1903	Historically used as a depot for this subsidiary of the American-based Great Northern Railway (GNR). Originally located on the Victoria Terminal Railway and Ferry Company wharf at the mouth of the Fraser River. Moved in 1924 to its present location adjacent to the company's 1914 spur line. Purchased in 1943 by the Ladner Fisherman's Co-operative Association. Located at the centre of the historic Port Guichon neighbourhood.
n/a	Chiloctin / Chilukthan Slough	Heritage Inventory 1999 Corporation of Delta	n/a	An important location for early businesses and a transportation corridor for people and goods during the late 19th and 20th centuries.
Parcel A, Lot 187, Brunswick Point	DgRs-35 Brunswick Cannery No. 2	Historic Place, not recognized	1897	In 1902 the cannery was purchased by the BC Packers Association. In 1914 it was purchased by the BC Fishing and Packing Company Ltd. In 1928 the cannery was closed and became a fish camp. In 1939 the buildings were reduced and the boat slip was added. In 1963 the building was further reduced to one wing. In 1971 the site and surrounding land was expropriated by the Provincial government. In 1975 the dyke was raised to the present height. In 1983 all the buildings but two were destroyed.

Address	Historical Site / Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
Located on the east bank of Ladner Reach. The site is south of the east end of Kirkland Island and east of Williamson Island.	DgRs-40	Legacy Historic Place, not recognized	n/a	A single stake was recovered at the foot of an eroded bank.

Table 2: Richmond Heritage Properties and Landscapes within the RAA

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12191 1st Avenue	Japanese Buddhist Temple / Steva Theatre / Arts Connection Building, Steveston Town Centre Heritage Location	K	Heritage Inventory 1977 City of Richmond	1924	Rectangular one and a half storey building that fronts First Avenue. The original structure may have been post-and-beam reflecting early barn construction.
11000 2nd Avenue	Steveston United Church Manse / Steveston Presbyterian Church Manse	A	Heritage Inventory 1989 City of Richmond	1912	Two storey Edwardian Builder house with Craftsman influences. Donated to the church in 1922. Good example of the vernacular architectural style.
12011 3rd Avenue	DgRt-24 (Old) Steveston Courthouse / Red Cross Hall / Steveston Community Hall, Steveston Town Centre Heritage Location	DgRt-24	Designated Heritage Site 1984 City of Richmond, 2005 Canadian Register	1927	Simple rectangular shape and small gabled inset porch with two access doors. Serves as example of an early institutional building with Craftsman influences. Located in Steveston's downtown core.
12111 3rd Avenue	Sockeye Hotel / Steveston Hotel, Steveston Town Centre Heritage Location	F	Heritage Inventory 1989 City of Richmond	1894	The hotel serviced the population of Steveston during the boom years of the fishing and canning industries. Located adjacent to the Gulf of Georgia cannery. Symbolic social gathering place throughout history.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12131 4th Avenue	DgRt-12 Gulf of Georgia Cannery Net Shed, Steveston Town Centre Heritage Location	DgRt-12	Designated Heritage Site 1976 National Historic Site of Canada, 1986 Classified Federal Heritage Building, 1989 City of Richmond, 2007 Canadian Register	1941	Associated with the Gulf of Georgia Cannery and with the Steveston canning and fishing industries. Consists of two rectangular building sections of one and two storeys respectively. The building is situated outside the dyke and constructed on wooden pilings.
12138 4th Avenue	DgRt-12 Gulf of Georgia Cannery, Steveston Town Centre Heritage Location	DgRt-12	Designated Heritage Site 1976 National Historic Site of Canada, 1986 Classified Federal Heritage Building, 1989 City of Richmond, 2007 Canadian Register	1894-1964	The most westerly surviving fish canning and processing plant along Steveston's riverfront. Documents and communicates the history of the west coast fishery resources and promotes their stewardship. The Cannery is an example of an evolved cultural landscape that has been shaped by the fishing industry over time.
12080 7th Avenue	Stilt Piling House #1, Steveston Town Centre Heritage Location	E	Heritage Inventory 1989 City of Richmond	1888-1890	Located in Steveston near Garry Point. A small rectangular, one storey house that accommodated Steveston's cannery workers. The simple style, rectangular shape, shed roof and wooden windows express the house's working class roots. One of the earliest areas of Lulu Island to be developed.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12100 7th Avenue	Stilt Piling House #2, Steveston Town Centre Heritage Location	D	Heritage Inventory 1990 City of Richmond	1912	Located in Steveston near Garry Point. A small rectangular, one storey house constructed on a foundation of posts or stilts. Accommodated Steveston's cannery workers and one of the earliest areas of settlement on Lulu Island. The aspect of the house is to the south, towards the river, not towards 7th Avenue, which indicates the haphazard nature of the original pattern of development in this area.
12004 No. 1 Road	DgRt-19 Steveston Telephone Exchange / Bill Rigby Memorial Society Building, Steveston Town Centre Heritage Location	DgRt-19	Designated Heritage Site 1990 City of Richmond, 2005 Canadian Register	1914	The first telephone exchange and office for the Steveston area. One storey Edwardian structure. The Steveston exchange owned by the BC Telephone Company, purchased the original line in 1904 and operated in this location from 1914 to 1954.
Foot of No. 1 Road beside 4000 Bayview Street	DgRt-23 No. 1 Road Pump station, Steveston Town Centre Heritage Location	DgRt-23	Heritage Inventory 1998 City of Richmond	1906-1978	Represents Richmond's city-wide storm drainage system. Located at the south foot of No. 1 Road at Bayview Street and consists of below-grade pumps, drainage pipes and the utilitarian pump station building. The main destination for storm water through the southwest section of Lulu Island.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
13320 No. 3 Road	Shepherd Barn	M	Heritage Inventory 1989 City of Richmond	1933	Large, rectangular gabled structure with two shed additions on adjacent sides.
13320 No. 3 Road	McNair Barn	M	Heritage Inventory 1989 City of Richmond	Pre-1900	Large gable-roofed structure. The barn was moved to its present site from Sea Island in 1922.
3691 Broadway Street	Wolff House / Beer House / Bull House, Steveston Town Centre Heritage Location	B	Heritage Inventory 1989 City of Richmond	1898	Tall, narrow, two storey dwelling constructed in the Queen Anne Revival style. Located on a prominent corner within the Steveston town site.
2220 Chatham Road, Garry Point Park	DgRt-7 Scotch Pond / Hole-in-the-Wall	DgRt-7	Designated Heritage Site 1992 City of Richmond, 2005 Canadian Register	Scottish Canadian Cannery 1899 (Malcolm and Windsor); Scotch Pond circa early 1950s	A man-made, rectangular water body, originally a slough. Situated along the tidal flats of Sturgeon Bank in Garry Point Park. Occupied by the Musqueam until the late 1890s: burial ground, fishing, clam beds, berry patches. The Canadian Fishing Company dredged the slough in the 1950s to create a moorage pond for their expanding fishing fleet. An early and rare example of an industrial development and small community built away from the shoreline within an area of tidal flats.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
3711 Chatham Street	Steveston Methodist Church / Steveston United Church / Steveston Bike Shop, Steveston Town Centre Heritage Location	C	Heritage Inventory 1989 City of Richmond	1894	Associated with the Methodist Indian Mission, formed in 1894 to work with Aboriginal peoples in the Steveston community. Oldest extant church building on its original site in Richmond.
Chatham and Moncton Streets and 12111 6th and 7th Avenues	DgRt-26 CPR Ferry Loading Ramp, Steveston Town Centre Heritage Location	DgRt-26	Heritage Inventory 2001 City of Richmond	1928-1929	The route of the historic ferry terminal crosses the walkway to Garry Point Park along Moncton Street. The dock began as a laneway originating at Chatham Street and ran southwards towards Moncton Street.
6471 Dyke Road	DgRs-31 McKinney House	DgRs-31	Designated Heritage Site 1993 City of Richmond, 2005 Canadian Register	1914	An Edwardian style two storey house which also demonstrates Craftsman influence. Occupied by James McKinney and his wife Christine, active early members of the Richmond community. The house has been relocated.
6511 Dyke Road	DgRs-12 London Farmhouse / London Heritage Farm / London Farmlands	DgRs-12	Designated Heritage Site 1979 City of Richmond, 2005 Canadian Register	1898, 1906	Two storey Edwardian home with Craftsman influences. Associated with Charles and William London, early and politically influential pioneers, cannery operators and farmers. London's Landing was a shipping and ferry wharf built to transport products from their farm.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
					One of the earliest farm sites in the South Arm. Its immediate context is the vestiges of an extensive farm operation, including dairy, grain fields, orchard, vegetable gardens and flower gardens.
10361 Dyke Road	DgRs-76 Tilson / Gilmore Barn	DgRs-76	Designated Heritage Site 2003 City of Richmond, 2009 Canadian Register	1882	Simple rectangular gable-roofed structure, with a shed roof addition on the west side. The oldest surviving barn in Richmond.
10631 Dyke Road	DgRs-75 Gilmore Potato Pit	DgRs-75	Designated Heritage Site 2003 City of Richmond, 2009 Canadian Register	1930	Rectangular, gabled barn example of a calf barn structure. Helped the South Arm Slough District maintain its distinct historic rural character. Distinctive given its proximity to and its lower grade relative to the dyke.
9711 Finn Road	DgRs-29 Eldstrom House / Wozny Farmhouse	DgRs-29	Designated Heritage Site 1987 City of Richmond, 2005 Canadian Register	1912, Lust Eldstrom	Demonstrates the experience of settlers from Finland who arrived in Richmond in the late 19th century, settling along the sloughs and participating in the Fraser River fishery. House is oriented towards Finn Road and Woodward's Slough, reflecting the original settlement patterns when transportation was primarily by boat.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
3480 Moncton Street	Watsida Building / Steveston Bookstore, Steveston Town Centre Heritage Location	G	Heritage Inventory 1989 City of Richmond	1927	Part of an almost-continuous façade of simple, wood frame, false front style commercial buildings along Moncton Street. Good example of a false-fronted commercial structure.
3580 Moncton Street	Hepworth Block, Steveston Town Centre Heritage Location	H	Heritage Inventory 1989 City of Richmond	1913	Three storey rectangular brick building located in Steveston's commercial district.
3680 Moncton Street	Wakita Grocery / Marine Grocery, Steveston Town Centre Heritage Location	I	Heritage Inventory 1989 City of Richmond	1927	Part of a row of commercial buildings along Moncton Street in downtown Steveston. All of the buildings are of similar age and scale, and present a continuous façade of small retail shops flush to the sidewalk.
3700 Moncton Street	Atagi Building / Redden Net Company, Steveston Town Centre Heritage Location	J	Heritage Inventory 1989 City of Richmond	1911	Part of a row of commercial buildings along Moncton Street in downtown Steveston. All of the buildings are of similar age and scale, and present a continuous façade of small retail shops flush to the sidewalk. A good example of a false-fronted commercial structure in a prominent corner location.
3811 Moncton Street	DgRt-9 Northern Bank / Ransford House / Royal Bank of Canada / Steveston	DgRt-9	Designated Heritage Site	1906, BC Mills Timber and Trading Company	Two storey pre-fabricated, gable- roofed structure situated on the main street of Steveston.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
	Museum, Steveston Town Centre Heritage Location		1981 City of Richmond, 2005 Canadian Register		One of the earliest surviving structures along Moncton Street and one of the first financial operations.
3831 Moncton Street	DgRt-25 Ray's Drygoods / Budget Appliance Centre, Steveston Town Centre Heritage Location	DgRt-25	Designated Heritage Site 2003 City of Richmond, 2009 Canadian Register	1912	Part of a row of commercial buildings along Moncton Street in downtown Steveston. All of the buildings are of similar age and scale, and present a continuous façade of small retail shops flush to the sidewalk.
3891 Moncton Street	Tasaka Barbershop / Phoenix Art, Steveston Town Centre Heritage Location	L	Heritage Inventory 1989 City of Richmond	1938	One storey false-front wooden structure that sits flush with the street, part of a row of similar commercial buildings along Moncton Street in downtown Steveston. All of the buildings are of similar age and scale, and present a continuous façade of small retail shops flush to the sidewalk.
4005 Moncton Street and No. 1 Road	DgRt-20 CPR Power Poles and Railway Tracks, Steveston Town Centre Heritage Location	DgRt-20	Designated Heritage Site 2003 City of Richmond, 2005 Canadian Register	1905	BC Electric Railway power poles and section of railway track on the corner of Moncton Street and No. 1 Road. The poles follow the curve of the tracks which pass through Steveston Park. Part of a transportation system that operated between 1902 and the late 1950s.
4111 Moncton Street	DgRt-21	DgRt-21	Designated Heritage Site	1971, Amulf H. Petzold, Dewey	Two storey building designed in the Japanese style and situated among

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
	Martial Arts Centre, Steveston Town Centre heritage Location		2003 City of Richmond, 2005 Canadian Register	DeVries Construction	traditional Japanese Gardens within Steveston Park. A social, cultural, and spiritual centre for the Japanese community in Richmond.
13333 Princess Street	DgRs-51 Abercrombie / Thompson House	DgRs-51	Designated Heritage Site 2003 City of Richmond, 2005 Canadian Register	1895-1900	An Arts and Crafts influenced farmhouse with a T-shaped plan. Historically significant as part of the development of the Middle Arm area of Richmond. Moved from its original location at 4860 River Road.
4431 Steveston Highway	DgRt-22 Ida Steves House	DgRt-22	Designated Heritage Site 2003 City of Richmond, 2005 Canadian Register	circa 1915	Building footprint of a two storey Craftsman style home. Home of Ida Steves, the daughter of pioneers Manoah and Martha. Documented early history of Steveston.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 First People's House, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1950s and 1960s	Communal dwelling for Aboriginal workers at the Phoenix Cannery. May be the last surviving Aboriginal residence associated with the Steveston canneries.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Japanese Duplex, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1919	Communal dwelling for Japanese workers and their families at the Phoenix Cannery. Originally part of a cluster of 16 buildings, which probably formed a Japanese community that provided a labour force for the cannery. The only surviving building of its type at Britannia.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Phoenix Seine Net Loft, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1954	The use, repair and storage of fishing nets was an integral part of the fishing industry, and the net loft has aesthetic value as a good example of a structure constructed solely as a net mending and storage facility.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Murakami Boat works, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1928, Otokichi Murakami	The physical design and details of the building which accommodated an early boat works operation, including its rectangular form with undifferentiated open space inside, a large double door at the south end of the building, above which is a hinged portion used to enlarge the door for the passage of boats.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Murakami Residence, Phoenix House #40, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1885	This building was a residence for Japanese-Canadian boat builders. The simple structural style and design of the building reflect its use as a cannery residence.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Richmond Boat Builders, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1932	Utilitarian design of the building to accommodate a number of large fishing vessels for construction or repair. Connected to the development and success of the fishing industry. May be the last Japanese-Canadian boat works from the period prior to World War II.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Cannery Office / Foreman / Manager Dwelling / Kamide House, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1897	Excellent example of an early industrial, functional structure. Historical connection to the development of the Britannia cannery and shipyard, used as both a cannery office and as a residence for workers.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Shipyard and Cannery Complex Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1889	A large, wooden, L-shaped structure on wooden pilings extending into Steveston Channel. Location is associated with an early roadway that connected it and other buildings to the Phoenix cannery and to Steveston. Oldest surviving structure on the Steveston waterfront and possibly the oldest cannery building in the province.
12451 Trites Road	DgRt-6, DgRs-26, DgRs-77 Phoenix Gill Net Loft / BC Packers Gill Net Loft, Britannia Shipyard National Historic Site of Canada / Britannia Shipyard Property / Chantier-naval-Britannia	DgRt-6, DgRs-26, DgRs-77	Designated Heritage Site 1989 City of Richmond, 1991 National Historic Site, 2007 Canadian Register	1938-1945	A large, rectangular wooden net shed with a hipped gable roof and shed addition. Part of the Phoenix Cannery built by Marshall English in 1882 and provides an understanding of the evolution of the cannery site.
n/a	South Arm Slough District Heritage Area	n/a	Heritage Inventory 1987 City of Richmond	Pre-contact to 1930	Comprises a large rural area along the South Arm of the Fraser River, encompassing four of Richmond's major sloughs: Woodward's Slough, Horseshoe Slough, Green Slough, and McDonald Slough. Consists of agricultural fields, narrow rural roads, new residential development and the natural areas created by the sloughs. Three historic settler's homes and two barns are located here.

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
n/a	Finn Slough Heritage Area	n/a	Heritage Inventory 2001 City of Richmond	1928 to mid-1940s	Results from early Finnish settlers. An unplanned and unregulated collection of dwellings, boardwalks, net sheds and boats straddling the channel between Whitworth Island and Lulu Island on the Fraser River.
n/a	Steveston Town Site Heritage Area	n/a	Heritage Inventory 2001 City of Richmond	1880-1920	Consists of the residential component of the town site with its street grid, and the commercial core, including Moncton Street, with its strong relationship to the Fraser River. Historical Development relates to farming, canning, and fishing industries along the Fraser River in the late 1800s. The existing grid pattern was established by the Steves family.
n/a	Cannery Row Heritage Area	n/a	Heritage Inventory 2001 City of Richmond	1880-1920	A linear stretch of the South Arm riverfront between the mainland at Steveston and Steveston Island. Cannery Row runs from Garry Point in the west to the foot of No. 2 Road in the east, and encompasses both the river channel and a portion of the mainland. -Historical association with salmon calling and the fishing industry in the late 19th and early 20th centuries. Large-scale structures along the riverfront modified the landscape and influenced

Address	Historical Site Identifier	Map Identifier	Designating Authority and Year	Construction Date	Description / Characteristics
					Steveston's development and social structure. The concentration of canneries developed here because of proximity to the fishing grounds. Includes the Britannia Heritage Shipyard, the Paramount Cannery complex, and the Gulf of Georgia Cannery.
n/a	Dyke System	n/a	Heritage Inventory 2000 City of Richmond	1860	High, wide dykes are part of an extensive flood protection network. Dykes have shaped the history and influenced the form of development of Richmond since the beginning of settlement. Dyke systems are landscapes that have developed as a result of human activity on the land.

APPENDIX E

Historical Aerial Photograph Summary for the LAA: 1938 to 2009

Date and Aerial Photograph Number*	Inferred Tide State	Land Use(s) Within the LAA	Comments
1938 A5985:11-20 A5938:12-27 A5984:44-45	Low	Agricultural.	■ Intertidal saltmarsh present on the upstream shore of Tilbury Island. ■ A mudflat point bar is observed on the tip of Tilbury Island. ■ Tilbury Slough diverges into two separate channels which appear to be dammed. ■ Tilbury Island is dyked, and the dyke is typically tree-covered.
1949 BC779:3-6 BC785:48-44 BC783:68-74 BC783:32-38 BC782:70-75 BC782:26-25	Low	Agricultural.	■ Intertidal saltmarsh still present on the upstream shore of Tilbury Island. ■ Sediment plume observed from Tilbury Slough into the South Arm of the Fraser River. ■ Tilbury Island dykes have had most of trees removed and the dykes appear to have been recently built up with light-coloured materials (likely newly deposited dredgeate fill and possibly gravel and rip-rap in some areas).
1954 BC1672:100-101 BC1672:72-73 BC1870:22-24 BC1672:42-43 BC1672:20-21 BC1689:17-18,20	High	Agricultural.	■ Active sedimentation downstream in the form of a large beach and bar formation. ■ Sediment bar formation downstream of the confluence of Tilbury Slough and the South Arm of the Fraser river upstream of the dammed channel at Deas Island. A channel extends from Tilbury Slough along the landward edge of this bar and connects with the main channel at the upstream / northwestern end of Deas Island.
April 28 1963 BC5065:94-97 BC5064:152-157 BC5064:120-127 BC5063:236-240	Low	Agricultural and industrial, including sawmill within Project site.	■ Sediment bar formation evident in the 1954 imagery is no longer present, possibly due to dredging. ■ Jetty construction observed on the north side of Tilbury Island, east of the LAA and within. Buildings and roads connecting to the jetty have also been established.
June 11 1974 BC5588:156-158 BC5588:178-182 BC5588:221-229 BC5581:230-236 BC5581:199-200	High	Agricultural in the southern portion and industrial in the northern portion of the Project site property. A number of buildings and / or lumber piles are observed on the Project site property. A large terminal and jetty have been built and attach to the Project site property. A sawmill was constructed near the north end of the Project site property. Log booms are visible in the South Arm of the Fraser River near the north shore of Tilbury Island at the Project site property.	■ Industrial development (e.g., buildings, roads) on properties adjacent to the LAA (east and west).

Date and Aerial Photograph Number*	Inferred Tide State	Land Use(s) Within the LAA	Comments
1979 BC79005:283-286 BC79008:165-170 BC79006:13-22 BC79009:118-124 BC79006:233-237	Low	Agricultural in the southern portion and industrial in the northern portion of the Project site property. Continued use of sawmill, lumber yard, and jetty on Project site property, and now property adjacent and west of the Project site property. More log booms are visible in the South Arm of the Fraser River near the north shore of Tilbury Island at the Project site property.	■ Reformation of the sediment bar first identified in the 1954 imagery, located downstream of the confluence of Tilbury Slough with the South Arm of the Fraser River, upstream of the dammed channel at Deas Island. This area appears to be used for storing and sheltering logs for the mill located at the Project site property. ■ Bar formation noted downstream of the island-bar has migrated and merged with the saltmarsh on the inner bank of the South Arm of the Fraser River on Tilbury Island.
1984 BC84013:139-142 BC84013:185-188	High	Industrial. Continued use of sawmill, lumber yard, and jetty on Project site property. Lumber yard has been extended to include the southern portion of the Project site property.	■ Decrease in plan form area of the sediment bar present in the 1979 imagery (located downstream of the confluence of Tilbury Slough and the South Arm of the Fraser River, upstream of the dammed channel at Deas Island). ■ Sand bar extending in LAA between jetties out to 30 m or 40 m offshore, visible in image at relatively high tide.
September 18 1991 FF9131:56-58 FF9131:81-83	High	Industrial. Continued use of sawmill, lumber yard, and jetty on Project site property.	■ Active sedimentation downstream of LAA, with inferred deposition in the lee of the sawmill terminal on the Project site property. ■ Sediment bar upstream of the island-bar formation at Tilbury Island is absent. The channel was likely dredged. ■ Tilbury Road has been extended to the properties west of the Project site property.
September 27 1997 FFC9700:75-76 FFC9700:110-113	High	Industrial. Continued use of sawmill, lumber yard, and jetty on Project site property.	■ n/a
July 9 2002 SRS6600:355-357 SRS6600:268-271	High and low	Industrial. Continued use of sawmill, lumber yard, and jetty on Project site property.	■ Exposed sediment bar observed downstream of the LAA at low tide. ■ Vegetation is well established over upper part of sand bar between jetties at Project site.
April 4 2009 SRS7964:316-317 SRS7964:325-328 SRS7964:383-388 SRS7964:415-429 SRS7964:490-494 SRS7964:497-498	High	Industrial. Project site no longer used as sawmill and lumber yard. Area has been cleaned up and additional buildings constructed. Jetty still present.	■ Sediment deposition occurring in the lee of and upstream to the island-bar formation that extends and is joined by a bridge to Tilbury Island.

*When exact dates of images are unknown, the year the photograph was taken is provided. It is assumed that all imagery would have been obtained from April to September.

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