EAO | Environmental Assessment Office

EAO's Assessment of an Application for Certificate Amendment

Wolverine Coal Mine Project
EA Certificate #M04-01

Amendment #7: Wolverine-Hermann Amendment

Requested by:
Conuma Coal Resources Ltd.

February 12, 2021
Pursuant to Section 19 of the Environmental Assessment Act, S.B.C. 2002, c.43

BRITISH COLUMBIA

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ACRONYMS AND ABBREVIATIONS

AAIR	Amendment Application Information Requirements
AAQOs	Ambient Air Quality Objectives
B.C. WQG-FAL	British Columbia Water Quality Guidelines for Aquatic Life
BCR	Biochemical Reactor
BRFN	Blueberry River First Nation
CAC	Criteria Air Contaminant
CCME	Canadian Council of Ministers of the Environment
CH_4	Methane
CMMP	Caribou Mitigation and Monitoring Plan
CO	Carbon monoxide
CO_2	Carbon dioxide
COPCs	Organic chemicals of potential concern
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWQG	Canadian Water Quality Guidelines for Protection of Aquatic Life

dBA	A-weighted decibel level
dBL	Linear decibel level
DQRA	Health Canada's 2016 Detailed Quantitative Risk Assessment
DRFN	Doig River First Nation
EAC	Environmental Assessment Certificate
EMA	*Environmental Management Act*
EMLI	Ministry of Energy, Mines and Low Carbon Innovation (formerly – Ministry of Energy, Mines and Petroleum Resources)
ENV	Ministry of Environment and Climate Change Strategy
ESSFmv2	Bullmoose Moist Very Cold Engelmann Spruce - Subalpine Fir Variant
FLNRORD	Ministry of Forest, Lands, Natural Resource Operations and Rural Development
FNITR	First Nations Independent Technical Review
GHG	Greenhouse gas
HDA	Hermann Disturbance Area
HHRA	Human Health Risk Assessment
HLFN	Horse Lake First Nation
HRFN	Halfway River First Nation
LAA	Local Assessment Area
MLIB	McLeod Lake Indian Band
Mtpa	Million tonnes per annum
N_2O	Nitrous oxide
NOx	Nitrogen oxides
OGC	Oil and Gas Commission
PAHs	polycyclic aromatic hydrocarbons
Partnership Agreement	Partnership Agreement for Conservation of the Central Group of Southern Mountain Caribou
PM_{10}	particulate matter with diameter below 10 µm
$PM_{2.5}$	particulate matter with diameter below 2.5 µm
PNCP	Peace Northern Caribou Plan
RAA	Regional Assessment Area
SARA	*Species at Risk Act*
SBEB	Science-Based Environmental Benchmark
SeHAWK	Frontier SeHAWK® water treatment system
SFN	Saulteau First Nations
SO_2	Sulphur dioxide
SPO	Site Performance Objectives
Sukunka	Sukunka Mine Project (currently in application review)
the Act	*Environmental Assessment Act* (2002, unless otherwise indicated)
this Report	Final Amendment Assessment Report for the Wolverine-Hermann Amendment
TSP	Total suspended particulate

VOCs	Volatile organic compounds
WMFN	West Moberly First Nations
WMP	Wildlife Management Plan

1 EXECUTIVE SUMMARY

The Wolverine Mine is an existing, operating open pit coal mine located approximately 25 kilometers (km) west of Tumbler Ridge, British Columbia (B.C.)[1]. The Wolverine Mine was issued an Environmental Assessment Certificate (EAC) in 2005.

On October 29, 2018, Conuma Coal Resources Ltd. (Conuma) requested an amendment under Section 19 of the *Environmental Assessment Act* (2002) (the Act) to the EAC to build a third pit (the Hermann Pit) and ancillary infrastructure to the Wolverine Mine and associated new infrastructure, to extend the life of the Wolverine Mine for processing the coal from the Hermann Pit, and to update the company name to 'Conuma Resources Ltd.'[2]. The Hermann Pit has the potential to produce approximately nine million tonnes of metallurgical coal[3] over approximately seven years. Extending the life of the Wolverine Mine would also allow Conuma to maintain employment for their workforce, as the existing pit (the Perry Creek Pit) is nearing depletion. The Environmental Assessment Office (EAO) accepted the Amendment Application for review on December 20, 2019.

The EAO prepared an Amendment Report in consultation with an advisory working group, made up of provincial and local government representatives with the mandates and skill sets relevant to the review of the Amendment, as well as representative of potentially affected Indigenous nations. Where possible, the EA process was conducted in coordination with the joint *Mines Act/Environmental Management Act* (2018) permitting process.

The EAO undertook public consultation activities over the course of the EA, including holding a public comment period and two public open houses. All public comments, and Conuma's responses to these comments, were considered in completing the EA.

In conducting this EA, the EAO considered the potential environmental, economic, social, cultural and health effects, including cumulative effects of other projects or activities. The EAO uses a values-based method that relies on the identification of valued components and intermediate valued components as the framework for assessing the effects of proposed projects. Valued components are those elements of the natural and human environments considered by the proponent, public, Indigenous nations, scientists and other technical specialists, and government agencies involved in the EA process to have scientific, conservation, ecological, economic, social, cultural, archaeological, or other importance. Intermediate valued components are part of the cause-effect pathway between a proposed project and valued

[1] Please see Figure 1 in the main body of this report.
[2] Please see Figure 2 in the main body of this report.
[3] Metallurgical coal is a type of coal that is used in the process for making steel. This is different than thermal coal, which has different chemical properties and is used to produce electricity.

components. For more information on valued components and guidance on how the EA process in B.C. is conducted, please see the EAO's website[4].

The EA assessed the following intermediate valued components and valued components:

- Noise
- Vegetation
- Cultural Heritage
- Land Use
- Socio-Community
- Economy and Employment
- Air Quality
- Groundwater Quantity and Quality
- Surface Water Quantity and Quality
- Aquatic Resources
- Fish and Fish Habitat
- Soil Quality and Quantity
- Wildlife
- Human Health

The EAO assessed the potential for the Amendment to have significant adverse effects on the valued components and also considered how accidents and malfunctions and changes to the environmental could affect the valued components. These assessments were based on the Amendment Application and supplemental material provided by Conuma and informed by comments received from the Working Group, Indigenous nations and the public.

Conuma proposed mitigation measures to avoid or minimize the adverse effects of the Amendment. In consideration of Conuma's proposed mitigation measures and the comments received during the review of the Amendment Application, the EAO has proposed 18 conditions in the Table of Conditions and a Certified Project Description to be included in the Amendment Order which, if issued, would become legally binding and subject to compliance and enforcement oversight by the EAO.

In consideration of the mitigation measures that would be required of the Amendment, either in the amendment to the EAC, if authorized, or in subsequent regulatory processes, the EAO concludes that the Amendment would result in the following key residual adverse effects:

- Increase in noise levels during operations;
- Direct and indirect effects to vegetation, including loss of wetlands and potential loss of plant species of cultural importance;
- Increase in vehicle traffic along the Coal Haul Road during construction and operations;

[4] Available at: https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/environmental-assessments/guidance-documents/2002-act-guidance-materials.

- Increased pressure on country foods due to potential increase in hunting and gathering;
- Decrease in air quality due to increased contaminants of concern;
- A reduction in baseflow to M20 Creek and Nabors Creek and reduction in streamflow to M20 Creek;
- Changes to surface water quality due to exceedances of selenium and other contaminants;
- Loss of periphyton and benthic invertebrate habitat due to loss or alteration;
- Decrease in fish health and an increase in fish mortality and loss of fish habitat;
- Decrease in wildlife habitat availability and in wildlife movement, and an increase in wildlife mortality risk; and
- Human health effects due to increase in contaminants of concerns and bioaccumulation in vegetation and country food.

The following is a summary of the key themes that, due to their complexity and level of attention given by the Working Group and Indigenous nations, became the main focus of the Amendment review: water quality/impacts to aquatic life, caribou, and impacts to Treaty rights and interests. A more detailed discussion of the assessment of each valued component and intermediate valued component can be found in the main body of this Report. All of the materials, submissions, comment tracking tables, and referral documents are posted to the EAO's EPIC website[5].

Water Quality and Impacts to Aquatic Life

Potential impacts to water quality and aquatic life from the proposed Amendment were raised as a key concern from all Indigenous nations and from the Ministry of Energy, Mines and Low Carbon Innovation (EMLI)[6], Ministry of Environment and Climate Change Strategy (ENV), and Northern Health Authority. Primarily of concern was the ability of the proposed water treatment system to remove enough contaminants, in particular selenium, from the effluent to be protective of aquatic life, such as fish and invertebrates. Existing conditions[7] indicated that levels of these contaminants are currently often above B.C. Water Quality Guidelines for Protection of Aquatic Life in the nearby M20 Creek where mine effluent would be discharged. Selenium was of particular concern because it has the potential to bioaccumulate[8] in aquatic life, become more bioavailable in different chemical forms[9], and be difficult to remove effectively from mining effluent. Conuma had initially proposed the use of a passive water treatment system using biochemical reactors (BCRs), but reviewers did not have confidence that the proposed water treatment technology could effectively remove contaminants of concern.

In response to concerns raised during the EA, Conuma proposed an active water treatment system – known as a Frontier SeHAWK® water treatment system ('SeHAWK'). Near the end of the EA, ENV and EMLI

[5] Available at: https://projects.eao.gov.bc.ca/p/58851085aaecd9001b811843.
[6] Formerly known as the Ministry of Energy, Mines and Petroleum Resources (changed in December 2020).
[7] Existing conditions is what exists before any additionally authorized development occurs.
[8] Bioaccumulation occurs when a contaminant gradually builds up in an organism, particularly as organisms are consumed by other organisms up the food chain.
[9] This process is called 'speciation'.

reviewers provided memos to the EAO to formally indicate that in their view the SeHAWK system demonstrated that the proposed water treatment system would be effective conceptually for the purposes of the EA but noted that more detail would be required at permitting. Given the uncertainty remaining on the proposed water treatment method and the effectiveness at protecting aquatic life, the EAO proposed the following conditions:

- Condition #9: Indigenous-Led Monitoring Plan, which requires monitoring to be conducted by the Indigenous nations for fish and other valued components of concern to the Indigenous nations;
- Condition #11: Aquatic Resources Management Plan, including requirements to monitor water quality, effects to aquatic resources, and bioaccumulation of selenium;
- Condition #12: Water Treatment Technology, requiring Conuma to use the SeHAWK system;
- Condition #13: Water Quality Management Plan, requiring Conuma to use the water treatment system effectively; and
- Condition #15: Country Foods Monitoring Plan, including additional fish tissue and other country foods sampling.

Please see Sections 6.12 (Surface Water Quality), 6.10 (Groundwater Quantity and Quality), 6.13 (Aquatic Resources), and 6.14 (Fish and Fish Habitat) for more information. The EAO concluded that with mitigation and the proposed conditions, the overall residual effects to these valued and intermediate valued components would not be significant.

Caribou

The Amendment would be located within critical habitat of the Quintette woodland caribou herd, which is designated as 'Threatened' under the federal *Species at Risk Act* (SARA) and is under consideration to be designated as 'Endangered' due to the low population numbers. The federal and provincial governments, West Moberly First Nations (WMFN), and Saulteau First Nations (SFN) have also negotiated a Partnership Agreement[10] which sets out the actions that the parties agree to take to stabilize and grow the Central Group of southern mountain caribou to levels that are self-sustaining and support the re-establishment of a traditional Indigenous nations' harvest.

The impacts to caribou habitat from the Amendment would include the loss of 323 hectares (ha) of high elevation and 344 ha of matrix[11] caribou habitat and the indirect[12] loss of 1,463 ha of high elevation[13] and

[10] Canada, British Columbia, Saulteau and West Moberly (Government of Canada, Government of British Columbia, Saulteau First Nations, and West Moberly First Nations). 2020. Intergovernmental Partnership Agreement for the Conservation of the Central Group of the Southern Mountain Caribou, February 2020. Available online: https://species-registry.canada.ca/index-en.html#/consultations/3202.

[11] Caribou matrix habitat includes areas that contribute to the predator-prey system in the overall caribou habitat and connect areas of higher quality habitat but are not considered core caribou habitat areas.

[12] Indirect means through disturbance from noise that would likely cause the caribou to stop using this habitat.

[13] Caribou have important life processes that occur at high elevations and so this is considered the most important habitat for caribou.

3,915 ha of matrix habitat for the life of the mine.

To offset the impacts to caribou, Conuma developed a Caribou Mitigation and Monitoring Plan (CMMP), committed to an initial financial contribution of $744,560 toward the habitat restoration component of the Provincial Caribou Recovery Program, voluntarily deferred development of the East Bullmoose Pit of the Wolverine Mine until 2025 (which would be located in high quality caribou habitat and has not been developed yet), and offered protection of 4,830 ha of Conuma-tenured areas in high quality caribou habitat.

Through discussions between Conuma, the Province, and Indigenous nations, Conuma committed to permanently relinquish an additional 292 hectares of caribou habitat to support the maternal penning program and to provide an additional contribution of $745,000 towards caribou habitat mitigation measures through an agreement with WMFN. The Province also committed to a contribution of $300,000 to support habitat restoration initiatives led by WMFN and SFN. In consideration of the contributions and measures proposed, FLNRORD communicated to the EAO its views that the Amendment would have a net-neutral or better impact on caribou. The EAO proposes the following condition:

- Condition #14: Caribou Mitigation and Monitoring Plan, which requires the mitigation measures, financial contributions, and description of the coal licenses to be used for restoration, as well as requires Conuma to enter into a caribou financial agreement with the Province prior to construction.

Additional concerns raised by the Indigenous nations are described further in Section 6.16 (Wildlife) and 7 (Assessment of Impacts to Treaty Rights and Interests). The EAO concluded that the impacts of the Amendment to caribou would be significant because cumulative effects on caribou habitat are already significant at baseline, which has resulted in the decline of caribou numbers over the past decades and designation of caribou as Threatened.

Impacts to Treaty Rights and Interests

The proposed Amendment is located within the boundaries of Treaty 8 and overlaps with the territories of Halfway River First Nation (HRFN), McLeod Lake Indian Band (MLIB), SFN, and WMFN, and Doig River First Nation (DRFN). These Indigenous nations participated in the review of the proposed Amendment and were consulted deeply by the EAO, with the exception of DRFN which elected to be notified only of key milestones in the EA.

At the outset of the Amendment EA process, SFN and WMFN worked together with MLIB as a First Nations Independent Technical Review (FNITR) committee to provide technical review and comment on the pre-application documents, as well as the Application and its appendices. Later, MLIB elected to participate independent of the FNITR.

A number of shared concerns were raised by the Indigenous nations during the EA, which included concerns related to:

- Existing cumulative impacts to Treaty 8 traditional territories, such that every new development further impedes Treaty 8 Nations' ability to exercise Treaty rights to hunt, trap, and fish in the region;
- Impacts to caribou from this Amendment as well as cumulative effects to caribou from resource development in the region;
- Impacts generally to wildlife and wildlife habitat, including moose, affecting the Treaty right to hunt;
- Impacts to water quality and the resulting impacts to aquatic resources, including drinking water and contamination of fish, affecting the Treaty right to fish;
- Impacts to fish and fish habitat through flow reductions in M20 Creek, potentially resulting in fish and fish egg stranding, affecting the Treaty right to fish;
- Impacts to vegetation from coal dust, which could impact traditional use plants and gathering activities; and
- An interest in establishing an Indigenous-Led Monitoring Program to increase capacity with each Nation to conduct monitoring of compliance and environmental impacts of the Amendment.

To address these concerns, the EAO has proposed the following conditions:

- Condition #9: Indigenous-Led Monitoring Program, to require Conuma to fund an environmental effects monitoring program led by the Indigenous nations;
- Condition #10: Air Quality and Emissions Monitoring Plan, requiring air quality monitoring and mitigation measures to reduce air contaminants;
- Condition #11: Aquatic Resources Management Plan, including requirements to monitor water quality, mitigate effects to aquatic resources, and model bioaccumulation of selenium;
- Condition #12: Water Treatment Technology, requiring Conuma to use the SeHAWK water treatment system;
- Condition #13: Water Quality Management Plan, requiring Conuma to use the water treatment system effectively;
- Condition #14: Caribou Mitigation and Monitoring Plan: which requires the mitigation measures, financial contributions, and description of tenures to be used for restoration;
- Condition #15: Country Foods Monitoring Plan, requiring additional fish tissue and other country foods sampling; and
- Condition #16: End Land Use Plan: to require Conuma to develop a plan for vegetation and ecosystems following reclamation, in consultation with Indigenous nations.

Please see Section 7 (Assessment of Impacts to Treaty Rights and Interests) for more information. The EAO concluded that the Amendment would result in a minor impact to Treaty rights to hunt (non-caribou wildlife) and trap, a moderate impact to the Treaty right to fish and a serious impact to the Treaty right to hunt caribou. The key mitigation measures and proposed conditions would accommodate the assessment potential effects to Treaty rights and interests. In the context of potential impacts on Treaty rights and interests, the EAO also considered the importance of the Amendment to the local, regional and provincial economy, and the benefits of the Amendment to Indigenous nations.

Additional Considerations

In making a decision on an amendment, the Chief Executive Assessment Officer considers the Assessment Report, including any recommendations, and any other matters that they consider relevant to the public interest. The following information regarding the potential economic and social contributions of the amendment was provided by Conuma in its Application.

Conuma estimated that at peak workforce during operations, the Amendment would directly employ 345 workers for eight years, with 480 person-years of employment in the local area and 570 person-years in the region stemming from the Amendment. Indirect and induced employment would continue from what is currently available from the Wolverine Mine as worker resources are moved to the Hermann Pit. Conuma predicted that there would be a positive effect on the local economy and employment.

Conclusions and Recommendations

The full details of the conclusions and recommendations of the EAO are provided in Section 7 of this Report. Based on Conuma's Amendment Application and supplemental information provided; review, comments and advice provided by Working Group members and Indigenous nations; consultation efforts with the Working Group and Indigenous nations that will continue; public comments; the subsequent permitting processes; and the proposed changes to the EAC in proposed Certified Project Description and Table of Conditions, the EAO recommends that the Chief Executive Assessment Officer authorize the Amendment with the proposed Certified Project Description and Table of Conditions.

2 OVERVIEW OF PROPOSED AMENDMENT

2.1 Wolverine Mine Project

The Wolverine Mine Project ('Wolverine Mine') is an existing, operating open pit coal mine located approximately 25 kilometers (km) west of Tumbler Ridge, B.C. with a production capacity of 2.4 million tonnes per annum (Mtpa). The EAO issued EAC #M04-01 for Wolverine Mine to Western Canadian Coal Corp in 2005. The Wolverine Mine EAC currently authorizes the construction, operation, closure and reclamation of two open pits:

- Perry Creek Pit, which is currently in operation and approaching the end of mine life; and
- East Bullmoose Pit, which remains undeveloped.

On October 29, 2018, Conuma Coal Resources Ltd. (Conuma) requested an amendment under Section 19 of the *Environmental Assessment Act*, 2002 (the Act) to amend EAC #M04-01 to add a third pit (the Hermann Pit) and ancillary infrastructure to the Wolverine Mine, referred to as the Wolverine-Hermann Amendment (the Amendment). The Hermann Pit would have the potential to produce approximately nine million tonnes of metallurgical coal over approximately seven years at a production rate of between 1.5 and 3.0 Mtpa of clean coal. This Amendment would also extend the life of the Wolverine Mine by seven years, as coal reserves at the Perry Creek Pit are nearing depletion and the permitting process for the East Bullmoose Pit was put on hold due to concerns regarding high-value caribou habitat in the area. Extending the life of the Wolverine Mine would allow Conuma to maintain employment for their workforce. The Amendment is located within the boundaries of Treaty 8 and overlaps with the territories of HRFN, MLIB, SFN, WMFN, and DRFN. Six previous amendments to EAC #M04-01 have been issued by the EAO (see Table 1).

Table 1: Amendments to EAC #M04-01 Issued by the EAO

#	Date Issued	Description
1	April 11, 2006	Increased production capacity from 1.6 to 2.4 Mtpa
2	May 30, 2007	Transferred ownership of the EAC from Western Canadian Coal Corp to Wolverine Coal Ltd, a wholly owned subsidiary of Western Canadian Coal Corp
3	February 1, 2010	Amended a condition regarding project modification and reflected a corporate name change from Western Canadian Coal Corp to Western Coal Corp, parent company of Wolverine Coal Ltd
4	November 9, 2012	On April 1, 2011, Walter Energy Canada Holdings, Inc. acquired Western Coal Corp. This amendment updated language regarding consent for transfer of EAC, to add "Certificate Holder" as a defined term, and to update Conuma Coal Resources as the Certificate Holder
5	December 13, 2016	Issued to reflect the new Certificate Holder as Conuma Coal Resources Limited
6	May 6, 2020	Authorized 34.6 hectares (ha) of tree clearing, grubbing, and stripping in the footprint of the proposed Wolverine-Hermann Amendment

In late 2017, Conuma began the process of applying for joint *Mines Act/Environmental Management Act* permits to initiate construction of the East Bullmoose Pit. A Mine Review Committee was formed by the EMLI to provide input on the proposed *Mines Act/Environmental Management Act* permit applications, which consisted of representatives from Indigenous nations, other provincial government agencies, and local governments.

During the Mine Review Committee process for the East Bullmoose Pit, Indigenous nations and provincial caribou biologists raised serious concerns about the potential impact of the East Bullmoose Pit on local caribou populations. Conuma estimated that the 500-600 ha expansion would occur entirely within high elevation winter range of the Quintette caribou herd. The understanding of the status of caribou and the types of measures that would be needed to protect and recover this species were undergoing important changes at that time. Several important developments with respect to caribou conservation and recovery were emerging at the time, including:

- The federal-provincial Conservation Agreement[14] for southern mountain caribou under SARA;
- The Partnership Agreement[15] between the Province, SFN, and WMFN on caribou recovery; and
- A declaration by the federal Minister of Environment and Climate Change that southern mountain caribou are facing imminent threats to recovery[16], with particular concern for the Quintette and other central mountain herds.

Additional details on these agreements, as well as how the understanding of impacts to caribou and caribou habitat was developing at this time, is provided in Section 6.16 (Wildlife) of this Amendment Report (Report).

Given the concerns expressed by Indigenous nations and provincial caribou biologists, as well as the ongoing development of relevant federal and provincial caribou policy, Conuma consequently did not submit *Mines Act*/*Environmental Management Act* applications for the East Bullmoose Pit and began to consider alternative options. Following discussions with Indigenous nations, Conuma agreed to defer any production permit applications for the East Bullmoose Pit for five years (ending in 2025) and instead work to develop the Hermann Pit as an amendment to the Wolverine Mine.

The Amendment proposes to extend the life of the Wolverine Mine and the infrastructure already certified and operating at the Wolverine Mine, add new infrastructure proposed at the Hermann Pit, and change the name of the Holder on the EAC from Conuma Coal Resources Ltd. to Conuma Resources Ltd. The EAO understands that the Amendment Application has been informed by previous studies and assessment completed for a previous and separate Environmental Assessment (EA) for the previously certified Hermann Mine Project (see Section 2.1.1 below), in addition to more recent supplemental studies and

[14] Available online: https://engage.gov.bc.ca/app/uploads/sites/373/2019/03/Draft-Section-11-Bilateral-Conservation-Agreement-2019_03_08.pdf
[15] Available online: https://engage.gov.bc.ca/app/uploads/sites/373/2019/03/Caribou-Partnership-Agreement.pdf
[16] Available online: https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/ImminentThreatAnalysisSmc-v00-2018Jun-Eng.pdf

information.

2.1.1 HERMANN EAC EXPIRATION

The Hermann Mine Project[17] was a standalone project by Conuma that was issued EAC #M08-01 on November 24, 2008. The EAO issued a one-time, five-year extension for the Hermann EAC on November 18, 2013. Pursuant to Section 18(5) of the Act, Conuma was required to have substantially started construction of the Hermann Mine Project by November 24, 2018, or the EAC would expire.

In the summer of 2018, Conuma indicated to the EAO that it would seek alternate options for development of their Hermann property as it would not meet substantial start requirements by November 24, 2018. On December 20, 2019, the EAO determined that the Hermann Mine Project was not substantially started and EAC #M08-01 expired[18].

2.2 Components and Activities at Hermann

If regulatory approvals are obtained, Conuma has proposed to begin construction on the Hermann Pit and ancillary infrastructure in 2020, with operations estimated to occur following approvals until approximately 2027. The reclamation and closure phase would take place in 2028 and 2029.

The location of the Wolverine Mine and the Amendment is shown on Figure 1. The main components of the Amendment are shown on Figure 2.

Table 2: Main Components and Activities of Proposed Amendment

Component	Description or Additional Information
Open pit	One open pit (the Hermann Pit)
Waste rock dumps	Two waste rock dumps (South Dump and West Dump) and one in-pit dump
Soil stockpile	Soil stockpiles at the south end and north ends of the Hermann disturbance area
Additional mining infrastructure	Run-of-mine stockpile, breaker station, crusher, laydown area, truck loadout, office, dry and shop facilities, explosives storage
Electrical power supply	On-site generating plant with a generating capacity in the range of 3.5 megawatts, and a backup generator of the same capacity
Water supply and sewage disposal	Supply of water to facilities will be from wells near the laydown area and sedimentation ponds. Water for equipment washing and maintenance will be supplied from groundwater wells. Bottled water will be used for potable water
Water management facilities	Clean water diversion structures, contact water collection ditches, aerator pond, polishing pond, sedimentation ponds, and a SeHAWK system, with supplemental ultrafiltration and reverse

[17] Information related to the former Hermann Mine Project can be found on the EAO's website at https://projects.eao.gov.bc.ca/p/588510f5aaecd9001b818608

[18] Information related to the EAO's substantial start determination can be found on the EAO's website at https://projects.eao.gov.bc.ca/api/document/5c1c25ecd35b9c002419319a/fetch/Substantially%20Started%20Report.pdf.

	osmosis units, as primary mitigation for surface water quality. For the purposes of this Report, the EAO considers the SeHAWK system to be the primary mitigation for surface water quality[19].
Use and maintenance of Coal Haul Roads	A total of 26 km of existing resource roads would be used to transport coal from Hermann to Wolverine. Personnel, equipment and materials would be transported between Hermann Pit and Wolverine Mine. While no upgrades to the roads would be required, there would be increased traffic along with road and bridge maintenance.

2.3 New and Modified Activities at the Wolverine Mine

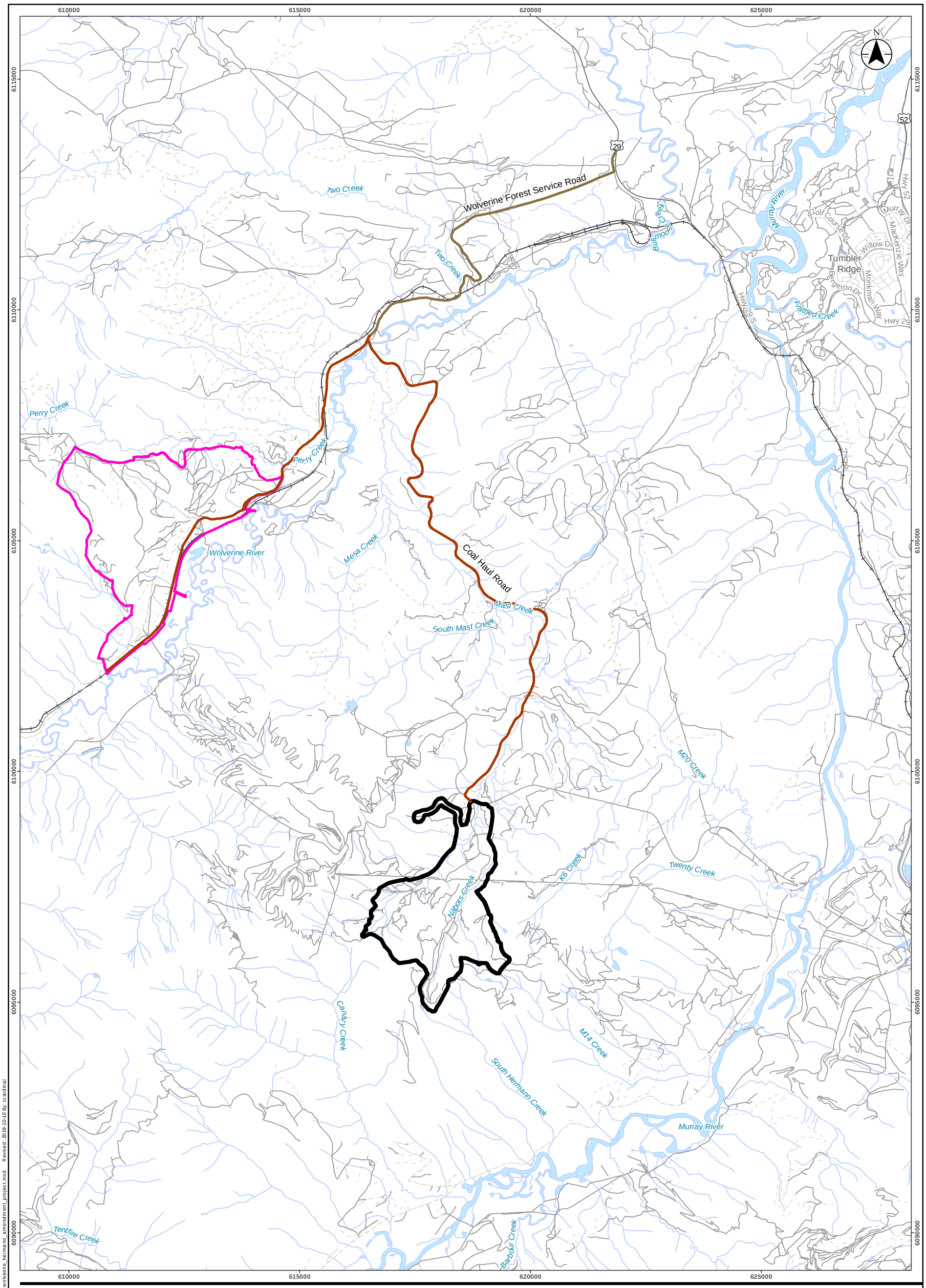
The Hermann Pit would provide additional reserves to extend the life of the Wolverine Mine by seven years, resulting in a total life of mine of 22 years and proposed to utilize infrastructure already certified and operating at the Wolverine Mine. It would also authorize new infrastructure at the Hermann Pit. After processing at the Wolverine Coal Processing Plant, Hermann coal would be transported by existing rail from the Wolverine loadout facility to Ridley Terminal in Prince Rupert, B.C. or to the coal terminal in Vancouver, B.C. This would use existing regional transportation infrastructure, including a railway network, a deep-sea shipping terminal, and a full-service community (Tumbler Ridge) within daily commuting distance of the mine site.

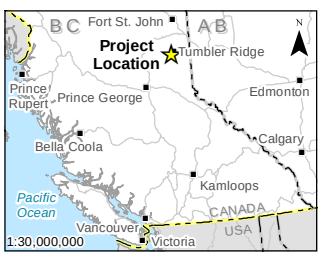
The footprint of the Wolverine Mine is currently 1,370 ha. The addition of the Hermann Pit and ancillary infrastructure would add approximately 680 ha, which would bring the total footprint to approximately 2,050 ha. All new and modified activities at the Wolverine Mine are proposed to occur within the existing project footprint and are listed in Table 3. Existing project components at the Wolverine Mine are shown on Figure 3.

Table 3: New and Modified Activities at Wolverine Mine

Component	Description or Additional Information
Production capacity	Increase from 2.4 Mtpa to 3.0 Mtpa clean coal production
Coal processing	Processing of coal at the existing Wolverine Coal Processing Plant
Tailings storage	Disposal of tailings in the existing Wolverine Tailings Storage Facility and the addition of another In-Pit Storage Complex in the mined-out Perry Creek Pit
Coarse coal rejects disposal	Disposal of coarse coal rejects from Hermann coal in the existing Wolverine In-Pit Storage Complex in the mined-out Perry Creek Pit

[19] While Conuma had originally proposed the use of BCRs as the primary water treatment technology, reviewers expressed low confidence in the ability of this system to meet the stated efficiencies and requested additional information over multiple round of Application Review. In round 4 of Application Review, the EAO requested that Conuma propose an alternate primary mitigation for surface water quality based on feedback from technical reviewers. Additional information regarding the shift from the BCRs to the SeHAWK system as primary water treatment is discussed in Section 6.13.





Road
Highway
Local Street
Resource Road
Unclassified Road
Forest Tenure Road
Railway
Watercourse
Waterbody

Coal Haul Road
Wolverine Forest Service Road
Hermann Disturbance Area
Wolverine Mine Site

0 1 2 3 km
1:80,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Watershed Boundaries: DataBC, Freshwater Atlas
4. Hillshade: ESRI World Topo Map

Stantec
CONUMA COAL RESOURCES LIMITED

Project Location
Near Tumbler Ridge, BC
NTS Map: 093I14, 093P03

Project Number 123221151
Prepared by TCARDINAL on 20190703
Discipline Review by LDESANDOLI on 20190813
GIS Review by SPARKER on 20190814

Client/Project/Report
Conuma Coal Resources Limited
Wolverine-Hermann Amendment Project
EA Amendment Application

Figure No.
1

Title
Location of Wolverine-Hermann Amendment Project

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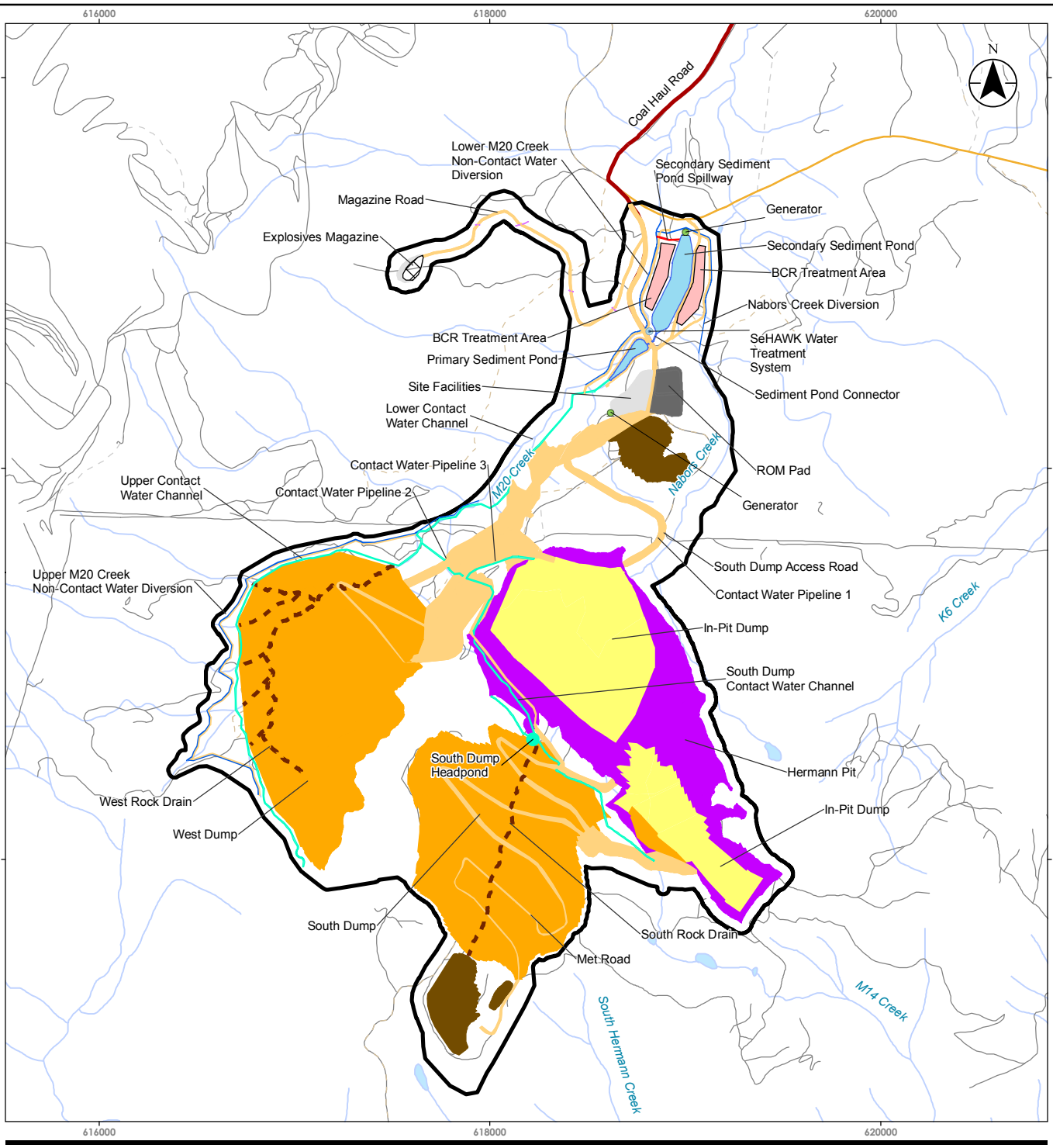

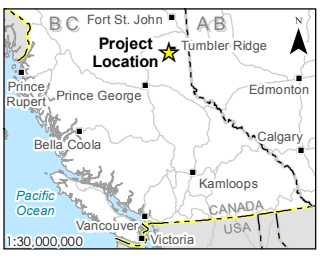

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Headpond
- Generator
- SeHAWK Water Treatment System
- Coal Haul Road
- Mast Resource Road
- Road
- Resource Road
- Forest Tenure Road
- Watercourse
- Waterbody
- Rock Drain
- Hermann Disturbance Area
- BCR
- Contact Water Management Feature
- Non-Contact Water Management
- Sediment Pond
- Spillway
- Culvert
- Dump
- Explosives Magazine
- Faciltiy
- In Pit Dump
- Pit
- ROM Pad
- Site Road
- Topsoil Stockpile

0 0.25 0.5 0.75 1 km
1:30,000 (at original document size of 8.5x11)

Stantec

CONUMA COAL RESOURCES LIMITED

Project Location
South of
Chetwynd, BC

Project Number 123221151
Prepared by SPARKER on 20201214
Discipline Review byLDESANDOLI on 20201214
GIS Review by TCARDINAL on 20201214

Client/Project/Report
Conuma Coal Resources Limited
Woverine-Hermann Amendment Project
EA Amendment Application

Figure No.
2

Title
Hermann-Wolverine Amendment Project Components within Hermann Disturbance Area

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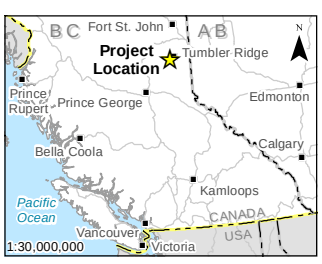
610000
612500
6107500
6105000
6102500

N

Perry Creek
Explosives Magazine
East Dump
Powerline
North Dump
Pit Lake
Perry Creek Pit
Rail
In-Pit Dump
Borrow Pit
Weather Station
Fuel Island
South Dump
Equipment Laydown
Wolverine River
Tailings Berm
Coal Stockpile
Tailings Storage Facility
Run of Mine Stockpile
Shop/Administration
Coal Processing Plant
Fuel Island
Coarse Coal Reject Pile
Hazardous Waste Transfer Area



Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- Conuma Climate Station
- Culvert
- Groundwater Well
- Coal Haul Road
- Railway
- Road
- Resource Road
- Powerline
- Forest Tenure Road
- Watercourse
- Waterbody
- Wolverine Mine Site
- Wolverine Component
- Biocell
- Borrow Pit
- Buttress
- Coal Stockpile
- Coarse Coal Reject Pile
- Ditch
- Dump Slope
- East Dump
- Exfiltration Basin
- Explosives Magazine
- Facility
- Fuel Island
- Hazardous Waste Transfer Area
- In-Pit Dump
- Laydown
- Non Contact Water Pipeline
- Non-Contact Water Diversion
- North Dump
- Pit
- Pit Lake
- Coal Processing Plant
- Powerline
- Rail
- Road
- Rock Drain
- Run of Mine Stockpile
- Sediment Pond
- Shop/Administration
- South Dump
- Tailings
- Topsoil Stockpile

0 0.25 0.5 0.75 km
1:21,000 (at original document size of 11x17)

Stantec
CONUMA COAL RESOURCES LIMITED

Project Location
South of Chetwynd, BC

Project Number 123221150
Prepared by TCARDINAL on 20190711
Discipline Review by LDESANDOLI on 20190814
GIS Review by SPARKER on 20190814

Client/Project/Report
Conuma Coal Resources Limited
Hermann - Wolverine Expansion Project
EA Amendment Application

Figure No.
3

Title
Wolverine Mine Site Components

S:\12221\projects\123221151\figures\reports\ea\fig_1_2_2_123221151_pd_wolverine_mine_components_2019.mxd Revised: 2019-10-06 By: tcardinal

3 AMENDMENT REVIEW PROCESS

3.1 Pre-Application

The EAO established a Working Group consisting of Indigenous nations and provincial government agencies to provide technical expertise in the assessment of the Amendment. The District of Tumbler Ridge and the Peace River Regional District were invited but did not participate in the Working Group. Table 4 lists Working Group members and their expertise.

Table 4: Working Group Members

Organization	Expertise
Halfway River First Nation (HRFN)	Traditional knowledge and understanding of potential effects on the Indigenous nation and its Treaty rights
McLeod Lake Indian Band (MLIB)	Traditional knowledge and understanding of potential effects on the Indigenous nation and its Treaty rights
Saulteau First Nations (SFN)	Traditional knowledge and understanding of potential effects on the Indigenous nation and its Treaty rights
West Moberly First Nations (WMFN)	Traditional knowledge and understanding of potential effects on the Indigenous nation and its Treaty rights
Ministry of Energy, Mines, and Low Carbon Innovation (EMLI)	Project history and permitting, hydrogeology, occupational health and safety, reclamation, and coordinated and subsequent permitting
Ministry of Environment and Climate Change Strategy (ENV)	Hydrology, fish, wildlife (including caribou), water quality, air quality, and greenhouse gases (GHGs) and climate
Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD)	Fish, wildlife (including caribou), and lands
Northern Health Authority	Human health

The EAO sought and considered advice from the Working Group in order to understand and assess any potential adverse effects associated with the Amendment. Working Group members were responsible for providing advice to the EAO on:

- Key EA documents including, but not limited to, the selection of valued components, draft Amendment Application Information Requirements (AAIR), Amendment Application, EAO's Amendment Assessment Report (this Report), draft Certified Project Description and draft Table of Conditions;
- Government policy direction and/or gaps that could affect the conduct of the EA;
- Potential conflicts with the legislation and/or regulations of their organizations;
- EA information requirements, as compared with permitting design and information requirements; and
- Technical issues raised by the public during the public consultation process.

The EAO reviewed the adequacy of Conuma's responses to all comments received from Working Group members and held meetings with Working Group members to discuss outstanding issues and concerns. In the development of this Report and recommended EAC conditions, the EAO considered all comments and issues raised during the EA.

3.1.1 ISSUES AND PROCEDURAL SCOPING

During the pre-application stage, the Working Group provided feedback on Conuma's proposed approach to the Amendment, the valued components that would be assessed, and the data and information that would be required to assess the effects of the proposed Amendment. The EAO held seven Working Group meetings during this stage.

Given that the Amendment was determined to be complex, the EAO developed a procedural letter – similar to a Section 11 Order under the Act– outlining the scope and procedures that would be required over the course of the Amendment. Given the complexity of the proposed Amendment, the scope of the changes requested, and the potential for adverse effects on water quality, caribou, and Treaty rights, the scope and procedures of the Amendment are similar to what would be required under a full environmental assessment (EA).

The Working Group and Indigenous nations reviewed and provided feedback on early drafts of the Procedural Letter. Based on feedback from HRFN, SFN, and WMFN, the EAO added additional detail regarding consultation with Indigenous nations and the responsibilities of the Working Group. The Procedural Letter was finalized and sent to Conuma on June 27, 2020[20].

3.1.2 DEVELOPMENT OF INFORMATION REQUIREMENTS

The Working Group reviewed and provided comments on the draft AAIR, which outlined the information that Conuma must include in the preparation of the Amendment Application for the Amendment. The EAO sought input from the Working Group on the draft AAIR, which was finalized on July 5, 2019. Working Group comments on the AAIR, the Issues Tracking Table, and Conuma's responses were posted to the EPIC website[21].

3.1.3 APPLICATION SCREENING

Conuma submitted both the Amendment Application and the joint *Mines Act*/*Environmental Management Act* permit applications on October 16, 2019. Once the EAO had confirmed receipt of the Amendment Application on October 17, 2019, screening of the Amendment Application began, which assesses the

[20] The Procedural Letter can be found on the EAO's website at https://projects.eao.gov.bc.ca/api/public/document/5d4b536a4cb2c7001b13fd81/download/2019.06.27%20Final%20Procedural%20Letter.pdf.

[21] The Issues Tracking Table can be found on the EAO's website at https://www.projects.eao.gov.bc.ca/api/public/document/60187a23609cfd002033618a/download/ITT.pdf.

completeness of the Amendment Application against the AAIR. The EA process was conducted in close coordination with the joint *Mines Act/Environmental Management Act* permitting process led by the Major Mines Office of EMLI, where possible.

Reviewers from the ENV, EMLI, the Ministry of Forest, Lands, Natural Resource Operations and Rural Development (FLNRORD), HRFN, MLIB, Northern Health, SFN, and WMFN provided comments during the screening process. On December 2, 2019, the EAO held a Working Group meeting with Indigenous nations, the Working Group, and Conuma to discuss reviewers' comments and the adequacy of Conuma's responses. The EAO noted that, while there was information required by the AAIR not present in the Application, this information could be provided by Conuma during application review for feedback by Indigenous nations and Working Group reviewers.

After considering feedback from Indigenous nations and the Working Group, the EAO determined that the Amendment Application could proceed into application review on December 20, 2019. The EAO communicated to Conuma that the issues that had been raised in screening would be included in the first round of application review and would require a comprehensive response at that stage. The joint *Mines Act/Environmental Management Act* permit applications did not successfully screen into the detailed technical review stage at this time.

3.2 Application Review

The Working Group reviewed the Amendment Application and supplementary information provided by Conuma in response to issues raised during the review process beginning on January 7, 2020. During this phase, the EAO held a series of meetings on key issues that had been identified by the Working Group, specifically on selenium bioaccumulation, human health, caribou, water quality and the proposed water treatment system. The EAO developed a series of information requests for Conuma as a result of these meetings, as reviewers indicated that insufficient information had been provided to date to conclude on the effects of the Amendment. Conuma provided responses to the EAO's information requests as part of the application review.

Conuma prepared responses to all Working Group comments in three rounds of application review and presented these responses in an Issues Tracking Table. Once the EAO received technical input from the Working Group and was satisfied with the responses, the finalized Issues Tracking Table was posted on the EAO's website[22]. The key issues raised by the Working Group are outlined in Section 6: Summary of Issues and Effects.

Following Round 3 of application review on the Amendment, the EAO met with reviewers in summer 2020 to discuss their comments and the adequacy of Conuma's responses to the Round 3 comments. The objective of these meetings was to determine whether any additional information would be required for the Chief Executive Assessment Officer of the EAO to come to a decision on the Amendment; what

[22] The Issues Tracking Table can be found on the EAO's website at https://projects.eao.gov.bc.ca/api/public/document/60187a23609cfd002033618a/download/ITT.pdf.

information the EAO should include the Assessment Report; and what proposed conditions would be required to address reviewers' concerns. The EAO incorporated reviewers' feedback into initial draft referral materials.

The EAO circulated initial draft referral materials, including a draft of this Report, the draft Certified Project Description, and a draft Table of Conditions to the Working Group for review and comment. The EAO shared subsequent drafts with the Working Group to demonstrate how comments were incorporated.

The EAO completed the evaluation of the Amendment and provided the final Amendment Assessment Report (this Report), the Certified Project Description, and the proposed Table of Conditions to the Chief Executive Assessment Officer of the EAO for decision on whether to issue the Amendment.

4 ADDITIONAL AUTHORIZATIONS

In addition to provincial EA approval, Conuma would need various authorizations from federal, provincial, and local governments to construct and operate the Amendment. These are described in the following sections.

4.1 Federal Regulatory Environment

An authorization under the federal *Fisheries Act* may be required. Conuma has been in contact with Fisheries and Oceans Canada to determine if this authorization is needed.

4.2 Provincial Authorizations

The Amendment EA process was conducted in close coordination with the joint *Mines Act/Environmental Management Act* (2018) permitting process. The *Mines Act* and *EMA* permit initial applications have been submitted at the time of writing this Report. The EAO has worked closely with the permitting agencies to facilitate continuation of the discussion of important issues into the permit amendment processes, as appropriate. The following provincial authorizations are being applied for as part of the *Mines Act*/*Environmental Management Act* applications:

- *Coal Act:* Mining lease for mineral claims at the Hermann Disturbance Area (HDA) for long-term production of ore;
- *EMA:* Amendments of effluent waste discharge permit and air waste discharge permit;
- *EMA* - Hazardous Waste Regulation: Registration and application to produce, store, treat, recycle or discharge hazardous wastes;
- *EMA* - Petroleum Storage and Distribution Facilities: registration for fuel storage;
- *Forest Act*: Occupant licenses to cut for Conuma tenures and Peace River Coal tenures;
- *Mines Act*: Amendment of existing Wolverine *Mines Act* Permit C-223 to include HDA facilities and infrastructure;
- *Mines Act and Code* (part 8): Approval to store, transport and use explosives and maintain the

explosives magazine at the HDA;
- *Water Sustainability Act:* License for water use and authorization for changes in or about a stream; and
- *Wildlife Act:* Beaver and Beaver Dam Removal permit and Amphibian and Reptile Salvage permit.

The following are provincial administrative permits that are also required for the Amendment but are not being submitted as part of the joint *Mines Act/Environmental Management Act* application:

- *Motor Vehicle Act:* Approvals for oversize loads or bulk haul;
- *Weed Control Act:* permit for noxious weed control;
- *Wildlife Act:* permit to handle wildlife; and
- *Heritage Conservation Act:* permit for site alteration.

5 PUBLIC ENGAGEMENT

The EAO required Conuma to prepare a Public Consultation Plan[23], approved by the EAO, which laid out the consultation objectives and activities that would be undertaken for the Amendment. The EAO held a 30-day public consultation period on the Amendment Application, which began on January 20, 2020. One public comment was received related to the cumulative effects on wildlife from development in the area.

The EAO held two open houses during the public consultation period, where the public was invited to learn about and comment on the Amendment. The open houses were held in Tumbler Ridge, B.C. on February 5, 2020 (17 attendees), and in Chetwynd, B.C. on February 6, 2020 (2 attendees).

Conuma submitted two Public Consultation Reports[24] to the EAO, one with the Amendment Application and a second after the close of the Public Consultation Period, that the EAO reviewed and accepted.

6 SUMMARY OF ISSUES AND EFFECTS

The EAO evaluated the potential for the Amendment to have significant adverse environmental, economic, social, heritage and health effects, including cumulative effects, considering practical means to reduce or avoid these effects. The EAO relied on information contained in Conuma's Amendment Application, comments received from the public and Working Group members, feedback received from Indigenous nations, and subsequent information provided by Conuma in response to comments received or requests

[23] The Public Consultation Plan can be found on the EAO's website at https://projects.eao.gov.bc.ca/api/public/document/5d1534494c873300236aa32b/download/Public%20Consultation%20Plan.pdf

[24] Available online: https://www.projects.eao.gov.bc.ca/api/public/document/601884f8609cfd0020336309/download/Wolverine-Hermann%20Amendment%20Project%20Public%20Consultation%20Report%20-%20SUBMITTED.pdf.

for supplemental information from the EAO.

This section provides a summary of key issues, organized by valued component, raised during the Amendment Application process and consideration of the potential for significant adverse effects, including cumulative effects after avoidance and mitigation measures are applied. This section does not discuss all the issues that were raised during the Amendment process but provides a summary of the key issues that were raised during the review. For a more detailed description of all issues raised and Conuma's responses, please see the Issues Tracking Table posted to the EAO's website[25]. For information regarding potential impacts to Treaty 8 rights and interests, please see Section 7 (Assessment of Impacts to Treaty Rights and Interests).

6.1 Valued Components and Intermediate Valued Components

EA in B.C. uses a values-based framework to promote a comprehensive, yet focused, understandable, and accessible assessment of the potential effects of proposed projects (including amendments). This framework relies on the use of valued components as a foundation for the assessment. Valued components are components of the natural and human environment that are considered by the proponents, the public, Indigenous nations, scientists and other technical specialists, and government agencies involved in the assessment process to have scientific, ecological, economic, social, cultural, archaeological, historical or other importance.

Appropriate valued components and intermediate valued components are identified and selected during the pre-application phase. Ultimately, the valued components required to be in the application are established by the EAO upon finalization of the Application Information Requirements.

An 'intermediate valued component' is a component of the natural or human environment that is changed by the project, which change then causes an effect on another component of the environment. Intermediate valued components are therefore part of the pathway between a proposed project and the ultimate receptor. For example, sediment-laden discharge from a project to a stream may adversely affect water quality and invertebrate habitat and these changes may consequently affect the health and survival of fish that depend on those habitat attributes. In this example, water quality and invertebrate habitat would be intermediate valued components and fish health and survival would be the ultimate receptor, or the valued component.

The EAO considered the potential effects of the changes to the following intermediate valued components through the assessment of valued components in this Report:

- Air Quality;
- Noise;

[25] The Issues Tracking Table can be found at the EAO's website at https://www.projects.eao.gov.bc.ca/api/public/document/601884f8609cfd0020336309/download/Wolverine-Hermann%20Amendment%20Project%20Public%20Consultation%20Report%20-%20SUBMITTED.pdf.

- Surface Water Quality;
- Surface Water Quantity;
- Groundwater Quality and Quantity; and
- Aquatic Resources.

6.2 Reader's Guide to the Assessment Report

Each part of this section focuses on a valued component or intermediate valued component and is structured with the following headings:

- **Summary of Conuma's Assessment** – contains relevant background information, primarily found in the Amendment Application. It summarizes existing conditions, Conuma's assessment findings, proposed mitigation measures as provided in its Application for an EAC, and any supplemental information.
- **Key Issues Identified During Application Review** – describes key issues and concerns raised by Working Group members, including Indigenous nations, and the public during the application review period. Each description of a key issue or concern is typically followed by Conuma's response, including critical outcomes from any additional analysis. Many of the EAO's proposed conditions include mitigations to further address the issues described.
- **EAO's Assessment of Residual Effects** – contains the EAO's objective analysis of all information received from Indigenous nations, Conuma, the Working Group and the public; describes the EAO's understanding of residual adverse effects of the Amendment; and proposed conditions to address effects. This would also include the EAO's analysis and determination of residual cumulative effects, including past, present and reasonably foreseeable projects and activities with the potential to act cumulatively with the Amendment.
- **Conclusions** – summarizes the EAO's significance determination of the potential effects of the Amendment to this valued component, if applicable. A reference to the original EA's conclusion is also provided for valued components. Where the EAO does not conclude on significance of residual effects (for intermediate valued components), reference to the applicable valued component conclusions is provided.

6.3 Noise

Conuma's assessment included noise as an intermediate valued component as the effects on noise would move along pathways to influence other valued components. The Amendment has the potential to change noise levels from existing conditions, affecting human populations through a change in land use (for example, through avoidance of haul road) and impacting wildlife and wildlife habitat (for example, through sensory disturbance). The impacts of noise to wildlife and wildlife habitat (Section 6.16) and land use (Section 6.6) are considered in their respective sections.

6.3.1 SUMMARY OF CONUMA'S ASSESSMENT

The spatial boundaries of Conuma's assessment included the HDA and the Coal Haul Road. The LAA included these areas and a 1 km buffer around all sides. The RAA included these areas and a 3 km buffer. The noise valued component was assessed for the operations phase. The noise effects during construction, reclamation and closure phases were expected to be lower than operations and were therefore not assessed separately.

There are currently no regulatory limits for noise from mining operations in B.C. In the absence of regulations, the B.C. Oil and Gas Commission (OGC) Noise Control Best Practices Guideline 2018 (B.C. OGC 2018) provides a quantitative limit for human receptors that can be used as a guideline. For remote areas, the applicable nighttime permissible sound level is 40 A-weighted decibel level (dBA) at 1.5 km from the facility property line. There was no threshold of human annoyance in the B.C. OGC 2018 for blasting air overpressure[26], therefore international threshold levels of 115 linear decibel level (dBL) for mining practices were used to assess the effect. Conuma assessed the potential effects of noise by measuring equivalent sound pressure level measured in dBA for human receptors and air blast overpressure in dBL.

Conuma's assessment included a modelling study based on the equipment and infrastructure associated with year five of the mine plan, which was considered the worst-case year for noise as operations with the highest total coal production and waste mined would occur, and therefore the greatest noise emissions. The modelling demonstrated that noise levels associated with the Amendment in year five would be below the B.C. OGC 2018 noise threshold of 40 dBA at 1.5 km except for a few small areas to the west, for a total of 14 ha.

Blasting air overpressure was calculated for typical blasting within the Hermann Pit. Conuma's modelling predicted that the threshold level of 115 dBL would be largely within the LAA and would unlikely be perceptible beyond the RAA.

Conuma proposed the following key mitigation measures to reduce the potential impacts from noise:

- Maintain mobile equipment in good working order and properly muffled;
- Avoid idling of vehicles (such as, outside winter months);
- Conduct blast during the daytime only, and in the absence of atmospheric temperature inversions and strong directional winds; and
- Delay the time between blasts by at least 1 millisecond (ms) per 0.304 metres (m) distance between boreholes to avoid reinforcement of overpressure energy in the direction of initiation.

Conuma predicted that with the proposed mitigation measures, there would be a low magnitude residual effect from noise that would occur during operations only and be continuous and reversible.

6.3.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, comments were raised by the Working Group and

[26] Air blast overpressure is the additional pressure above normal atmospheric pressure that is generated from a blast.

Indigenous nations in relation to noise but only specifically in relation to wildlife. These are described further in Section 6.16 (Wildlife and Wildlife Habitat) of this Report.

6.3.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in the following residual adverse effects related to noise during operations: noise levels above B.C. OGC 2018 noise threshold of 40 dBA in an area of approximately 14 ha.

This residual effect is anticipated to be low magnitude, continuous, and reversible. It is also noted that the Amendment activities are a continuation of mining from the Wolverine Mine activities within the same region. As this is an intermediate valued component, these effects are addressed by conditions connected to other valued components, including wildlife and wildlife habitat and land use. As part of the Construction Environmental Management Plan (condition #6) and Operations Environmental Management Plan (condition #7), noise management will also be required.

6.3.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would result in residual adverse effects on the noise intermediate valued component. The effects on the noise intermediate valued component are carried forward to the related assessment of other valued components (land use, human health and wildlife) in this Report.

6.4 Vegetation

Conuma's assessment included vegetation as a valued component because the Amendment would have potential impacts on vegetation and ecosystems. Conuma assessed the following sub-components: rare plants, wetland ecosystems, riparian ecosystems, ecological communities of conservation concern, old forests, forest capability, black huckleberry habitat (a plant of cultural significance) and other plants of cultural significance.

6.4.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma identified the following potential effects on vegetation:

- Loss of vegetation (through direct effects of topsoil and vegetation clearing associated with mining, and development of infrastructure and access roads);
- Changes in abiotic[27] conditions necessary for vegetation development (through direct effects of

[27] Physical rather than biological.

ground disturbance and indirect effects of changes to hydrological conditions including drainage patterns, water quality and water quantity); and
- Changes in the structure or composition of vegetation communities (through direct effects of clearing vegetation and a variety of indirect effects occurring in edge areas adjacent to project disturbances and areas of activity).

The spatial boundaries of Conuma's vegetation assessment included the HDA and the Coal Haul Road. The vegetation LAA included a 1 km buffer around the HDA and a 200 m buffer on either side of the Coal Haul Road. These buffered areas were considered separately in the vegetation assessment as there would be no proposed clearing associated with the Coal Haul Road. The vegetation RAA was 94,100 ha in area and defined by the Wolverine Landscape Unit, corresponding to the watershed boundaries of the Wolverine and Murray Rivers, and included both the HDA and Coal Haul Road LAA.

The vegetation valued component was assessed for construction, operations, reclamation and closure and post-closure. Vegetation loss was expected to occur primarily during construction due to vegetation clearing and soil and overburden removal. During the operations phase, the progressive development of the mine infrastructure would cause additional incremental loss of vegetation and could prevent vegetation recovery. Conuma determined that effects on vegetation would primarily be concentrated during construction and operations, with little recovery anticipated during the operations and reclamation and closure phases and therefore combined them into a single scenario referred to as maximum build out. The EAO notes that the Early Works Amendment (Amendment #6) to the Wolverine Mine EAC already authorized the disturbance of 34.6 ha within the HDA.

Conuma used a number of existing data sources to understand the existing conditions in the region for vegetation, such as available provincial and federal data, data collected for the Hermann Mine and Murray River Coal Projects, Indigenous knowledge, scientific literature, and the results of ecosystem mapping conducted by Conuma.

Baseline vegetation and ecosystem field surveys were conducted for the Hermann Mine Project to complete Predictive Ecosystem Mapping and Terrestrial Ecosystem Mapping, rare plant surveys, and wetland surveys. Both the HDA and the LAA were situated nearly exclusively (99 percent) within one ecological community – a single bio-geoclimatic variant the Bullmoose Moist Very Cold Engelmann Spruce - Subalpine Fir Variant (ESSFmv2)[28] – which is an ecological community of conservation concern. No rare plant species were identified during field surveys and one red- and three blue-listed[29] plant species were identified to potentially occur in the HDA and LAA.

Conuma predicted that the Amendment would have the following effects on vegetation:

[28] ESSFmv2 is the vegetation site classification under the Terrestrial Ecosystem Mapping system
[29] Based on their conservation status rank, each species and ecosystem are assigned to the red, blue or yellow list to help set conservation priorities and provide a simplified view of the status of B.C.'s species and ecosystems. Red-listed are any species or ecosystem that is at risk of being lost (extirpated, endangered or threatened); blue-listed are any species or ecosystem that is of special concern; yellow-listed are any species or ecosystem that is at the least risk of being lost.

- Ecosystems of conservation concern: the permanent removal of 13.5 ha of ESSFmv2-06 forested habitat at maximum buildout, which is a 12.3 percent loss in the RAA, and two sedge fen wetlands, for a total of 1.0 ha. There would likely be additional indirect effects to these communities from disturbance along the edges of clearing and other surface disturbance such as changes to surface drainage as well as effects to long-term recovery of these ecosystems;
- Wetlands: direct removal of 7.9 ha of wetlands, representing 0.9 percent of wetland ecosystems in the RAA, and including two sedge fen wetlands which are an ecosystem of conservation concern;
- Riparian ecosystems: direct removal of 211.0 ha of vegetation surrounding the M20 and Nabors Creek drainages in the HDA;
- Old forest: no loss of old forest ecosystems;
- Black huckleberry habitat: loss of 362.0 ha of high potential productivity and 49.8 ha of very high potential productivity black huckleberry habitat;
- Forest capability: loss of 420.2 ha of moderate capability habitat and 42.0 ha of low capability habitat for forests;
- Plants of cultural significance: loss of 310.5 ha of moderate potential habitat and 145.0 ha high potential habitat for plants of cultural significance; and
- Indirect effects: the construction of water channels, creek diversions, and changes in soil moisture and nutrient availability post-closure could cause indirect effects on vegetation through potential changes in vegetation structure and composition in and adjacent to the LAA.

Proposed Mitigation Measures

Conuma proposed the following key mitigation measures to reduce potential effects on vegetation:

- The extent of permitted clearing boundaries within the HDA will be clearly delineated in the field;
- All recently disturbed areas will be revegetated as soon as practical to reduce the risk of invasive plant establishment and loss and degradation of soil;
- In the event a rare plant is detected through chance encounter, a sturdy and highly visible snow fencing buffer will be installed surrounding the plant or plant community;
- Conuma will verify that vehicles and machinery arrive to site in a clean condition, free of dirt that could transport plant seeds, and are maintained free of fluid leaks;
- Regular monitoring will be conducted to identify newly introduced invasive plant species; and
- Vehicle speed will be set at a limit considered suitable for dust reduction along the Coal Haul Road.

Potential Effects of the Amendment with Mitigation

Conuma identified that there would be a low to moderate magnitude effect on vegetation due to vegetation loss, changes in abiotic conditions, and changes in structure and composition of ecosystems, with a high magnitude effect to wetland ecosystems specifically. This effect would be generally restricted to the LAA, moderate to long-term in duration, regular to irregular in occurrence, generally reversible, and a moderate to high likelihood of occurrence, but would overall be not significant in the context of the LAA and given the proposed mitigation measures.

6.4.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the Working Group raised the following key issues related to vegetation, as summarized below.

Loss of wetland habitat

FLNRORD, SFN, and WMFN raised a concern that the B.C. Environmental Mitigation Policy regarding offsetting wetland habitat loss was not considered by Conuma. Conuma responded that the avoidance of sensitive and provincially listed ecosystems, including wetlands, was prioritized during design and siting of infrastructure. Where avoidance was not possible, Conuma noted that the proposed Vegetation Management Plan would address the protection of these ecosystems, including riparian and wetland ecosystems, to limit potential effects. SFN and WMFN requested that a Wetland Compensation Plan be included in the Vegetation Management Plan. Conuma responded that through ongoing consultation with Indigenous nations, including SFN and WMFN, Conuma will seek to further understand concerns with local wetland ecosystems and discuss opportunities to support measures to enhance the current state and function of wetlands. A Vegetation Management Plan will be required as part of the *Mines Act* permit application which will include wetland mitigation measures.

Impacts on plants of cultural significance

SFN and WMFN requested that Conuma address impacts to plants of cultural significance by planning directly with Indigenous nations, developing measurable reclamation targets, and engaging Indigenous nations further on the development of the Vegetation Management Plan and Reclamation Plan. Conuma indicated that these plans would be developed in consultation with SFN and WMFN as part of the permitting process and would also include mitigation measures to protect plants of cultural significance.

Additional concerns raised by the Working Group during the review of the Amendment Application were related to vegetation but covered in Section 6.20 (Reclamation) of this Report.

6.4.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in residual adverse effects on vegetation, including:

- Direct effects to vegetation, including the loss of vegetation through removal, including loss of wetlands and potentially loss of plant species of cultural significance; and
- Indirect effects to vegetation, including changes in hydrology and surface drainage, increase in dust, and change in abiotic conditions.

These residual effects are anticipated to be low to moderate in magnitude, generally restricted to the LAA, moderate to long-term in duration, regular to irregular in occurrence, and generally reversible, with a moderate to high likelihood of occurrence.

The EAO has proposed the following condition related to vegetation to reduce the potential residual effects on vegetation:

- Condition #6: Construction Environmental Management Plan, including mitigation measures to address invasive plant management and site restoration; and
- Condition #16: End Land Use Plan, to require Conuma to develop a plan for vegetation and ecosystems following closure, in consultation with Indigenous nations.

The Vegetation Management Plan and Reclamation Plan will be considered further in the *Mines Act/Environmental Management Act* application review process.

Cumulative Effects

Cumulative effects on vegetation from industrial development were present at baseline. Mining, energy (oil and gas facilities and pipelines), agriculture, forest harvesting, transportation (roads and rail lines), power (transmission lines), recreational areas, and urban development exist within the RAA. Additional forestry activities, new road development, oil and gas exploration, and coal exploration are also proposed in the RAA in the future and will likely contribute further to residual effects on vegetation resources.

Conuma identified several past, present and reasonably foreseeable future projects and physical activities that are within the vegetation RAA that are likely to interact cumulatively with the Amendment's effects. With mitigation, the overall cumulative effect on vegetation from the loss of vegetation was characterized to be an adverse effect that is low in magnitude, occurred at the scale of the RAA, long term, irregular, irreversible, and a high likelihood of occurrence. Conuma assessed the overall cumulative effect on vegetation loss to be not significant. No cumulative effects for potential effects to abiotic conditions or change in structure or composition on vegetation were identified by Conuma.

With mitigation, the EAO predicts that the overall cumulative effect on vegetation from the loss of vegetation would be an adverse effect that is low in magnitude, long-term, irregular, reversible to irreversible, and a high likelihood of occurrence. The overall cumulative effect on vegetation loss in the region is considered not significant.

6.4.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding if this Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would not have significant adverse effects on vegetation.

6.5 Cultural Heritage

Conuma's assessment included archaeological and cultural heritage as a valued component due to its importance to understanding past human activity in the region, particularly as it is related to Indigenous

use and history. This section is focused on archaeological and cultural heritage as considered under the B.C. *Heritage Conservation Act*. A detailed assessment of the impacts to Treaty rights and interests is provided in Section 7 of this Report.

6.5.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma assessed the following potential effect on cultural heritage: construction activities within the HDA would result in ground disturbance and tree removal that would have the potential to affect cultural and heritage resources, including the loss of information about or alteration of site contents or context.

The spatial boundaries of Conuma's assessment included the HDA as this represents the maximum extent of disturbance. The LAA included the HDA and the Coal Haul Road. The RAA included a 10 km buffer around the LAA. The cultural heritage valued component was assessed for construction, when vegetation removal and surface disturbance would occur which could potentially damage sites.

No recorded archaeological sites were found within the HDA or LAA. Conuma determined that any cultural and heritage resources within the LAA would likely consist of small lithic scatters or culturally modified trees, located in lower-altitude, elevated terrain on localized, level landforms (such as knolls, ridges, terraces or riverbanks), and often associated with a water source. Sixteen archaeological sites (including two culturally modified trees) were recorded within the RAA[30].

Conuma proposed the following key mitigation measures to reduce potential effects on cultural heritage:

- Implement the Archaeological Chance Finds Protocol (provided in Appendix 4.10-E of the Amendment Application) to protect any cultural features or sites found during construction;
- Protect any cultural heritage sites identified using flagging or fencing; and
- Educate staff and contractors about the importance of cultural heritages sites.

Conuma assessed the potential impact on cultural heritage, following mitigation, to be negligible and not significant.

6.5.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

No comments directly on this valued component were raised by the Working Group or Indigenous nations. Related comments are addressed in Section 6.7 (Socio-community) and Section 7 (Assessment of Impacts to Treaty Rights and Interests).

6.5.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result

[30] Additional details were provided in Table 4.2-1 of the Amendment Application.

in negligible adverse effects on cultural heritage. As part of the Construction Environmental Management Plan (condition #6), a Chance Find Protocol and Protection of Archaeological and Heritage Sites will be required to protect any cultural heritage features or sites identified during construction.

6.5.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding if the Amendment is issued) and subsequent permitting, the EAO is of the view that the Amendment would not have significant adverse effects on cultural heritage.

6.6 Land Use

Conuma's assessment included land use as a valued component because of the potential interactions of the Amendment with land use activities, including tenured (such as forestry, trapping, and guide outfitting) and non-tenured land use (such as outdoor recreation). The Amendment would be located within the Municipality of the District of Tumbler Ridge, and crown lands in this region are managed through zoning bylaws and the District of Tumbler Ridge Official Community Plan.

6.6.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma assessed the following potential effects on land use:

- Change in park or protected areas land use, where the Amendment may interact with management or use of park or protected areas;
- Change in private property and tenured land use, where the Amendment may remove or affect the access to or quality of experience for private property owners or tenured land uses; and
- Change in non-tenured land use, where the Amendment may remove or affect the access to or quality of experience for non-tenured land uses.

The spatial boundaries for this assessment included the HDA and the Coal Haul Road. The LAA included these areas plus a one km buffer. The RAA included the areas and the Dawson Creek Land and Resource Management Plan area. The land use valued component was assessed for construction, operations, reclamation and closure.

The Coal Haul Road would intersect one private and four Crown provincial lands properties. No parks or protected areas overlap with the LAA, but the RAA overlaps 20 provincial parks, one regional park, two ecological reserves and 69 recreational sites and trails areas. Land tenures in the LAA include coal, forestry, oil and gas, electrical and wind development, coal, quarrying, two guide outfitting areas and one registered trapline. In the RAA, there are also range tenures, forestry, oil and gas, electrical and wind development, coal, quarrying, guide outfitting and registered traplines.

Non-tenured land uses in the LAA and RAA include hunting and trapping, fishing, vegetation gathering and berry picking activities. Indigenous land use in the LAA and RAA are described in more detail in Section 7 (Assessment of Impacts to Treaty Rights and Interests). Many local municipalities also have recreational opportunities through parks, trails, and boat launches, local rivers for boating and other forms of water-based recreation, snowmobiling, camping, boating and canoeing, hiking, biking and golfing. These recreational opportunities are related to attracting tourism in the area as well.

Amendment-related vehicle traffic (including traffic along the Coal Haul Road) would be generated through the movement of workers, equipment, and materials to and from the HDA, which would increase demand on local roads and highways. Conuma estimated that construction related traffic would generate up to 200 round trips on local roads and highways and approximately 266 round trips per day on the Coal Haul Road during the 8-month construction period. Conuma expected this to exceed 6-year highs at 8 of 25 traffic monitoring stations within the RAA. Vehicle traffic during operations along local roads and highways is expected to replace, and not exceed, current volumes that are associated with the Wolverine Mine.

Conuma proposed the following key mitigation measures to reduce the potential effects to land use:

- Develop a Public Engagement Plan, including consultation with tenure holders in the HDA, to facilitate ongoing and engagement including, communication of Amendment information, and monitoring, recording, and addressing of complaints and concerns;
- Prioritize local contracts, business opportunities, and employment;
- Develop a Traffic Management Plan to promote the safe use of public roads, including the use of radio control procedures, and address changes in access to private and crown lands;
- Work with the District of Tumbler Ridge and local recreational clubs to discuss public access to the summit of Hermann Mountain; and
- Prohibit workers from storing hunting or fishing gear onsite.

With the proposed mitigation measures and given the existing context of vehicles and construction equipment using the existing public roads, Conuma assessed the potential impacts on land use to be low to moderate in magnitude during construction due to the small increase in traffic and moderate in magnitude during operations related to increased use of the public roads, noting that this use would be approximately equal to the current vehicle traffic from Wolverine Mine. Conuma noted that the increased presence of traffic including coal haul trucks may cause members of Indigenous nations and the public to avoid the Coal Haul Road or increase public access to areas off the Coal Haul Road. Conuma noted there would resilience in the local land use, given the Amendment would be located in an area where mining operations are common, and that the effect would be reversible following the closure of the mine and would be non-significant.

6.6.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

No comments on this valued component were raised by the Working Group – related comments are

addressed in Section 6.7 (Socio-Community) and Section 7 (Assessment of Impacts to Treaty Rights and Interests).

6.6.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in the following residual adverse effects on land use: an increase in traffic along the Coal Haul Road during construction and operations and a potential for Indigenous and other users of lands to avoid areas along the Coal Haul Road and nearby public roads where coal haul trucks from Wolverine Mine would continue to operate. These effects are anticipated to be low to moderate in magnitude during construction due to the small increase in traffic and moderate in magnitude during operations related to increased use of the public roads. These effects would also be restricted to the LAA, regular, continuous, reversible, and with a moderate to high likelihood of occurrence.

These effects would be addressed by the following conditions proposed by the EAO:

- Condition #6: Construction Environmental Management Plan, including traffic management;
- Condition #7: Operations Environmental Management Plan, including traffic management; and
- Condition #9: Indigenous-Led Monitoring Plan, to understand the impacts on Indigenous users of the roads.

Conuma assessed potential cumulative effects on land use where the Amendment was predicted to overlap with effects from other existing or reasonably foreseeable Amendments, such as noise, dust, direct loss of use of lands, controlled access, development of lands, and change in the quality of user's experience. The Amendment was predicted to act cumulatively with other existing and predicted land users of the roads in the area, specifically along the Coal Haul Road directly during construction and indirectly during operations, impacting guide outfitting, trappers, recreation, and consumptive use (berry-picking, hunting, and fishing) in the LAA. This cumulative effect would be on those users of areas immediately adjacent to the Coal Haul Road and access roads off the Coal Haul Road, be moderate in magnitude and long-term in nature, but reversible. Given the existing socio-economic context in the RAA and the existing Wolverine Mine, Conuma assessed the impacts to be not significant.

The EAO agrees that potential cumulative effects on land use along the Coal Haul Road would be not significant in the regional context.

6.6.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding if the Amendment is issued) and subsequent permitting, the EAO is of the view that this Amendment would not have significant adverse effects on land use.

6.7 Socio-Community

Conuma's assessment included socio-community as a valued component because the Amendment could increase demand for accommodation, community infrastructure and services, and transportation infrastructure.

6.7.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma assessed the following potential effects of the Amendment on socio-community:

- Change in community infrastructure and services, where the Amendment may affect the resident and transient population and demand for infrastructure and services such as wastewater treatment capacity, emergency service call volumes and health care capacity;
- Change in accommodation availability, where the Amendment may change the local population and demand for infrastructure and services through vacancy rates, cost of accommodation and shelter-to-income ratios;
- Change in transportation infrastructure, where the Amendment may induce changes to road, air and rail traffic volumes as a result in changes to population and demand for infrastructure and services; and
- Change in community health and wellness, where the Amendment may affect food security through the loss of or change in land and resources.

The spatial boundaries of Conuma's assessment included the HDA. The LAA included communities within the Peace River Regional District that were within 100 km of the HDA. The socio-community valued component was assessed for construction, operations, reclamation and closure.

Conuma conducted a socio-community survey in summer 2019 that collected information on existing conditions, issues and concerns and perceived benefits of the Amendment. The survey was administered to local workforce, families and other community stakeholders, at various locations around Tumbler Ridge and Chetwynd and at Conuma's three mine sites. Conuma received 338 completed surveys and stated that 90.9 percent of respondents have positive feelings towards the Amendment.

Conuma described that the population in the LAA increased by 2.0 percent between 2011 and 2016, with an Indigenous population increase of 52.2 percent to 4,415 people. In 2016, Indigenous persons represented 17.8 percent of the total LAA population. However, population decreases during this time were experienced in the District of Tumbler Ridge and the District Municipality of Chetwynd, with a decrease of 26.7 percent and 5.0 percent respectively. Conuma reported that transient workers in this region are often employed in considerably higher numbers than the permanent residents of the local communities. This is due to industrial projects that usually house workers in work camps or rental accommodations. In 2012, Northern Health estimated that there were 1,674 industrial work camps within the Northeast Health Service Delivery Area. Labour requirements for the Amendment could result in a population increase with the in-migration of workers and their families; however, Conuma expected that the transition of existing employees from the Wolverine Mine to this Amendment would not cause 'net

new' changes to employment. Conuma expected the impacts to population in the LAA to be low in magnitude and population effects to be negligible.

Conuma proposed the following key mitigation measures to avoid or reduce adverse changes in transportation infrastructure:

- Develop and implement a Public Engagement Plan to facilitate ongoing and meaningful engagement including project information (including location and timing of Amendment activities), and monitoring, recording and addressing complaints and concerns; and
- Develop a Traffic Management Plan to address Amendment-related changes within the HDA and along the Coal Haul Road.

The Amendment Application noted that food security is a key determinant of health and can be affected through a change in consumptive land use and the cost and availability of market foods. Amendment-related employment could increase access to market foods through an increase in household income, and decrease time spent engaging in consumptive land use. Adverse effects related to the consumption of country foods are assessed under the Human Health valued component in the Application. Additional mitigation measures found in Section 6.3 (Noise), Section 6.14 (Fish and Fish Habitat), Section 6.4 (Vegetation), Section 6.16 (Wildlife and Wildlife Habitat), Section 6.6 (Land Use), Section 6.8 (Economy and Employment) and Section 6.17 (Human Health) were also considered where effects to community health and wellness is linked.

Conuma predicted that with the proposed mitigation measures, there would be a low magnitude residual effect on socio-community, extend during construction and operations, and be reversible following reclamation.

6.7.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, no comments were raised by the Working Group and Indigenous nations in relation to the socio-community valued component.

6.7.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that this Amendment would result in the following residual adverse effects on socio-community: increase in movement of workers, equipment and materials resulting in an increase in traffic and demand on local infrastructure; increase in availability of food in the local context; and an increase in pressure on country foods due to increased hunting and gathering. These effects are anticipated to be of low magnitude, extend during construction and operations, and be reversible following reclamation.

The EAO proposes the following conditions related to the effects on socio-community:

- Condition #6: Construction Environmental Management Plan, which would include traffic

management and access management;
- Condition #7: Operations Environmental Management Plan, which would include traffic management and access management; and
- Condition #8: Public Information, which would require Conuma to create and maintain a dedicated Project website to provide information to the public on relevant safety information and respond to public concerns regarding the Project.

Conuma assessed potential cumulative effects on socio-community where the Amendment was predicted to overlap with effects from other existing or reasonably foreseeable projects. The Amendment was predicted to cumulatively affect transportation infrastructure (due to increased traffic) and community health and wellness (due to changes to food security) during construction, and community health and wellness during operations. However, given the socio-economic context in the RAA, Conuma assessed the cumulative impacts to be not significant.

The EAO agreed that potential cumulative effects on socio-community would be not significant in the regional context.

6.7.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding if the Amendment is issued), the EAO is of the view that this Amendment would not have significant adverse effects on socio-community.

6.8 Economy and Employment

Conuma's assessment included economy and employment as valued components due to the economic conditions that would be impacted by this Amendment. Conuma expressed that if this Amendment does not proceed, existing operations at the Wolverine Mine would likely cease, adversely affecting the regional labour force and economy.

6.8.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma assessed the following potential effects of the Amendment on economy and employment:

- Change in regional labour force, including direct employment and indirect/induced employment from the Amendment;
- Change in regional business through increased spending on goods and services; and
- Change in regional economy through induced effects of Amendment spending on local consumer goods and services.

The spatial boundaries of Conuma's assessment included the HDA. The LAA included communities within the Peace River Regional District that were within 100 km of the HDA. The economy and employment

valued component was assessed for construction, operations, reclamation and closure.

Conuma assessed that unemployment in the LAA and RAA were higher than average provincial rates, with an increase in unemployment by approximately six percent between 2011 and 2016. Industrial activities such as mining, quarrying and oil and gas represented the third largest source of employment in the region, with retail trade and construction representing first and second sources. These trends were found to be comparable when looking at the Indigenous industry-based labour force as well.

Incomes in the region were found to be higher than overall provincial averages, specifically in the Peace River District E, but for Indigenous residents, the opposite was found to be the case. Conuma estimated the contribution of the LAA to B.C.'s Gross Domestic Product to be approximately $1.4 billion ($3.3 billion in the RAA) in 2018.

Conuma proposed the following key mitigation measures to reduce the potential adverse effects of the Amendment on economy and employment:

- Advertise locally for job opportunities and contracts;
- Require bidders for contracts with Conuma to disclose their policies and practices for providing opportunities to local businesses and residents, and encourage them (or their subcontractors) to hire locally; and
- Identify local skills shortages, and support training and apprenticeship programs for local residents.

Conuma estimated that at peak workforce during operations, the Amendment would directly employ 345 workers for eight years, with 480 person-years of employment in the LAA and 570 person-years in the RAA from Amendment-related employment. Additionally, an estimated 210 workers would be employed for the eight-month construction phase and 75 workers during the two-month reclamation and closure phase. Indirect and induced employment would continue from what is currently available from the Wolverine Mine. With the proposed mitigation measures, Conuma predicted that there would be an overall positive effect on local economy and employment.

6.8.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

No comments directly on this valued component were raised by the Working Group or Indigenous nations.

6.8.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that there would be no residual adverse effects on the local economy and employment. No conditions have been proposed by the EAO related to economy and employment.

6.8.4 CONCLUSIONS

Considering the above analysis, the EAO is of the view that this Amendment would not have significant adverse effects on economy and employment.

6.9 Air Quality and Greenhouse Gases

6.9.1 SUMMARY OF CONUMA'S ASSESSMENT

Air quality was identified as an intermediate valued component, as the Amendment would result in the release of air contaminants from vehicles, ore processing, mine activities and fugitive sources. The effects on air quality would move along pathways to influence other valued components. The results from the air quality effects assessment were thus carried forward to the assessment of vegetation (Section 6.4), wildlife (Section 6.16), and human health (Section 6.17). Conuma also assessed greenhouse gas (GHG) emissions that could result from the Amendment, which are considered and summarized in this section of the Report.

Existing Conditions

To assess the effects of the Amendment on air quality, Conuma assessed the following criteria air contaminants (CACs): carbon monoxide (CO), nitrogen oxides (NOx), sulphur dioxide (SO_2), total suspended particulate (TSP), particulate matter with diameter below 10 µm (PM_{10}), and particulate matter with diameter below 2.5 µm ($PM_{2.5}$). Conuma also assessed the following GHG emissions: carbon dioxide (CO_2), nitrous oxide (N_2O) and methane (CH_4). CH_4 and N_2O were expressed as equivalent CO_2 in Conuma's analysis.

Conuma assessed the effects of coal processing from the Perry Creek Pit and Hermann Pit at the Wolverine Mine processing plant, the HDA, the Coal Haul Road, and storage of tailings and coarse coal rejects at the Perry Creek Pit. The LAA/RAA included the Wolverine Mine, the proposed operations at the HDA, as well as the Coal Haul Road connecting the Wolverine Mine and the HDA and a buffer area. Air quality was only assessed for the operations phase, as emissions from construction, reclamation and closure, and post-closure were predicted in the Application to be negligible.

As there were no ambient air quality stations within the LAA/RAA, baseline air quality and meteorological conditions were developed using representative monitoring sites in B.C. and Alberta.

The climate of the area is typical of northeast B.C. with expected seasonal variation in temperature and precipitation. This region of the province is characterized by severely cold, heavy snowfall winters and hot, dry summers. Winds are typically from the west with most wind speeds averaging around 2.0 metres per second or below. The climate in the area is a mixture of highland at higher levels and subarctic at lower levels. The average annual precipitation in the area is above 400 mm and can be higher than 700 mm.

Conuma noted that existing ambient air quality in the study area is generally below provincial and federal

ambient air quality objectives (AAQOs)[31] or guidelines. AAQOs are non-legally binding limits on the acceptable presence of contaminants in the atmosphere, established by government agencies to protect human health and the environment. Exceedances of the AAQOs do not necessarily represent a significant effect, as the magnitude and duration of the exposure is an important factor in understanding air quality effects.

Conuma noted that where measurements indicated that AAQOs had been exceeded, in some instances, this was attributed to local particulate sources or the influence of forest fires, which are discussed in further detail in Section 6.19 (Effects of the Environment on the Amendment).

In the Amendment Application, Conuma noted that the Amendment would result in the release of emissions to the atmosphere from diesel-burning heavy equipment (including coal trucks, loaders, and bulldozers) and particulates from both fugitive and point sources[32]. Air emissions were anticipated to include: CO, NOx, SO_2, TSP, PM_{10} and $PM_{2.5}$.

The majority of air emissions from the existing, operating Wolverine Mine is fugitive dust from mining operations such as: blasting, bulldozing, movement of waste rock material or coal and activities that expose erodible surface areas. Operations at the Wolverine coal processing plant (such as loading, unloading, bulldozing, screening and conveying) also contribute fugitive dust emissions. A fluidized bed coal dryer, while not used frequently, is located at the Wolverine coal processing plant and emits particulate matter as well as products of combustion such as NOx, SO_2, volatile organic compounds (VOCs) and GHGs. The two point sources of particulate emissions are the train coal loadout bin and raw coal silo stacks.

The primary fugitive dust emission source associated with HDA operations would be raw coal hauling from the mine to the Wolverine coal processing plant, which would involve 40 tonne trucks driving along the 26 km long coal haul road between the Wolverine Mine and the HDA. There would also be fugitive dust from mining operations at the HDA, similar to those noted above for the Wolverine Mine. Conuma did not include other HDA emissions in the assessment based on advice from ENV, since it was anticipated that the primary effect to air quality would occur at the Wolverine coal processing plant.

Conuma noted the potential effects of the Amendment on air quality would be changes in the ambient concentrations of the CACs mentioned and dust and GHG emissions. Consistent with ENV's recommended approach and direction, Conuma did not assess VOCs, as the total VOC emissions from the Amendment were estimated by Conuma to be negligible (less than 0.1 g/s).

At sufficiently high concentrations, CACs can have direct and indirect effects on animals, vegetation, humans, soil and water, including a change in the quality of the ambient air. Indirect effects include

[31] Listed in Table 3.1-1 of the Amendment Application, the provincial and federal AAQOs used in the assessment include the air quality management system developed by the Canadian Council of Ministers of the Environment in 2012 and AAQOs adopted or updated by B.C. under the *Environmental Management Act* (2003) (EMA). In 2018, the provincial AAQOs were updated to align with Canadian Ambient Air Quality Standards, and there are additional standards that are planned to be introduced in 2025.

[32] Stationary sources of emissions

contaminants being captured by vegetation, consumed by wildlife and potentially consumed by humans. Suspended particulate from coal that is deposited on the ground may contain trace metals, which can also affect vegetation, wildlife and humans.

To understand potential impacts to air quality, Conuma developed an air quality dispersion model, including inputs from calculated emission factors, secondary aerosols formed through oxidization such as sulfate and nitrate, both local and modelled meteorological data and information from previous EAs. The dispersion model was developed according to the methods outlined in the *British Columbia Air Quality Dispersion Modelling Guideline* developed by ENV in 2015, in consultation with ENV and with Northern Health in reference to Health Human Risk Assessment (HHRA) requirements. ENV did not require dispersion modelling for the HDA, as most emissions generated at the HDA would be fugitive dust, which are highly uncertain and lead to unreliable modelled concentrations unsuitable for effects assessment.

As the Amendment would be relatively remote and there was no air quality monitoring within the study area, data were selected from the three nearest monitoring stations (SO_2 Pine River 2017 data, NO_2 Beaverlodge 2018 data, and CO Fort St. John North Camp 2018 data). Modelled ambient air quality concentrations and established baseline concentrations were assessed against provincial and federal ambient AAQOs or guidelines to understand the potential effect on air quality.

The following sections describe Conuma's assessment of the potential effects of the Amendment on air quality and GHGs.

Change in Air Quality

Conuma provided the results for four modelling scenarios and results for air quality which are outlined in Section 3.1 of the Amendment Application. Scenarios three and four were those that would most likely reflect the changes in air quality as a result of the Amendment. The third scenario, which represented the 'normal' case, assumed that the production capacity of the Wolverine Mine would be increased to 3.0 Mtpa with coal being trucked from the HDA. The fourth scenario was a conservative estimate that assumed the increase in production capacity, the production of coal from the HDA, as well as that the coal dryer at the Wolverine coal processing plant would be operating continuously (which would be more likely to operate for 300 days/year so was considered conservative).

Conuma provided a summary of model predictions for maximum point of impingement, where the highest concentration of a contaminant would be expected to occur, and special receptors (16 receptors located around wetlands south from the Wolverine Mine footprint). Modelling results were compared to the provincial AAQOs and national objectives.

The modelled concentrations demonstrated that the vast majority of the contaminants did not exceed the AAQOs. For the most likely scenarios that would result from the Amendment (Scenarios three and four), the modelling demonstrated that the predictions of maximum 24-hour PM_{10} and TSP and annual average TSP were higher than objectives. These elevated concentrations of NO_2, CO, PM_{10}, and TSP would cover a small area and predictions were limited to the Wolverine Mine area.

Change in GHGs

Stationary combustion sources including propane heaters, transportation emissions and coalbed CH_4 emissions would emit CO_2, CH4, and N_2O, with the highest emissions predicted during operations. The annual consumption of diesel fuel was estimated conservatively, assuming that equipment would operate 24 hours a day and 365 days a year.

The highest GHG emission sources for the Amendment activities at the Wolverine Mine would be coal bed CH_4 from the surface of the mine (53.3 percent) and diesel burning from heavy equipment and vehicles (44.4 percent). Gasoline burning equipment and propane emissions in terms of CO_2 equivalent tonnes/year were predicted to be below 2.3 percent. Total annual emissions would be approximately 230 thousand tonnes/year.

Within the HDA, total emissions were predicted to be approximately 340 thousand tonnes per year. The highest GHG emission sources would be coal bed CH_4 from the surface of the mine (51 percent) and diesel burning from heavy equipment and vehicles (46.7 percent). Gasoline burning equipment (mainly smaller trucks) and stationary combustion (propane) emissions in terms of CO_2 equivalent tonnes/year would be below 2.4 percent.

While there is an increase in GHGs relative to existing conditions, the volume would be small. Conuma noted that emissions from the Amendment would account for 0.36 percent and 0.031 percent of provincial and national emissions inventory, which Conuma considered to be negligible.

Proposed Mitigation Measures

Conuma proposed several mitigation measures to reduce the effects of the Amendment on air quality, as well as triggers for adaptive action, which were discussed in the draft Hermann Fugitive Dust Management Plan in the Amendment Application, which would be required during permitting. Key mitigation measures included:

- Limiting vehicle speed to 60 km/hr for the Coal Haul Road;
- Watering the haul road, applying chemical dust suppressants, and increasing watering during very dry and hot conditions if necessary to reduce dust;
- Watering stockpiles and other mine waste operations during very dry and hot conditions;
- Blasting during daylight hours and avoiding blasting during very low wind conditions;
- Checking coal haul truck box covers covering raw coal during transport from HDA to the Wolverine coal processing plant and covering empty boxes during travel along the Coal Haul Road;
- Regularly performing maintenance on equipment;
- Replacing end-of-life-span equipment with new energy and emission efficient engines, where feasible;
- Minimizing idling time, depending on the weather; and
- Efficiently using equipment and applying good GHG management practice (training, tracking, and recording).

Conuma stated that the mitigation measures would be effective almost immediately once in place and the recommended triggers outlined in the management plan would ensure timely application of mitigation measures so that effects would be limited in duration.

Potential Effects of the Amendment

Overall, Conuma identified a high likelihood of potential effects on air quality from changes in ambient concentrations of contaminants of concern. These were associated with the exceedances in Scenarios one, two, three and four for NO_2, PM_{10} and TSP at the maximum point of impingement related to the Wolverine coal processing plant, conservatively assuming the plant and all equipment were operating at maximum capacity all year (whereas operating at approximately 300 days/year would be more likely).

For contaminants of concern, Conuma identified moderate adverse residual effects during the operations phases within the LAA/RAA, occurring close to the emissions sources (processing plant, Coal Haul Road, and the HDA) and decreasing with distance. Despite that most emission sources would be continuous; the exceeding concentrations were irregular in frequency depending on meteorological conditions. Conuma stated that the likelihood of the residual adverse effects is low to moderate, related to the conservative assumption that the Wolverine coal processing plant and all equipment would be operating at maximum capacity 365 days per year.

For GHGs, Conuma identified negligible adverse residual effects, as the emissions would be very small compared to provincial and national total emissions. Conuma noted that GHG emissions would occur continuously over the life of the mine.

Conuma considered the residual adverse effects on air quality to be reversible and the ambient air quality was expected to revert to its original state after operations.

6.9.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During the review of the Amendment Application, reviewers raised several issues related to the air quality assessment. Concerns related to potential effects on air quality that would impact vegetation are described in Section 6.4 (Vegetation); potential effects on air quality that would impact wildlife health are described in Section 6.16 (Wildlife); and potential effects on air quality that would impact human health are described in Section 6.17 (Human Health).

The remaining issues are summarized below.

Uncertainty in the Assessment

Reviewers from ENV, HRFN, SFN, WMFN and Northern Health questioned the air quality data that was used in the air quality assessment. Reviewers noted that the data used was collected from monitoring stations more than 100km away and that dustfall analysis was not included.

Conuma noted that there were no ambient air quality stations within the LAA/RAA. As monitoring data near the Wolverine Mine was limited to dustfall, existing conditions were determined from PM_{10}/$PM_{2.5}$ continuous monitoring data. Conuma also explained that dustfall analysis was not included in the assessment, as it has limited application in human health assessments and ENV recommended that continuous monitoring for PM was more appropriate to assess fugitive dust deposition.

Reviewers from ENV, HRFN and Northern Health also expressed concerns that the discussion related to TSP, PM_{10} and $PM_{2.5}$ modelling predictions was focused solely on the concentrations after application of a 75 percent forest cover mitigation factor. Reviewers requested further justification for the use of the mitigation factor, as it was unclear how the actual value was derived. Ultimately, reviewers did not accept the use of this mitigation factor. However, the reviewers also acknowledged that there is overall uncertainty and low level of confidence in the modelled predictions of fugitive dust in all mine projects.

Given the uncertainty, Conuma indicated that it would install four new air quality monitoring stations: two at Hermann (upwind and downwind of sources) and two at Wolverine (upwind and downwind of sources in the area where the highest particulate concentrations were predicted in their Amendment Application. The EAO notes that the submission of a Fugitive Dust Management Plan is a requirement of the EMPR/ENV production permitting process, which would outline additional mitigation measures (if required) to reduce fugitive dust emissions associated with mining and related activity.

In September 2020, Conuma provided a memo outlining changes to their assessment based on the new proposed primary mitigation for water treatment (see Section 6.12). This change required the inclusion of four diesel powered generators to provide power for the works. Conuma provided additional information about the air quality assessment, to which ENV reviewers outlined further issues with Conuma's air quality modelling, including that:

- The model was not conducted using a standard approach consistent with the B.C. Dispersion Modelling Guideline by not providing the model plan to ENV in advance of the work being conducted;
- The modelling assumed that the generators would be running 100 percent of the time, not typical of the generator usage which combined with the worst-case meteorology makes for a conservative model and indicates that actual impacts are lower than model outputs indicate; and
- Emissions from generators of this type when used for mining operations do not require a permit from ENV.

In recognition of reviewers' concerns related to the uncertainty in the air quality assessment, the EAO has also proposed a condition (#10) that requires the development of an Air Quality and Emissions Management Plan. This plan includes requirements for Conuma to develop a plan for air quality management and dust control in consultation with ENV, EMLI, Northern Health and Indigenous nations. The plan would require, at minimum, measures to mitigate air emissions and generator emissions. The EAO further recognized that additional requirements would be developed during the permitting process.

6.9.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that this Amendment would result in a decrease in air quality due to increased contaminants of concern.

The EAO noted that Conuma's predictions demonstrated that maximum NOx, SO_2, TSP and PM levels resulting from the Amendment would increase with respect to existing conditions and exceed the provincial and federal objectives in some scenarios. However, the EAO recognizes that these high concentrations were predicted at the boundary line and in small areas near the Wolverine Mine.

To address the residual effects and in recognition of the uncertainty in the air quality modelling, the EAO has proposed the following condition to reduce the potential residual adverse effects on air quality:

- Condition (#10): Air Quality and Emissions Management Plan, requiring the development of a plan for air quality management and generator emissions in consultation with ENV, EMLI, Northern Health, and Indigenous nations. The plan must include the means by which ambient air quality modelling and meteorological modelling would be implemented.

Cumulative Effects

Conuma did not conduct a cumulative effects assessment for air quality, stating there are no active neighboring industrial sources and no future industrial sources nearby that have a confirmed planned start date. Conuma noted that emissions from other projects in the RAA have negligible (such as the CNRL Murray River compressor station or CNRL Mast compressor station) or almost zero emissions (such as the Tumbler Ridge Wind Energy Project).

While Conuma did not identify any active or future industrial sources had the potential to interact cumulatively with the Amendment, the EAO noted that the Sukunka Mine Project (Sukunka) is currently in the EA process and would be within 15 km of the East Bullmoose Pit. Further, the East Bullmoose Pit is authorized by the Wolverine EAC but is currently undeveloped. Future predicted ambient air concentrations would include Sukunka (should it receive an EAC) and the East Bullmoose Pit (should enter the permitting process for development).

6.9.4 CONCLUSIONS

Based on the EAO's assessment of residual and cumulative effects and the mitigations proposed by Conuma, the EAO has proposed an additional condition to mitigate these effects, Condition #10: Air Quality and Emissions Monitoring Plan.

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding if this Amendment is issued) as well as subsequent permitting, the EAO is of the view that the Amendment would have residual adverse effects on air quality.

The effects on the air quality intermediate valued component are carried forward to the related assessment of other valued components (vegetation, wildlife and human health) in this Report.

6.10 Groundwater Quantity and Quality

6.10.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Groundwater quantity and quality was selected as an intermediate valued component, as mining activities can affect the quantity (rates of flow) and quality of the groundwater. The effects on groundwater quantity and quality would move along pathways to influence other valued components. The results from the groundwater quantity and quality effects assessment were inputs into the assessment of surface water quantity (Section 6.11), surface water quality (Section 6.12), aquatic resources (Section 6.13), fish and fish habitat (Section 6.14) and human health (Section 6.17).

Conuma assessed the following aspects of groundwater quantity: geology, lithology, structural geology, hydrogeological units, hydraulic conductivity, groundwater levels, hydraulic gradients, and groundwater flow directions. Conuma assessed the following for groundwater quantity and quality: field measurements (including pH, temperature, oxidation-reduction potential, turbidity, total suspended solids, specific conductance, and dissolved oxygen), major ions, trace metals, nutrients, hardness, total organic carbon and physical parameters.

The LAA included the Wolverine Mine (which included the Perry Creek Pit due to the placement of coarse coal rejects and tailings generated from processing of Hermann coal) and the HDA. Key drainages included the Wolverine River, Perry Creek, M20 Creek, Nabors Creek, South Hermann Creek, M14 Creek and the Murray River. The RAA included both the Wolverine Mine and the HDA as well as an area around the Wolverine Mine and the HDA to capture the extent of the effects on the key drainages. The Coal Haul Road connecting the Wolverine Mine to the HDA were not included in the groundwater quantity and quality assessment, as Conuma predicted that the Coal Haul Road would have a negligible effect on groundwater. The groundwater quality and quantity valued component was assessed for only operations and post-closure, as construction and reclamation activities were not expected to impact groundwater.

Four potential pathways of effect on groundwater quantity and quality were identified by Conuma in the Amendment Application, including:

- Alteration of local scale hydraulic conductivity of the bedrock through blasting;
- Alteration of groundwater flow directions and gradients;
- Elevated concentrations of parameters of potential concern; and
- Groundwater withdrawal for use during operations.

To describe existing conditions at the operating Wolverine Mine, Conuma primarily relied on the

Wolverine Mine EA Application submitted by Western Canadian Coal Corporation in 2004, supplemented with additional more recent and ongoing groundwater sampling and monitoring.

To describe existing conditions at the HDA, Conuma relied on the Hermann Mine Project EA Application submitted by Western Canada Coal Corporation in 2007[33]. This information was supplemented by more recent data collected by Conuma in 2018 and 2019. The hydrogeological investigation at the HDA included installation of nine monitoring wells at four locations, groundwater sampling, water level monitoring and hydrogeological testing. Geology and groundwater data were collected through test pits, deep exploration boreholes and groundwater monitoring well installations. Conuma also executed a hydrogeological field program in March through June 2019, which included drilling, hydraulic testing and installing monitoring wells and vibrating wire piezometers.

Wolverine Mine

The Wolverine Mine is currently in operation. Conuma reported that the development of the existing, operating Perry Creek Pit shifted the groundwater flow divide between Perry Creek and the Wolverine River slightly northward, reducing the groundwater recharge catchment to Perry Creek by about 98 ha and diverting these flows to the Wolverine River. Conuma indicated that most of the groundwater drainage from the Wolverine Mine site still flows to the Wolverine River, with a small portion flowing to Perry Creek. The northeastern limit of the pit development also diverted a small portion of groundwater flow from Perry Creek to the Wolverine River.

Conuma estimated that the daily use of groundwater at the Wolverine Mine is approximately 2280 m^3 obtained from four shallow wells. Water is used at multiple sites at the Wolverine Mine, including the administration building, gatehouse, shop, warehouse, plant, dryer, plant laboratory and plant office. Conuma did not identify any other groundwater users within the Wolverine Mine RAA.

Conuma reported that the quantity of groundwater flow varies across the Wolverine site. The Perry Creek Pit and the tailings storage facility are underlain by relatively fine-grained moraine[34] and colluvial[35] sediments that are overlying coal measure rocks. Conuma noted that permeability varies across the site. The Wolverine coal processing plant is situated on a recent alluvial fan deposit[36] that overlies lacustrine[37] sediments with a thickness ranging from 15 to 20 m. Alluvium gradation ranges from coarse gravelly sand to clayey, well-graded sand and gravel and silty sand.

While hydraulic conductivity varies, Conuma noted that alluvium within the alluvial fans and beneath the valley bottom area can convey substantial groundwater flow. Conuma also reported that groundwater elevations have remained relatively constant over time on the southeast side of the Wolverine Mine.

[33] Available online: https://www.projects.eao.gov.bc.ca/p/588510f5aaecd9001b818608/project-details;currentPage=1;pageSize=10;sortBy=-datePosted;ms=1612285151182
[34] Unconsolidated glacial debris
[35] Loose
[36] Clay, silt, sand and gravel left by flowing streams
[37] From lake deposits

Along the north side, the depth to water in the wells ranged between 2 and 5 m. While these variations may have been due to seasonal variations in water level, Conuma noted that the depth to water has remained generally consistent between 2007 and 2019.

Groundwater quality is influenced by the relative input of water, or recharge, and the discharge of groundwater that has migrated through bedrock and sediments. Conuma noted that the Amendment could result in elevated concentrations of contaminants in groundwater as water infiltrating the waste rock dumps would have a chemical signature representative of the waste rock (also known as contact water) during operations and post-closure. This groundwater would either be captured by the contact water management infrastructure or could flow to adjacent creeks.

At the Wolverine Mine, Conuma noted that groundwater chemistry ranges from a fresh calcium magnesium bicarbonate type through to a sulphate type, whereas the surface water data plots mid-way between the two end member types. Conuma noted that that nitrate, selenium and aluminum appear to be elevated in some locations at the Wolverine Mine, and exceedances of B.C. Freshwater Aquatic Life Guidelines for nitrate, aluminum and/or selenium were noted in six wells.

HDA

Conuma indicated that groundwater at the HDA was isolated from that of surrounding terrain, including that of the adjacent Teck Mesa-Wolverine Mine and the Wolverine Mine due to the intervening topography and drainage.

Regional geological trends indicated a zone of relatively enhanced fracturing and associated elevated hydraulic conductivity through which the Hermann Pit would be excavated. The hydraulic head associated with deeper bedrock zones in the area of the pit indicated an upward hydraulic gradient with localized flowing artesian conditions in boreholes. The Hermann Pit would be dewatered based on the expectation that there would be measurable groundwater inflow with deeper pit excavations.

Conuma noted that the HDA would be located east of the height of land between the Murray and Wolverine River drainages at elevations ranging between 1,200 and 1,600 m above sea level. It would be transected by two main drainage features, the M20 Creek mainstem and its main tributary, Nabors Creek.

Western Canadian Coal Corporation (the previous Certificate Holder for the former Hermann Mine Project) provided a hydraulic conductivity characterization from 2005. Conuma performed additional hydraulic characterization in 2019. Based on this program, Conuma stated that hydraulic conductivity varied across the site. Conuma noted that geological structures (factures/faults) appear to influence groundwater flow preferentially (a fast transport of water can happen in a small portion of the system). Within several of the geological units, there are likely features that promote groundwater flow and others that restrict it. Conuma noted that conductivity generally decreased with depth at the site.

Conuma noted that groundwater elevations have remained relatively steady over the long-term. Under the Hermann Pit and dump areas, the recharge area (where water goes from surface to groundwater) for

groundwater flow occurs in the upland area within the M20 catchment, within the footprint of the HDA and dump areas. Conuma suggested that the watershed-scale groundwater flow regime in the HDA is topographically driven, and bedrock faults and fractures act mainly as localized controls on groundwater levels and flows.

Conuma indicated that groundwater in the fluvial deposits within the Nabors and M20 incised valleys was discharging into these creeks. Conuma also identified local areas strong upward hydraulic gradients in bedrock down-slope of the proposed Hermann Pit, and suggested that the field observations of seepage, boggy ground and very wet surficial sediments in this area are associated with surface discharge of groundwater from bedrock.

Within the HDA, the groundwater chemistry in the area of the Hermann Pit was typical of sedimentary rock flow systems, where water is very alkaline and can often be highly mineralized. The key parameters that were considered included nitrate, sulphate, and selenium and potentially aluminum and cadmium. Many of the total metal concentrations in the initial samples were relatively high, but Conuma attributed this to high turbidity in the samples. Overall, the parameters for nitrate, sulphate, aluminum, cadmium and selenium ranged from below detection to slightly above detection based on selected dissolved metals results that have an associated low turbidity.

Potential Effects of the Amendment

Wolverine Mine

Conuma stated that the volume of the waste rock and tailings that would be stored in the mined-out Perry Creek Pit was anticipated to have a negligible effect on the in-pit water levels and the direction of flow of pit water compared to the flow system described in the Five-Year Mine Plan. Conuma thus concluded that there would be no residual effects to groundwater quantity at the Wolverine Mine and did not assess groundwater quantity at the Wolverine Mine further.

As coarse coal rejects and tailings generated from the processing of coal from the Hermann Pit would be placed in the mined-out Perry Creek Pit, the focus of Conuma's assessment was how these new activities would interact with groundwater. Conuma stated that the incremental change in groundwater quality adjacent to the Perry Creek Pit would not be affected by the proposed placement of the pit, coarse coal rejects and tailings, compared with what has already been permitted.

Conuma concluded there would not be any residual effects to groundwater quality at the Wolverine Mine, as they stated that there was limited interaction between the Perry Creek Pit and groundwater flow and that all contaminant loadings generated from mine contact water in the back-filled Perry Creek Pit were expected to flow to the Wolverine River.

HDA

To determine the effects of the Amendment at the HDA, Conuma commissioned the development of a 3D,

numerical, groundwater flow model by environmental consulting firm Lorax. It was developed using available site physiographic, meteorological, geological, hydrological and hydrogeological data.

The pre-development groundwater models consisted of steady-state model simulations, which Conuma validated with groundwater data obtained in 2019. A groundwater flow model was developed and adjusted to align with hydraulic heads and observed stream discharges. Groundwater model development for the operations and post-closure phases were based on modifications to the pre-development model phased according to the mine schedule.

During operations, there would be mining in the Hermann Pit and the associated removal of contact water, which would create a hydraulic depression and induce the flow of groundwater into the Hermann Pit, reducing the baseflow into M20 and Nabors creeks. Modelling for average climate scenarios, Conuma estimated that the Nabors Creek baseflow would be reduced by 76 percent and that M20 Creek baseflow would be reduced by 17 percent at the end of operations. Conuma stated that baseflow reduction would be negligible in the South Hermann and M14 Creeks.

Conuma identified that there would also be a reduction of baseflow into M20 and Nabors Creeks related to this diversion of groundwater in the post-closure phase. Modelling for average climate scenarios, Conuma estimated that, at post-closure, the Nabors Creek baseflow would be reduced by 60 percent compared to existing conditions and that M20 Creek baseflow would be reduced by 10 percent. Conuma stated that this baseflow reduction would have negligible impact to groundwater quantity, and these effects would be continuous for as long as contact water was diverted from the back-filled Hermann Pit to the sedimentation ponds. Conuma also noted that, should diversion of contact water to the sedimentation ponds at some point be no longer required, the effects would be reversible in the portions of the creeks that would have not been either covered by waste rock or removed through the excavation of the Hermann Pit.

Conuma identified that mining activities would alter groundwater quality primarily through contact of water to rock exposed to oxidizing conditions (such as the walls of the Hermann Pit, waste rock and tailings). Various forms of water management around the mine site (such as dewatering, diversions and ponds) could enhance or depress recharge to the groundwater system, potentially altering groundwater quality in M20 Creek, Nabors Creek, South Hermann Creek, M14 Creek and the Murray River. Conuma's modelling anticipated that contact water would migrate via the subsurface and potentially affect surface water quality of M20 Creek, Nabors Creek and South Hermann Creek due to the migration of contact water from the west Dump and the South Dump and flow into the Hermann Pit during operations and flow from the back-filled pit in the post-closure phase. This effect would be continuous if contact water was generated in the waste rock dumps and back-filled Hermann Pit and considered reversible when diversion of contact water would no long be required.

As groundwater quantity and quality area intermediate Valued Components, additional information about the effect of the Amendment continues in Section 6.13 (Aquatic Resources) and Section 6.17 (Human Health).

Proposed Mitigation Measures

Conuma did not propose any additional mitigation measures for groundwater quantity or quality at the operating Wolverine Mine.

While there would be reductions in groundwater discharge to M20 Creek within the HDA, Conuma suggested that the overall flow in M20 Creek drainage basin would not be affected appreciably by mining and associated mine water management. This included groundwater diversion relating to pit dewatering activities in operation and closure. If a connection between the groundwater supply wells and M20 Creek occurs, Conuma proposed not to use the wells during winter minimal stream flow conditions (December through to March, inclusive).

Conuma proposed the following mitigation measures for groundwater quality at the Hermann site, which would be primarily design features:

- Unlined contact water channels located at potential discharge locations;
- Contact water channels installed at the toe of the South and West Dumps;
- Rock drains installed beneath the dumps would capture contact water seeping through the waste rock and prevent it from travelling outside the dump footprints;
- Water management structures would remain active through operations, closure, and post-closure;
- Sedimentation ponds lined and designed with an under-drain system;
- Regular inspections and additional infrastructure along the M20 and Nabors drainages to capture any contact water that is not captured by the rock drains;
- No use of wells during winter minimal stream flow conditions (December through to March), should a groundwater connection be indicated between the supply wells and M20 Creek;
- Dewatering of Hermann Pit to control groundwater in and around the pit during operation; and
- During closure, a spillway would convey water spilling over the Hermann Pit towards the water treatment system.

6.10.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the following key issues related to groundwater quality and quantity were raised.

Exceedances at Wolverine Mine

ENV and FNITR reviewers noted that elevated concentrations of sulphate and selenium were detected in groundwater monitoring wells at the Wolverine Mine north of the north and east waste rock dumps and asked whether this contaminant load was considered in Conuma's water quality modelling. The FNITR raised the possibility that Teck's nearby decommissioned Quintette Mine, located southeast of the Wolverine River and M20 Creek, may be influencing groundwater at Wolverine and requested further investigation into the matter.

Conuma responded that it is in the planning phases of investigations into mine contact water migration, and that the findings would be reported to EMLI in the Annual Reclamation and Closure Report for Wolverine Mine. While Conuma clarified that all mine contact loadings were included in the modelling, it noted that further assessment would be required to determine if groundwater is being influenced by mine impacted groundwater from the Wolverine Mine or another source.

The EAO noted that Conuma is proposing to increase the production capacity of the Wolverine Mine to process the coal from the Hermann Pit as part of this Amendment. Due to this and the ongoing uncertainty regarding contaminant loading at Wolverine, the EAO has included a proposed condition (#11) requiring an Aquatic Resources Monitoring Plan, which would require groundwater monitoring and triggers for additional mitigation, developed in consultation with Indigenous nations. The EAO also noted that Amendment will be subject to subsequent permitting approvals under the *Mines Act* and the *Water Sustainability* Act.

Characterization of Existing Conditions

Early in application review, ENV reviewers provided feedback that the data set used to characterize existing conditions and develop the groundwater model did not meet the minimum requirement of one year of quarterly sampling data and monthly groundwater level measurements. Reviewers also noted that several of the samples could not be reliably used for interpretation, either due to high turbidity levels or ionic balance errors and requested all available quality assurance and quality control information. Further, reviewers noted that wells north of the Wolverine Mine and the east dump did not have the top of pipe elevation surveyed, which meant that groundwater elevations could not be determined.

Conuma responded that the Wolverine Mine groundwater quantity and quality database was continually expanding through review of the historical databases and review and refinement of ongoing field procedures. While Conuma noted that the historical database was subject to high turbidity, Conuma stated that that the data overall was useful for identification of pre-development and ongoing trends. Conuma also noted that it had been undertaking a groundwater data collection program through the execution of three notices of work in 2019 and one groundwater supply investigation, and that groundwater level data is being recorded continuously. Conuma stated that all the monitoring wells were monitored through the winter minimal period and the 2020 spring freshet, capturing the most dynamic and important periods at all the monitoring locations by June 2020.

Conuma provided additional groundwater data to supplement the existing data to reviewers on March 27, 2020, which included a hydrogeologic baseline update, additional information on groundwater supply, and hydrographs for the HDA to supplement the groundwater assessment. In a final memo to the EAO, reviewers from ENV identified that the baseline conditions, and specifically groundwater quality and flow exchanges between surface water and groundwater in the HDA remained a key uncertainty.

While Conuma has committed to continue and expand its groundwater collection and monitoring program to include continuous monitoring, the EAO has included this commitment in a proposed condition (#11) requiring an Aquatic Resources Monitoring Plan, including groundwater monitoring.

Uncertainty in Modelling Methodology

Reviewers from ENV, EMLI, FNITR, and HRFN raised multiple issues related to the groundwater modelling methodology throughout application review, including:

- Concerns regarding the ability of project design features to mitigate effects on groundwater quantity and quality;
- Limited characterization of bedrock faults and fractures identified in the HDA, including contradictions in Conuma's assessment of how the faults were characterized;
- Limited information provided about how contact water captured by the subdrains would be tested, collected, and treated (if required);
- Limited representation of mitigation measures (such as rock drains, unlined contact water collection, subdrains below sedimentation ponds) in the groundwater modelling;
- The assumptions made in the modelling for precipitation, evaporation, runoff and groundwater-surface water interaction;
- The calculations of predicted groundwater recharge rates and dilution ratios within the HDA; and
- Limited sensitivity analysis of the calibration model and predictive models.

Cumulatively, the impact of these issues contributed to continued uncertainty in the groundwater quality models and thus, the predictions of the assessment. Reviewers noted that the magnitude of the effects could be underestimated, impacting the surface water quantity and quality modelling as well as aquatic resources. To address the ongoing concerns about the groundwater modelling predictions, the EAO developed an information request for Conuma on the topic of water modelling. One of the requests was that the groundwater model predictions be updated using 25 percent higher hydraulic conductivity and a higher recharge rate, and that these predictions be used as results to the HDA water balance model and water quality model. Conuma provided a memo and an additional figure to alleviate these concerns.

In a final memo to the EAO, reviewers from ENV identified that key uncertainties remained in the modelling methodology. In addition to the uncertainty around characterization of existing conditions (se: Characterization of Existing Conditions), ENV reviewers identified that the reliability of the alternative approach to fully transient groundwater modelling used to support the model predictions and the efficiency of the contact water channels in the collection of mine-impacted groundwater remained key uncertainties in the effects assessment. ENV indicated that, while Conuma's responses were adequate at the EA level, these uncertainties should be investigated at the production permitting stage should the Amendment be granted. Given the ongoing uncertainty with respect to groundwater quality and quantity modelling, the EAO proposed the following condition (#11) requiring an Aquatic Resources Monitoring Plan.

Cumulative Effects of Quintette and Murray River Mines

Reviewers from the FNITR and MLIB expressed concerns that the potential cumulative effects of the Amendment and HD Mining's Murray River Coal Project were not considered, although the HDA and Murray River Coal Project are both located within the M20 watershed. The FNITR noted that groundwater

seepage from the Quintette Mine (Deputy Pit) is strongly suspected to be influencing groundwater and this is currently under investigation by Teck. The FNITR noted that this seepage flows into Camp Creek, which reports to M20 and that this constitutes influence.

Conuma responded that the assessment of potential cumulative effects of both Teck's Quintette Mine and HD Mining's Murray River Coal Mine were recognized in the water quality models in the following ways:

- Loadings from the Quintette Mine to the Wolverine River were reflected in data used to characterize existing conditions at the Wolverine Mine;
- Loadings from the Quintette Mine to M20 Creek are reflected in the M20 Creek existing condition water quality data used to model water quality for the HDA; and
- HD Mining Murray River Coal Mine effluent discharge permit 106666 limits are added to the predictions for the HDA water quality model.

Given the ongoing uncertainty with respect to groundwater quality and quantity monitoring, the EAO proposed the following condition (#11) Aquatic Resources Monitoring Plan. This plan would require that Conuma undertake groundwater chemistry monitoring.

Drinking Water Potential

Reviewers from Northern Health and the FNITR expressed concerns that the potential for human consumption of groundwater, which could have implications for human health as well as Treaty Rights. Conuma responded that it was highly unlikely that there were any humans in the area who were at risk of drinking groundwater near the Wolverine Mine or the HDA, while Northern Health continued to indicate this constitutes a risk.

Given the ongoing concerns from Northern Health, the EAO has proposed the following condition (#11) an Aquatic Resources Monitoring Plan, requiring groundwater chemistry and toxicity monitoring.

6.10.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in residual adverse effects on groundwater quantity and quality continuously during operations and post-closure within the HDA and the LAA.

The EAO concludes that there is expected to be a reduction in baseflow to both M20 Creek and Nabors Creek, which is due to the migration of contact water from the West Dump, the South Dump, and the back-filled Hermann Pit, which would occur within the M20 Creek, Nabors Creek and South Hermann Creek drainages. These effects are considered at least partially reversible, should the diversion of contact water to the sedimentation ponds be no longer required, which is currently estimated at 100 years post-closure.

No residual effects are predicted for changes to groundwater quantity and quality at the Wolverine Mine

due to the placement of coarse coal rejects and tailings, generated from the processing of HDA coal, into the Perry Creek Pit. All water generated from the pit would be directed to the Wolverine River via sedimentation ponds.

The EAO has proposed the following conditions related to groundwater quantity and quality to reduce the potential residual effects on groundwater quantity and quality:

- Condition #11: Aquatic Resources Monitoring Plan, including a requirement for groundwater monitoring; and
- Condition #9: Indigenous-Led Monitoring Program, requiring that Indigenous nation monitors have the opportunity to be involved in water quality monitoring.

Cumulative Effects

During application review, reviewers expressed concern about groundwater contamination at the Wolverine Mine, as well as the potential for cumulative effects of the Quintette Mine and the undeveloped Murray River Coal Project. While Conuma provided information about how these nearby projects were considered in the assessment, Conuma did not agree that a cumulative effects assessment was warranted.

The EAO concludes that cumulative effects to groundwater quantity and quality are expected as a result of interaction with the effects of other past, present and reasonably foreseeable future projects and activities, including a reduction in M20 Creek and Nabors Creek baseflows as well as water quality impacts in M20 Creek, Nabors Creek, and South Hermann Creek. These cumulative effects would be moderate in magnitude, not fully reversible, extending within the LAA, and occur continuously through operations and post-closure.

6.10.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would result in residual adverse effects on the groundwater quantity and quality intermediate valued component.

The effects on groundwater quantity and quality are carried forward to the related assessment of other valued components (surface water quantity, surface water quality, aquatic resources, fish and fish habitat, and human health).

6.11 Surface Water Quantity

6.11.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Surface water quantity was selected as an intermediate valued component, as the Amendment is anticipated to interact with surface water quantity and flows by potentially altering the streamflow in the receiving environment.

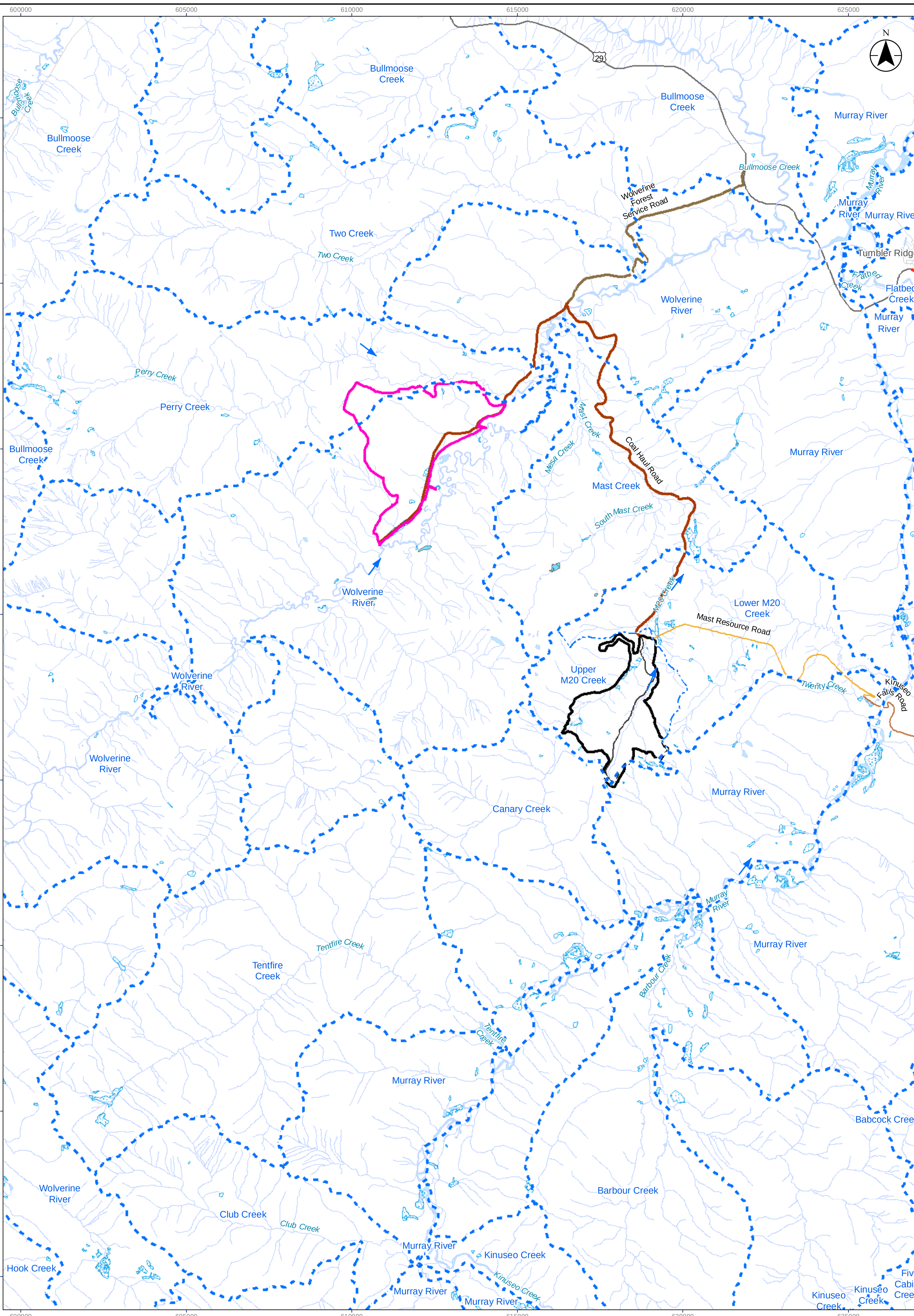
The effects on surface water quantity would move along pathways to influence other valued components. The results from surface water quantity effects assessment were carried forward to the assessment of surface water quality (Section 6.12), groundwater quality and quantity (Section 6.10), aquatic resources, (Section 6.13), wildlife (Section 6.16), and fish and fish habitat (Section 6.14).

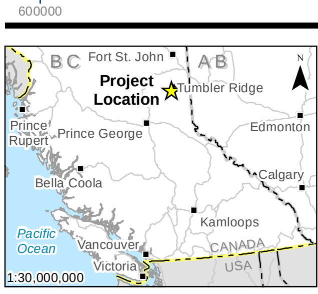
Conuma assessed the potential change in surface water quantity by assessing average annual streamflow, monthly distribution of flow, as well as peak and low monthly stream flows. The spatial boundaries for this assessment included the catchment area within which surface streamflow could be affected by the Amendment. The HDA includes an anticipated area of project disturbance association with construction and operation, while the LAA includes the M20 Creek watershed (including Nabors Creek), the mainstems of South Hermann Creek and M14 Creek, and the Murray River from the confluence of M20 Creek; sections of Perry Creek and Wolverine River adjacent to the Wolverine Mine; and the Coal Haul Road between the HDA and the Wolverine Mine. The LAA also included a 200 m buffer on either side of the Coal Haul Road. The RAA for surface water quantity included the Murray River watershed upstream of the confluence of Quality Creek, approximately 5 km north-northeast of Tumbler Ridge.

The surface water quantity valued component was assessed for construction, operations, reclamation and closure, and post-closure. Water quantity predictions included 20 years of post-closure (which are anticipated to extend from year 11 to year 30).

Conuma used various data sources to characterize existing conditions for surface water quantity, including regional hydrometric stations, spot discharge measurements, and data compiled by HD Mining during the EA process for the Murray River Coal Project, which is approximately 10 km away from the Wolverine Mine.

Within the LAA, Conuma provided descriptions of the M20 and Wolverine River watersheds (summarized below and depicted on Figure 4).





- Highway
- Road
- Local Street
- Dam/Reservoir
- Lake - Intermittent
- Waterbody
- Wetland
- Coal Haul Road
- Wolverine Forest Service Road
- Hermann Access Road
- Highway 52
- Kinuseo Falls Road
- Mast Resource Road
- Nabors Non-Status Road
- Hermann Disturbance Area
- Wolverine Mine Site
- Watershed Boundary
- Sub-Catchment

0 1 2 3 km
1:115,000 (at original document size of 11x17)

Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada
3. Watershed Boundaries: Fresh Water Atlas, DataBC, Government of British Columbia

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Project Location
Near Tumbler Ridge, BC
NTS Map: 093I14, 093P03

Project Number 123221151
Prepared by TCARDINAL on 20190704
Discipline Review by AKRUCHTEN on 20190812
GIS Review by SPARKER on 20190802

Client/Project/Report
Conuma Coal Resources Limited
Wolverine - Hermann Amendment Project
EA Amendment Application

Figure No.
4

Title
M20 Creek and Neighbouring Watersheds

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M20 Creek Watershed

The area of upper M20 Creek watershed upstream of the Mast Resource Road crossing is approximately 15 km^2. This is where the HDA would be located and includes the watershed area of Nabors Creek. The M20 Creek watershed area is 43 km^2. The M20 Creek flows north from its headwaters and confluences with Nabors Creek before crossing the Mast Resource Road. M20 Creek then flows to the east shortly after crossing the Mast Resource Road, running parallel with the road, and ultimately discharges into the Murray River approximately 14 km south-southeast of Tumbler Ridge. Conuma noted that there are multiple waterfalls in lower M20 Creek, which are barriers to upstream fish migration. Conuma provided information that there is a natural sediment source upstream of one of the waterfalls, which was also described in the original EA application for the Hermann Mine.

Downstream of where M20 Creek flows into the Murray River, the Wolverine River flows into the Murray River near Tumbler Ridge. The Murray River ultimately discharges into the Pine River approximately 25 km east of Chetwynd, B.C.

As there was not enough data from the local hydrometric stations in M20 Creek to fully characterize surface water quantity in the LAA, Conuma supplemented these local data with regional records to estimate long-term streamflows. Conuma also used annual runoff to validate annual inputs (precipitation) and losses (evapotranspiration). Peak discharges were used to represent the maximum instantaneous discharge in a watershed as a result of precipitation or snowmelt; low flows were used to provide an estimate of the normal baseflow conditions.

Conuma noted that peak monthly discharges in M20 Creek occurred during May to July. In general, discharges dropped over 90 percent from their peak by August and remained low through the winter, with slight increases in October or November, depending on the year. Conuma noted that the high discharge and runoff in M20 Creek in May are a result of snowmelt freshet, whereas high discharge and runoff in June was most likely the result of a combination of snowmelt and rainfall. High discharge and runoff in July were mostly a result of high intensity rainfall events. Conuma noted that annual low flows typically occur during winter months.

Wolverine River Watershed

The existing Wolverine Mine is located at the confluence of Perry Creek and the Wolverine River. Perry Creek is a tributary to the Wolverine River. Perry Creek flows west from its headwaters to east and confluences with the Wolverine River approximately 12 km west of Tumbler Ridge. The Wolverine River watershed extends approximately 358 km^2 upstream of the confluence with Perry Creek, and approximately 899 km^2 at its confluence with Murray River near Tumbler Ridge.

Conuma found that regional stations displayed strong seasonal patterns, where the highest discharges occur in May or June and annual low flows occurs in February or March. At some regional stations, there was a secondary peak occurs in October as a result of increased precipitation in the fall. Annual low flow periods occur from January to March for all stations, as precipitation is locked up in snow and groundwater

baseflow recedes before spring snowmelt occurs. The percentage of annual runoff during the low flow period was found to be less than 6 percent at all stations.

Potential Effects of the Amendment

Surface water quantity for the Amendment was characterized using an integrated water balance model to predict water quantity effects in the HDA receiving environment (M20 Creek) and Wolverine Mine receiving environment (the Wolverine River). Models were developed for M20 Creek and the Wolverine River, which were used to predict water quantity in Murray River. Results were simulated for five potential flow conditions: average, 1:10 year dry (dry conditions), 1:10 year wet (wet conditions), 1:100 year dry (extreme dry conditions), and 1:100 year wet (extreme wet conditions).[38]

Conuma determined that there would be potential effects to M20 Creek, South Hermann Creek, Wolverine River and Murray River as a result of the Amendment. These are described further in the sections below.

M20 Creek

Conuma noted that Amendment activities would interact with the surface water of M20 Creek, including access road construction, vegetation clearing and soil and overburden removal and storage, water management infrastructure construction, storage of potentially acid-generating waste rock, metal leaching, diversion of non-contact water[39], collection, storage and discharge of contact water[40], re-vegetation of temporary work areas, and pit backfilling with waste rock.

All these activities would alter the land cover within the LAA, which have the potential to change the pattern of surface water. Storage and discharge of contact water would have the potential to change the peak flow, low flow, and monthly distribution of flow depending on the storage and discharge patterns. Some of these activities would potentially also change the existing drainage pathways.

As contact water collection, storage, and discharge would continue during reclamation and closure and post-closure phases, interaction between activities and surface water quantity as a result of the Amendment would continue through post-closure.

Conuma predicted that winter streamflows (January through March) would be reduced in M20 Creek (compared to the existing conditions) because there would be no effluent discharge during these months. Winter flows during operations were predicted to be 34 percent and 12 percent less than the existing condition flows for the average, 1:100 dry, and 1:100 wet flow scenarios at two separate locations. The storage of contact water in sediment ponds during January to March, and therefore reduction of winter flows in M20 Creek, would continue through post-closure. Winter flow reductions (averaged over the closure and post-closure phases) were predicted to be 42 percent and 14 percent at two separate

[38] Model inputs, methods, and assumptions are described in detail in Appendix 3.3-A (HDA Model) and Appendix 3.3-B (Wolverine Mine Model) of the Amendment Application.
[39] Water that does not interact with mine workings.
[40] Water that does interact with mine workings.

locations.

During other months of the year, streamflows during operations would be higher than the existing condition flows for the average, 1:100 year dry, and 1:100 year wet flow scenarios respectively. Due to the water modelling assumptions, Conuma stated that post-closure mean annual flows were expected to be less than those predicted during operations.

Conuma stated that the effects of the Amendment on maximum monthly flow were expected to be less than those on the mean annual flow because of conservatism of their modelling methodology and predicted that maximum monthly flows at the end of operations would be similar to existing conditions.

South Hermann Creek

Conuma's modelling predicted that mean annual, minimum monthly, and maximum monthly streamflows during operations, reclamation and closure, and post-closure would be similar to existing conditions over all modelled scenarios. Conuma also noted that the monthly distribution of flow would be unchanged from existing conditions during operations, early post-closure when the backfill pores are being infilled, and late post-closure after the backfill is fully saturated.

Wolverine River

Activities at the Wolverine Mine resulting from the Amendment would have the potential to change the existing water balance (inflow and outflow of water) of the Wolverine Mine and thus the streamflows in the Wolverine River, including disposal of tailings into the existing Wolverine Mine Tailing Storage Facility, the in-pit storage complex in the mined-out Perry Creek Pit, and the disposal of coarse coal rejects into the in-pit storage complex at the mined-out Perry Creek Pit. Conuma's modelling demonstrated that existing condition streamflows (including mean annual, minimum monthly, and maximum monthly) were predicted to be similar to the streamflows during operations and closure/post-closure for the average, 1:100 dry, and 1:100 wet flow scenarios.

Murray River

The M20 Creek and the Wolverine River drain into the Murray River. Consequently, activities that interact with M20 Creek and Wolverine River streamflows also have the potential to affect Murray River streamflows. Conuma noted that streamflows in Murray River were approximately two orders of magnitude larger than those of M20 Creek and project activities that have the potential to affect M20 Creek streamflows would have substantially less effect on Murray River. Conuma's modelling indicated that existing condition streamflows (including mean annual, minimum monthly, and maximum monthly) in Murray River are predicted to be similar to (with less than 1 percent change) the streamflows during operations, closure and post-closure for the average, 1:100 dry and 1:100 wet flow scenarios.

Proposed Mitigation Measures

Conuma proposed the following measures to mitigate the effects of the Amendment on surface water quantity:

- Diversion of non-contact water away from mine area and remain non-contact;
- Collection of contact water within the HDA and discharge to the receiving environment after treatment. Between January and March (inclusive), where discharge is not planned and contact water would be stored on site, contact water would be treated and discharged into the receiving environment during all other months; and
- Progressive reclamation for revegetation of disturbed areas.

While these mitigation measures are primarily project design features intended to mitigate effects to surface water quality, Conuma stated that these measures would also serve to mitigate effects on surface water quantity.

6.11.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the following key issues related to surface water quantity were raised, which are summarized below.

Uncertainty in Modelling Methodology

Reviewers from ENV, EMLI, SFN, WMFN and HRFN raised concerns related to the modelling methodology for surface water quantity. Reviewers requested clarifications to better understand the water balance modelling, including information about:

- How Conuma's dataset characterized existing conditions compared to the actual, measured flow in the creeks;
- The rationale for which modelling locations were included in the assessment;
- The assumptions used to derive the inputs (such as precipitation and runoff) in the modelling;
- How climate change had been incorporated into the modelling;
- The storage capacity of the water treatment system; and
- How sources of conservatism and/or uncertainty associated with the assumptions used in the water balance model were included.

In response to concerns raised, Conuma provided a technical memorandum on January 31, 2020 explaining how the water models and a continuous discharge record were developed. Conuma provided another technical memorandum on July 14, 2020, which included information about how previous data and long-term temporal trends were incorporated into the modelling.

In response to outstanding concerns related to remaining uncertainty in runoff assumptions used in modelling for M20 Creek and the predicted effluent discharge volume, Conuma explained that it had conservatively assumed higher volumes of contact water and lower volumes of non-contact water for

mixing with the contact water effluent in the receiving environment. Conuma also responded that the proposed storage capacity met provincial guidelines, noting that bypasses of the water treatment system would likely only occur during freshet and would not result in exceedances of the B.C. Water Quality Guidelines for Aquatic Life (B.C. WQG-FAL).

HRFN, SFN and WMFN continued to express concern that the storage capacity of the water treatment system was insufficient, which could result in untreated water being discharged during times of peak flows (such as during freshet or times of unusually high precipitation).

In a memo to the EAO near the end of application review (October 30, 2020), ENV reviewers identified that there were still uncertainties associated with the runoff characterization for upper M20 Creek and the volume of overflow to the receiving environment. While ENV and EMLI expressed that these uncertainties were likely addressed by Conuma's incorporation of conservatism in the modelling, Conuma stated that the uncertainty could be further addressed at permitting. ENV specifically recommended that the following information be required as part of the production permit applications:

- Revise the HDA water balance runoff assumptions for both undisturbed and disturbed catchment areas to reflect the updated measured streamflow;
- Validate the HDA water balance model with streamflow data for upper M20 Creek collected since submission of the Amendment Application; and
- Develop additional mitigation and/or contingency measures for the potential overflow from the primary and secondary sediment pond to Upper M20 Creek during freshet.

6.11.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in residual adverse effects on surface water quantity, specifically a reduction in streamflows in M20 Creek. The EAO is satisfied that the remaining issues have been adequately addressed for the purposes of this Amendment and acknowledges that more detailed discussions, requirements, and issues-resolution would be required regarding water quantity modelling during the permitting process. ENV provided a letter to this effect, including the specific issues related to water quantity that ENV expects would be addressed in permitting. Based on the outstanding issue, the EAO has developed a table of issues, including those related to surface water quantity, that would be carried over to the permitting process, which will be available here[41].

These effects would occur during operation and post-closure and would range from negligible to medium (mean flow) and medium to high (low flow). This effect is contained within the LAA and would be both continuous and long-term. The likelihood of these effects is moderate, and the EAO concludes that the effects would be reversible following reclamation and closure of the mine. The EAO has not proposed any conditions related to surface water quantity specifically as these issues would be assessed further at

[41] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019bdfe2090f10020b5315f/download/Wolverine%20Combined.pdf

permitting. However, along with the groundwater quantity and quality models, Conuma's water quantity approach and modelling is a key input in the development of the surface water quality model. The EAO has proposed conditions relating to surface water quality, given the issues identified in the surface water quality modelling, which are further discussed in Section 6.12 (Surface Water Quality).

Cumulative Effects

The EAO has determined that there would be residual cumulative effects to surface water quantity in M20 Creek and the Murray River due to the potential interaction of the Amendment with the Murray River Coal Project.

The water management activities undertaken as part of the Amendment would hold water during the winter low flow period for treatment and subsequent discharge, while streamflow in M20 Creek could be reduced due to seepage into the underground workings of the Murray River Coal Project. The cumulative effect would occur in M20 Creek and in Murray River during the period when both projects are operational and into post-closure, for as long as water management is required at the HDA.

Conuma stated that the water management mitigation measures for the Amendment and for the Murray River Coal Project would be expected to mitigate cumulative effects on surface water quantity and did not proposed additional mitigation measures to address cumulative effects.

The EAO has assessed that there would be cumulative effects on streamflows in M20 Creek due to the Amendment and the Murray River Coal Project, with a high magnitude during low flows. These effects would occur continuously and during all project phases. The cumulative effects on surface water quantity would be geographically limited to the LAA, and the effects were predicted to be reversible as the water management infrastructure is reclaimed or the underground workings of the Murray River Coal Project are filled with groundwater seepage. Surface water quantity is characterized as not resilient (as streamflow reductions cannot be recovered by other sources of water), and the likelihood of this effect would be high.

6.11.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would result in residual adverse effects on the surface water quantity intermediate valued component.

The effects on the surface water quantity intermediate valued component are thus carried forward to the related assessment of other valued components (aquatic resources and fish and fish habitat) in this Report.

6.12 Surface Water Quality

6.12.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Surface water quality was selected as an intermediate valued component, as the Amendment could result in changes to water quality in the aquatic receiving environment downstream of the HDA.

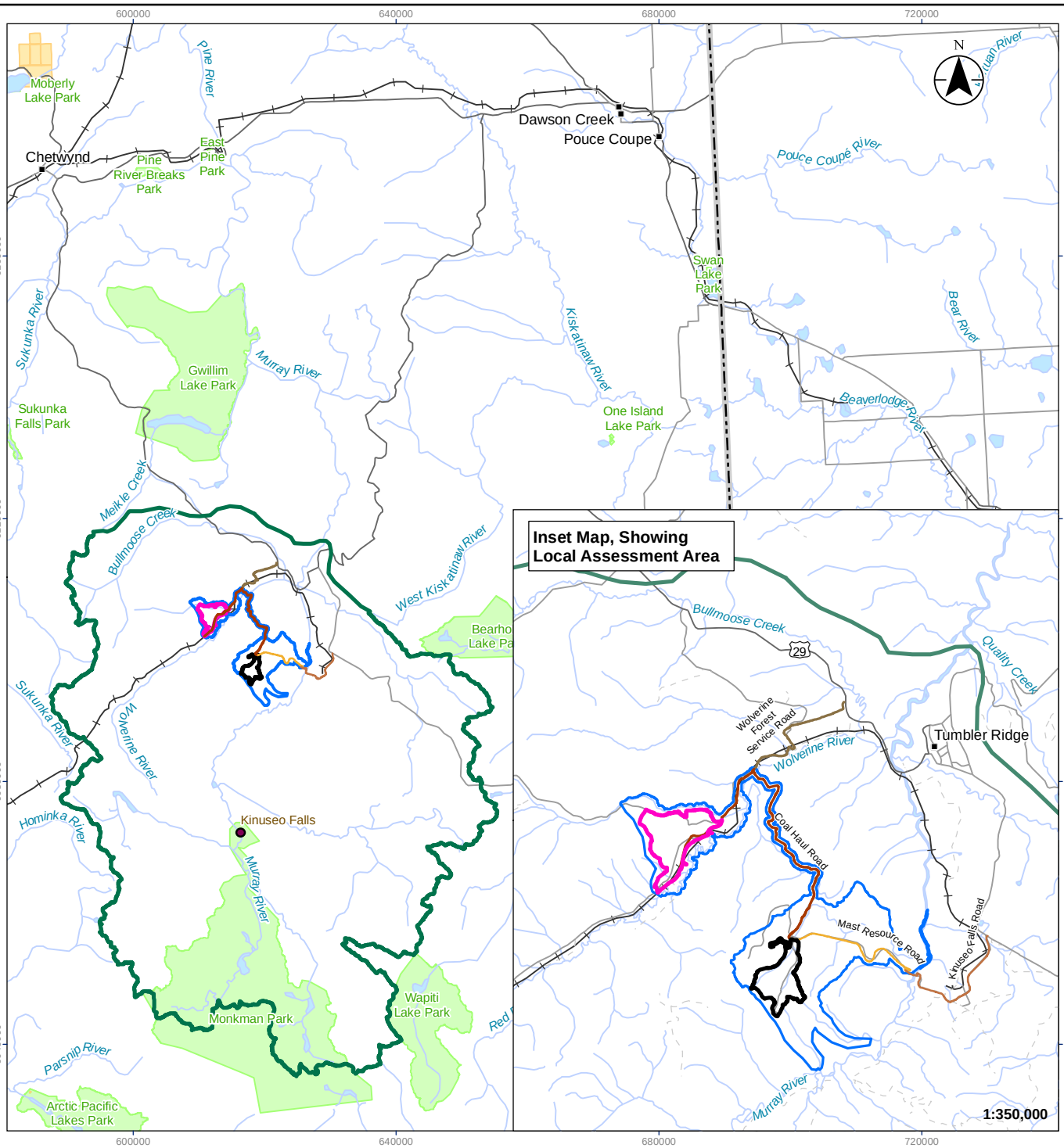
The effects on surface water quality would move along pathways to influence other valued components. The results from surface water quality effects assessment were thus carried forward to the assessment of aquatic resources (Section 6.13), wildlife and wildlife habitat (Section 6.16), fish and fish habitat (Section 6.14), and human health (Section 6.17).

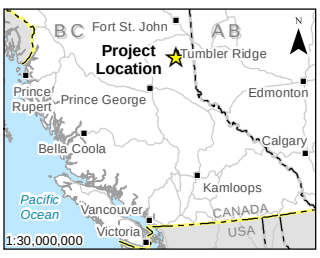
Amendment activities that would take place at the HDA with the potential to affect surface water quality are:

- Land disturbance such as vegetation removal, overburden removal, water management infrastructure construction, haul road upgrades and reclamation, which can trigger erosion and movement of sediments into watercourses;
- Accidental release of chemicals such as fuel, oil, grease, or hydraulic fluids;
- Blasting, resulting in increased suspended sediments and nitrogen compounds;
- Metal leaching and acid rock drainage from pit walls and waste rock, leaching dissolved metals and sulphate;
- Dustfall;
- Sewage treatment and discharge; and
- Discharge of contact water.

Amendment activities that would take place at the Wolverine Mine with the potential to affect surface water quality include:

- Land disturbance during reclamation, which can trigger erosion and movement of sediments into watercourses;
- Accidental release of chemicals such as fuel, oil, grease, or hydraulic fluids;
- Disposal of coarse coal rejects and tailings in the existing tailings storage facility, and in-pit storage complex, resulting in increased suspended sediments or leaching dissolved metals, nitrate and sulphate;
- Dustfall; and
- Discharge of contact water.





Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- City, Town or Village
- Kinuseo Falls
- Highway
- Road
- Railway
- Provincial Boundary
- Watercourse
- Waterbody
- First Nations Reserve
- Park, Ecological Reserve, or Protected Area
- Coal Haul Road
- Wolverine Forest Service Road
- Kinuseo Falls Road
- Mast Resource Road
- Hermann Disturbance Area
- Wolverine Mine Site
- Surface Water Quality Local Assessment Area
- Surface Water Quality Regional Assessment Area

0 10 20 30 40 km

1:350,000 (at original document size of 8.5x11)

Stantec

CONUMA COAL RESOURCES LIMITED

Project Location
Near Tumbler Ridge, BC
NTS Map: 093I14, 093P03

Project Number 123221151
Prepared by TCARDINAL on 20190807
Discipline Review by PREECE on 20190809
GIS Review by TDINNEEN on 20190812

Client/Project/Report
Conuma Coal Resources Limited
Wolverine-Hermann Amendment Project
EA Amendment Application

Figure No.
5

Title
Surface Water Quality Assessment Boundaries

The spatial boundaries for the surface water quality assessment were defined by the catchment area for surface flow that could be affected by the Amendment. The LAA included the M20 Creek watershed (including Nabors Creek), South Hermann Creek, M14 Creek, Murray River from the confluence of M20 Creek, sections of Perry Creek and Wolverine River adjacent to the Wolverine Mine, and the Coal Haul Road plus a 200 m buffer. The RAA included the Murray River watershed upstream of the confluence with Quality Creek, approximately 5 km north-northeast of Tumbler Ridge.

The surface water quality valued component was assessed for construction, operations, reclamation and closure, and post-closure. Water quality predictions included 20 years of post-closure (which were anticipated to extend from year 11 to year 30).

Conuma used the following indicators to characterize existing conditions, which were identified as parameters of potential concern for the project: total suspended solids, fluoride, nutrients (nitrogen and phosphorus), sulphate, biochemical oxygen demand, and total and dissolved metals.

Data used to characterize existing conditions were drawn from multiple historical, recent, and ongoing monitoring datasets, including the original EA applications for the Wolverine Mine, the Hermann Mine Project, and the Murray River Coal Project and follow-up monitoring from these projects in 2017 and 2019. At the Hermann site, Conuma included new data from monitoring stations in the M20 Creek watershed and nearby watersheds. The monitoring stations located on M20 Creek were downstream of the former Teck Mesa-Wolverine Mine, which did not directly discharge into M20 Creek, but water quality patterns suggest it is likely this mine is contributing to water quality concerns in M20 Creek. Monitoring stations were also present near the mouth of the creek, in the area of the existing Murray River Coal Project. The Teck Mesa-Wolverine Mine, which has been in care and maintenance since 2014, is approximately 17 km southwest of Tumbler Ridge and overlaps the Murray River watershed.

The existing surface water quality conditions at the HDA were characterized by:

- Increased total suspended solids/turbidity, phosphorus, organic carbon and metal concentrations during spring freshet and storm events;
- In Lower M20 Creek, there was a natural sediment source found consisting of highly erodible clay. This natural source and seasonal variations in flow conditions caused increased turbidity and ion concentrations;
- The influence of the Teck Mesa Wolverine Mine was apparent in M20 Creek, as conductivity and concentrations of nitrate, selenium, sodium, and strontium were greater upstream of the HDA relative to downstream of the HDA;
- Measured concentrations of sulphate and ammonia were below the B.C. WQG-FAL;
- The pH levels in the Murray River tributaries exceeded the B.C. WQG-FAL and Canadian Water Quality Guidelines for Protection of Aquatic Life (CWQG) range;
- Fluoride concentrations were higher than the CWQG in M20 Creek;
- Concentrations of aluminum, dissolved aluminum, arsenic, beryllium, cadmium, copper, iron, dissolved iron, mercury, selenium, silver, and zinc exceeded either the B.C. WQG-FAL or CWQG at a sampling location. At most of the sites sampled, metals concentrations were below guidelines; and

- Unlike the other metals assessed, selenium concentrations did not vary in parallel with total suspended solids/turbidity. Most of the selenium in M20 Creek was in the dissolved form throughout the year, reflecting inputs from the Teck Mesa-Wolverine Mine upstream. Total selenium concentrations at baseline were higher than the CWQG and B.C. WQG-FAL in many samples collected from M20 Creek.

Existing surface water quality conditions in the Wolverine River were characterized by:

- Increased concentrations of total suspended solids/turbidity, major ions, phosphorus, total metals and organic carbon at Wolverine River and Perry Creek sites during spring freshet, reflecting contributions of overland erosion, stream bank erosion, and instream re-suspension;
- All sulphate concentrations measured in the Wolverine River and Perry Creek were below the B.C. WQG-FAL;
- Nitrate levels were elevated in the Wolverine River downstream of the Wolverine Mine disturbance boundary, reflecting the influence of the Teck Mesa-Wolverine Mine. Nitrate levels in Perry Creek increased downstream, reflecting the influence of the Wolverine Mine. The nitrate concentrations, however, were below the CWQG and B.C. WQG-FAL;
- Metal concentrations in the Wolverine River were typically highest at sites directly downstream of the Wolverine Mine disturbance boundary and decreased further downstream. Metal concentrations in Perry Creek were highest at the downstream site, before the confluence with the Wolverine River. Concentrations of aluminum, dissolved aluminum, arsenic, beryllium, cadmium, copper, iron, dissolved iron, mercury, selenium, silver, and zinc exceeded either the B.C. WQG-FAL or CWQG at one sampling location. At most of the sites sampled, metals concentrations were below guidelines; and
- Selenium concentrations did not vary in parallel with total suspended solids/turbidity. In the Wolverine River, most of the selenium was in the dissolved form throughout the year, reflecting the selenium source from weathering and flushing of waste rock and pit surfaces at the Wolverine Mine and Teck Mesa-Wolverine Mine upstream. On average, selenium concentrations were higher than the CWQG and B.C. WQG-FAL in the Wolverine River.

The existing surface water quality conditions in the Murray River were characterized by:

- Increased total suspended solids/turbidity, phosphorus and organic carbon concentrations at the Murray River sites during periods of peak flows (spring freshet and storm events), reflecting contributions of overland erosion, stream bank erosion, and instream resuspension;
- Sulphate, nitrate and ammonia concentrations and hardness peaked downstream of the confluence with the Wolverine River, reflecting the influence of mine-related disturbances in the area. All sulphate and nitrate concentrations were below the B.C. WQG-FAL and CWQG;
- Most ammonia values were also below the detection limit, with a maximum concentration in February 2019;
- At all sites sampled, nutrient and total organic carbon concentrations were lower than the B.C.

WQG-FAL and CWQG;

- Concentrations of most of the total metals followed the same seasonal trend as total suspended solids/turbidity, with maximum values during periods of high flow and total suspended solids concentrations. Exceptions were noted for calcium, lithium, magnesium, selenium, and strontium, which had minimum concentrations during spring freshet. Metal concentrations in the Murray River were typically highest at sites immediately downstream of the confluence with M20 Creek and the Wolverine River; and
- At most of the sampled sites, metals concentrations were lower than the B.C. WQG-FAL and CWQG; however, exceptions include aluminum, dissolved aluminum, beryllium, cadmium, copper, iron, dissolved iron, selenium, silver, and zinc.

Potential Effects of the Amendment

To determine the potential effects of the Amendment, Conuma compared predicted water quality to the short- and long-term B.C. WQG-FAL or Conuma's existing site performance objectives (SPOs) (determined in a previous permitting process) to existing water quality conditions.

Water quality modelling scenarios included five cases for climate (average conditions, 1:10 year wet conditions, 1:100 year wet conditions, 1:10 year dry conditions, and 1:100 year dry conditions) and two cases for geochemical source terms (expected case and upper case) for a total of ten scenarios. The identification of parameters of concern was based on a modelling scenario that incorporated 1:10 dry conditions and upper-case geochemical source terms (the 1:10 dry-upper scenario). Identified parameters of concern were assessed for residual and cumulative effects under three scenarios: average-expected, average-upper, and 1:100 dry-expected. Water quality modelling results of these three scenarios incorporated water quality treatment predictions for the water treatment system.

From the model results, Conuma identified effects for the following sites:

- M20 Creek immediately downstream of the effluent mixing structure (non-fish bearing section);
- M20 Creek in the fish-bearing section downstream of a natural sediment source and proposed Murray River Mine influence;
- Lower South Hermann Creek (fish bearing section); and
- Murray River downstream of M20 Creek and South Hermann Creek.

B.C. WQG-FAL were predicted to be exceeded for at least one month in at least one scenario and mine phase for nitrate, selenium, sulphate, beryllium, chromium, cobalt, uranium, dissolved aluminum and dissolved cadmium. Overall, the model results demonstrated that most parameters are not predicted to exceed B.C. WQG-FALs at most sites in M20 Creek, Lower South Hermann Creek, or Murray River. While remaining below B.C. WQG-FAL increasing, nutrient concentration increases relative to baseline conditions (including phosphorus, total nitrogen, nitrate, nitrite and ammonia) are likely resulting in effects on the aquatic habitat productiveness. Effects to aquatic resources as a result of changes in water quality are further discussed in Section 6.13 (Aquatic Resources).

While the magnitude and location of the exceedances vary, the key findings of the assessment related to the predicted exceedances of selenium. In M20 Creek (and to a lesser degree in South Hermann Creek and the Murray River), selenium concentrations are predicted to consistently exceed the B.C. WQG-FAL (2 µg/L) over all project phases and all assessment scenarios in M20 Creek and to a lesser degree in South Hermann Creek and the Murray River.

In the Wolverine River, selenium concentrations are predicted to consistently exceed the B.C. WQG-FAL at all locations in all project phases over three assessment scenarios. Conuma predicted changes to surface water quality in the Wolverine River relative to background conditions and stated that the in the average-expected scenario selenium was predicted to have an annual maximum concentration 3.4 times the B.C. WQG-FAL (6.8 µg/L).

In addition to the exceedances of B.C. WQG-FAL, Conuma identified potential cumulative effects in M20 Creek M20 Creek in the fish-bearing section upstream of the confluence with the Murray River and in Murray River 250 m downstream of M20 Creek and downstream of the Wolverine River. With the addition of the effluent discharges from the planned Murray River Coal Project and expected flow reduction in M20 Creek, the magnitude of the above exceedances is increased in M20 Creek. Cumulative effects would result in selenium exceeding B.C. WQG-FAL in the fish bearing section of M20 Creek for about four months each year during the reclamation and closure phase and in the Murray River downstream of Wolverine River during one month in early spring each year over all mine phases.

Other potential contaminants of concern (sulphate, nitrate, cobalt, uranium, dissolved aluminum, and dissolved cadmium) were predicted by Conuma to exceed B.C. WQG-FAL in the receiving environment in at least one month, node, and assessment scenario. Other parameters assessed were nitrite (below B.C. WQG-FAL for the three assessment scenarios), cobalt (above B.C. WQG-FAL only for average-upper and 1:100 dry-average scenarios), and dissolved aluminum (related to existing conditions in South Hermann Creek and Murray River). For these parameters, Conuma considered the magnitude negligible.

Mercury was also identified as a parameter of concern because of its potential to bioaccumulate in aquatic receptors. Mercury was predicted to remain below the B.C. WQG-FAL in all Amendment phases and assessment scenarios in M20 Creek, South Hermann Creek, and Murray River. No Amendment-related changes to mercury concentrations were predicted by Conuma.

Sulphate, nitrate, and cobalt were predicted to exceed the long-term B.C. WQG-FAL in the 1:100 dry-expected and average-upper scenarios in one node of M20 Creek, in South Hermann Creek or the Murray River. These parameters were not predicted to exceed the B.C. WQG-FAL in the fish-bearing reach of M20 Creek in the three assessment scenarios.

Uranium was predicted to exceed the long-term B.C. WQG-FAL in all assessment scenarios in M20 Creek but not in South Hermann Creek or the Murray River. In the average-expected scenario, uranium was predicted to exceed the B.C. WQG-FAL in the fish-bearing reach of M20 Creek, marginally above the long-term B.C. WQG-FAL and 17 times existing conditions at the end of operations.

Dissolved cadmium was predicted to exceed the hardness-dependent B.C. WQG-FAL in the 1:100 dry-expected and average-upper scenarios in M20 Creek, but not in South Hermann Creek or Murray River. Dissolved cadmium was predicted to exceed the B.C. WQG-FAL in the fish-bearing reach of M20 Creek in the 1:100 dry-expected and average-upper scenarios.

In the Wolverine River, nitrate was identified as a parameter of concern and predicted to exceed the site performance objective (1.5 mg/L) in two scenarios. Nitrite was screened in as a parameter of concern in the 1:10 dry-upper scenario but was not predicted to exceed the B.C. WQG-FAL in the assessment scenarios. Similar to the HDA receiving environment, mercury was not predicted to exceed the B.C. WQG-FAL in the Wolverine River in any scenario.

Proposed Mitigation Measures

Conuma proposed the following measures to monitor or mitigate the effects of the Amendment on surface water quality:

- Developing a Fuel Management and Spill Prevention Plan and a Solid Waste Management Plan to prevent or limit change in water quality due to hydrocarbon and chemical spills from heavy machinery;
- Develop and implement a Chemicals and Materials Storage and Handling Plan, in order to prevent or limit chemical spills;
- Develop measures to limit surface erosion and sediment control;
- Implement a water management system, including diversion of non-contact water and collection, treatment, and discharge of contact water, that would consist of collecting contact water seepage from waste rock, use of pipelines and lined and unlined channels to convey water, and lining of the sediment ponds and water treatment to prevent seepage;
- Implement water quality monitoring to confirm water quality predictions, groundwater predictions, seepage collection, and treatment efficiencies to facilitate adaptive management;
- Implement measures to promote the efficient use of blasting materials to limit residual nitrogen to be implemented as part of a Nitrogen Management Plan;
- Implement measures to limit selenium leaching, including monitoring, adaptive management, and a trigger response plan to be implemented as part of a Selenium Management Plan;
- Limit weathering and the potential for metal release during the management of potentially-acid generating rock;
- Develop protocols for appropriate handling of wastes to reduce uncertainties and to reduce risks of non-performance; and
- Implement progressive reclamation to limit exposure of rock surfaces to weathering.

6.12.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the following key issues related to surface water quality were raised, which are summarized below.

Proposed Water Treatment Technology

ENV, EMLI, FNITR, HRFN and MLIB raised concerns throughout application review about Conuma's proposed water treatment technology. In the Amendment Application, Conuma proposed BCRs, a biological system, for the treatment of selenium, nitrate, nitrate and ammonium.

Based on the information provided, reviewers identified that there was insufficient information to support the viability of the BCRs as the primary water treatment in operation and post-closure, and they requested additional data and information about the specific functioning of the system. Reviewers indicated that Conuma did not provide enough analogue or site-specific data that met reviewers' expectations, thereby calling into question whether BCRs could achieve the removal efficiencies stated in the Amendment Application over a range of climate conditions and over the life of the mine.

MLIB, HRFN, WMFN and SFN also raised concerns that Conuma did not demonstrably evaluate other viable water treatment options for the HDA prior to proposing BCRs as the primary water treatment in operation and post-closure. Indigenous nations consistently noted that Conuma's assessment of the best achievable water treatment technology at the HDA failed to incorporate water quality objectives that were requested by Indigenous nations, namely B.C. WQG-FAL at end-of-pipe. Further information regarding Indigenous nations' concerns regarding water treatment can be found in Section 7 (Assessment of Impacts to Treaty Rights and Interests).

To address reviewers' concerns about BCRs, Conuma provided additional data and information about the BCRs and how the BCRs would remove selenium, nitrate, nitrite, and ammonium in supplementary information about BCRs. The Working Group continued to indicate concerns about the BCRs as the primary water treatment for surface water quality. Given the ongoing feedback from the Working Group regarding the lack of confidence in BCRs as the primary water treatment mitigation, the EAO, ENV, and EMLI requested that Conuma develop an alternate plan for primary water treatment.

Following a review by subject matter experts, Conuma proposed that the BCRs would be supplemented by a proposed backstop technology consisting of a temporary Frontier SeHAWK® system ('SeHAWK'). Following feedback from reviewers and Indigenous nations that there was greater confidence in the SeHAWK technology, Conuma then submitted a design basis report that proposed using a SeHAWK with reverse osmosis water treatment system as primary mitigation for water quality for life-of-mine.

Conuma's updated design basis report outlined that mine-impacted water would be treated in a primary sedimentation pond, flow to a secondary sedimentation pond, then to a SeHAWK modular treatment system. Effluent from the SeHAWK system would then flow to a polishing pond then aeration pond, then discharged to the environment (M20 Creek). Due to the volume of effluent generated from May to July in Year one and April to September in subsequent years, the effluent from the secondary sedimentation pond would be treated through an ultrafiltration unit and then concentrated in a reverse osmosis unit prior to entering the SeHAWK system. An updated model was also provided, as the new system was not assumed to remove phosphorus, sulphate and ammonia. Since the SeHAWK system required influent to be at least ten degrees Celsius, this updated model also assessed potential temperature effects from the

warmer effluent.

Conuma plans to use the SeHAWK system as primary mitigation for the first two years of mine life, after which Conuma proposes to switch to BCRs as primary mitigation if authorized, with SeHAWK as an additional mitigation if required. Conuma stated that it would continue to collect site-specific information within the HDA during the first two years of mine life, and work with ENV and EMLI to prove the BCRs as a viable treatment technology through the ongoing pilot at Conuma's Brule Mine, prior to switching to BCRs.

The Working Group then raised further questions to better understand the system and how it would meet the treatment efficiencies assumed in the Amendment Application. In response, Conuma submitted a technical memo that outlined changes to the effects assessment in the Amendment Application resulting from the change in primary water treatment. In reviewing Conuma's responses, ENV and EMLI reviewers indicated that the information provided about the SeHAWK was sufficient to conceptually demonstrate that the proposed water treatment system would remove selenium and nitrate at efficiencies stated in Conuma's SeHAWK design basis report. Both agencies submitted letters to the EAO to this effect, stating that they accepted the data provided at the EA level though uncertainty still existed regarding specific details regarding the operation of the system (such as how the system reacts to changes in temperature or pH).

ENV noted several aspects of the design that would require additional detail in the *EMA* permit application, including further information regarding the chemical and physical reactions and anticipated results at each stage of treatment; comprehensive contingencies to alleviate uncertainties and operational risks; further description and analysis of the ability of the SeHAWK system to perform at the range of concentrations expected (e.g., with and without reverse osmosis concentration); and details of the waste by-products and their disposal. ENV also noted that detailed information regarding the proposed SeHAWK system's ability to meet B.C. WQGs-FAL would be required at permitting, which is discussed in further detail in Section 6.13 (Aquatic Resources).

In a final memo to the EAO dated November 3, 2020, ENV continued to expressed concern that there has not been any bench or pilot scale testing of the proposed treatment with representative effluent expected from the site, leading to an increased risk that the proposed system would not be operational and effective in meeting the limits developed at permitting to be protective of the environment and of Treaty rights. ENV encouraged Conuma to engage in conversations with EMLI and ENV regarding piloting during permitting.

In response to concerns raised, the EAO has proposed the condition #12 (Water Treatment Technology) which would require water treatment for any discharge of contact water. The EAO recognizes that additional information on the BCRs may be brought forward during permitting and so this condition allows for a proposal for an alternate water treatment method to be proposed, following consultation with ENV, EMLI, and the Indigenous nations.

Uncertainty in Modelling Methodology

While the water treatment system emerged as one of the key issues in the review, reviewers also raised concerns about the water quality modelling methodology. Reviewers from ENV, EMLI, SFN, WMFN, and HRFN requested clarifications about the proposed mine plan and features of the water management structures to better understand the assumptions in the water modelling, including information about:

- The data used to characterize existing conditions and to perform the effects assessment;
- How the model's source terms were derived;
- Methods and assumptions used in the water quality modelling;
- How mitigations were incorporated into the surface water quality modelling;
- Inconsistencies in the mine plan (such as waste rock volumes) and features of the water management system (such as polishing pond design, sedimentation pond design, ability to store contact water), which contributed to uncertainty in the modelling predictions;
- How the groundwater and surface water quantity models interacted with the surface water quality model; and
- Calibration and validation of the surface water quality model based on recent data.

Cumulatively, the impact of these issues contributed to uncertainty in the surface water quality modelling and thus, the predictions of the assessment. Reviewers noted that the magnitude of the effects could be underestimated, potentially impacting aquatic resources and fish. Conuma provided additional information and responses to reviewers' queries throughout application review.

The EAO is satisfied that the remaining issues have been adequately addressed for the purposes of this Amendment and acknowledges that more detailed discussions, requirements, and issue resolution would be required regarding surface water quality modelling during the permitting process. As ENV reviewers provided a letter to the EAO outlining the outstanding issues, the EAO has developed a table of topics, including those related to surface water quality, that will be carried over to the permitting process, which can be accessed here[42].

While reviewers ultimately indicated that they were satisfied with Conuma's responses to the comments about water modelling at the EA level, the EAO recognizes that uncertainty in the modelling exists and more detailed mitigation and contingency plans would be determined during the permitting process. The EAO has thus proposed a condition #11 (Aquatic Resources Monitoring Plan), developed in consultation with Indigenous nations, which would require the effects to aquatic resources to be monitored, the development of specific monitoring triggers (both below and at guideline levels when guidelines exist, and corresponding responses and mitigation measures that would be implemented if the triggers were reached.

Sewage Treatment

ENV raised concerns regarding Conuma's proposal to route treated sewage effluent into the water

[42] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019bdfe2090f10020b5315f/download/Wolverine%20Combined.pdf

treatment system. ENV noted that there can be several chemicals added to the effluent from cleaners, soaps, pharmaceuticals, and other unknown additions, which have the potential to affect water treatment for the mine-impacted parameters. ENV also recognized that there would be no sewage post-closure, and the system may not function as predicted in the post-closure phase if it had been designed to account for sewage effluent. Given these factors, ENV recommended that Conuma develop an alternative plan for sewage treatment.

Conuma acknowledged that treated sewage introduced into the secondary sedimentation pond would have the potential to increase mass load of nutrients. As the sewage treatment process would include disinfection, Conuma said that it did not expect that the microbiota would be affected by the treated sewage source and that the effect on the water modelling would be negligible. Conuma stated that the introduction of treated sewage is an accepted form of nutrient supplementation in the water treatment industry.

ENV stated that separate registration under the Municipal Wastewater Regulation is generally required for sewage effluent and noted that adequate piloting information for the effluent addition to the water treatment system would be required to support any application to authorize the combination of municipal and industrial effluent streams. ENV reiterated that it would be in Conuma's interest to develop an alternative plan.

The EAO developed an information request for Conuma on the topic of sewage treatment, wherein the EAO required that Conuma propose a separate system for treated sewage effluent (such as exfiltration basin or other disposal option) in the water treatment design to enhance confidence in the water treatment system. Conuma responded that it would truck the treated sewage effluent off-site instead of incorporating it into the industrial effluent. As reviewers indicated that they were satisfied with Conuma's response, the EAO proposed a condition #12 (Water Treatment Technology), which requires that Conuma separate treated sewage effluent from the industrial effluent.

Existing and Predicted Exceedances of Selenium

Reviewers from ENV, EMLI, FNITR and HRFN expressed concern that existing conditions for nitrate, sulphate, and selenium concentrations were exceeding B.C. WQG-FAL at monitoring locations near the Wolverine Mine. Of particular concern were the observed concentrations of selenium, which are exceeding the current SPOs near the Wolverine Mine under the existing effluent discharge permit.

Conuma provided results of a regional selenium bioaccumulation model from which it back calculated a preliminary threshold of 76 µg/L as a proposed protective level for selenium. In the effects assessment, Conuma also predicted that selenium concentrations as a result of the Amendment would exceed the B.C. WQG-FAL in M20 Creek.

The FNITR expressed strong concerns about selenium exceedances in M20 Creek and the Wolverine River, particularly as existing conditions for selenium were increased in relation to the Teck Mesa-Wolverine Mine. The FNITR stressed that there had not yet been enough investigation into the source and the effect

of the selenium, as well as the impact on aquatic life and fish, especially with respect to the potential for selenium speciation and impacts on Treaty rights.

The FNITR expressed throughout application review that comparing selenium concentrations to the SPOs in the Wolverine River and the B.C. WGQ-FAL in M20 Creek was inappropriate, as the FNITR stated that these guidelines are not based on an assessment of risk of adverse effects. In the case of selenium, the FNITR noted that western science indicates that the B.C. WQG-FAL of 2ug/L may not be protective, as speciation to more bioavailable forms of selenium has been shown to cause bioaccumulation at even very low water concentrations. The FNITR expressed that these comparisons have not allowed for a thorough consideration of the effect of changes in water quality on Treaty rights, as elevated selenium in water would have an adverse effect in Indigenous fisheries and the level at which this would have an effect is unknown. HRFN and MLIB also raised concerns that the Amendment would contribute to selenium bioaccumulation in aquatic resources and fish and questioned the use of regional selenium bioaccumulation model used by Conuma. This issue is further discussed in Section 6.13 (Aquatic Resources) and Section 6.14 (Fish and Fish Habitat).

Given reviewers' ongoing concerns about selenium, the EAO developed an information request requiring Conuma to provide additional, detailed information about specific mitigation measures for selenium at both the Wolverine Mine and HDA and indicate how these measures would prevent exceedances of the site performance objective at Wolverine Mine and of the B.C. WQG-FAL at the HDA. Conuma provided further information about the water management system at the HDA and more information about their proposed Selenium Management Plan, which described source control, water management, and a trigger response plan in the event of elevated selenium concentrations. In response to the comments raised and the EAO's information request, Conuma stated that it would not be proposing a new site performance objective for the Wolverine River and described the proactive mitigation measures that would control selenium, including water management, strict waste rock placement, and progressive reclamation.

In a final memo to the EAO, ENV reviewers noted that, while occasional slight exceedances of the WQG of 2 µg/L for protection of aquatic life occurred upstream of the Wolverine Mine, exceedance of the current site performance objective (3 µg/L) downstream of the Wolverine Mine currently occur occasionally and are predicted to appear continuously in the future due to the Wolverine Mine and the HDA. ENV stated that the current exceedances of the site performance objective in the Wolverine River would need further assessment during permitting, particularly regarding how the mine would ensure compliance with the current site performance objective.

The FNITR continued to express that neither the site performance objective in the Wolverine River nor the B.C. WQG-FAL of 2 ug/L were protective of the environment, and that neither of these guidelines were sufficient against which to evaluate Treaty rights.

In recognition of existing and predicted exceedances of selenium at the Wolverine Mine and the HDA, the EAO has proposed Condition #11 (Aquatic Resources Monitoring Plan), which would include bioaccumulation modelling of selenium and sampling of water, sediment, periphyton, benthic invertebrates and fish. The condition would also include specific monitoring triggers (both below and at

guideline levels when guidelines exist) and corresponding responses and mitigation measures that would be implemented if the triggers were reached. The triggers would be developed in consultation with Indigenous nations.

Eutrophication

ENV requested additional information about the potential for eutrophication as a result of the Amendment. Conuma responded that no nitrate, nitrite, or phosphorus concentrations were predicted to exceed B.C. WQG-FAL, and Conuma did not anticipate an elevated risk of eutrophication occurring in M20 Creek.

ENV noted that Conuma had ruled out evaluating changes in surface water quality related to nutrients based on predictions being below the applicable water quality guidelines. However, ENV explained that the changes should be assessed with respect to existing conditions, and that any change in nutrient concentrations could pose an environmental risk. Conuma responded to ENV's concerns in order to evaluate the potential for eutrophication in M20 Creek in a series of memos.

Ultimately, while ENV indicated that these responses were sufficient to address the concerns raised, reviewers also noted that a significant increase of nitrogen species (nitrate, nitrite, ammonia) and phosphorus over background would very likely lead to eutrophication of M20 Creek. This would have the potential to impact the aquatic receiving environment, including aquatic plants (periphyton and macrophytes), invertebrate and fish habitat, and species compositions in M20 Creek. Once eutrophication has occurred and plant growth has proliferated, it would be difficult to reverse it.

In recognition of the ongoing concerns regarding eutrophication, the EAO has proposed a condition #11 (Aquatic Resources Management Plan), which would require mitigation measures for nutrient management and limiting of eutrophication in M20 Creek and Wolverine River.

While the EAO is satisfied that these issues have been adequately addressed for the purposes of this Amendment, more detailed discussions, requirements, and issues resolution would be required regarding surface water quality modelling during the permitting process.

6.12.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures and reviewers' feedback, the EAO concludes that the Amendment would result in residual adverse effects on surface water quality within the HDA (M20 Creek, South Hermann Creek, and Murray River) and at the Wolverine Mine (Wolverine River). These effects are due to exceedances of selenium above B.C. WQG-FAL for the protection of aquatic life (2 µg/L) and occasionally above the drinking water guideline of 10 µg/L in M20 Creek above the fish bearing section.

In the HDA receiving environment, these effects are predicted to be moderate, restricted to the LAA, medium-term, and would occur with regular frequency due to seasonal peaks in operations and reclamation and closure. In post-closure, these effects are predicted to be moderate, restricted to the LAA,

long-term, and would occur with regular frequency due to seasonal peaks. The EAO predicts, with a high likelihood, that these effects would primarily occur in M20 Creek, and to a limited degree in Murray River and South Hermann Creek.

At the Wolverine Mine, these effects are predicted to be negligible, restricted to the LAA, medium-term, and would occur with regular frequency in operations and reclamation and closure. In post-closure, these effects are predicted to be moderate, restricted to the LAA, long-term, and would occur with regular frequency due to seasonal peaks. The EAO predicts, with a high likelihood, that these effects would occur in the Wolverine River. To reduce the potential for residual effects and based on reviewers' identification of ongoing uncertainty, the EAO has proposed the following conditions related to surface water quality:

- Condition #11: Aquatic Resources Monitoring Plan, requiring a plan to monitor and mitigate effects to aquatic resources, including the specific measures by which surface water chemistry would be monitored as well as specific monitoring triggers and corresponding responses and mitigation measures;
- Condition #12: Water Treatment Technology, requiring that Conuma separate treated sewage effluent from the industrial effluent and treat contact water with a SeHAWK system; and
- Condition #13: Water Quality Management Plan, requiring Conuma to operate the SeHAWK system effectively and monitor water quality parameters.

While ENV reviewers communicated to the EAO that the responses provided by Conuma were adequate, in their view, at the EA level, reviewers identified that the following items be included in Conuma's production permit applications:

- Additional site-specific information to support a protective selenium threshold to reduce uncertainties and support permit limit development;
- A plan by the applicant on how approved SPOs and (when available) WQOs for the Murray River Watershed can be achieved in the future;
- Additional cumulative effects assessments on aquatic life from predicted exceedances of WQG by dissolved cadmium, cobalt, uranium, dissolved aluminum and sulphate and how to mitigate them;
- A plan for management of nutrient releases to minimize the significant risk of eutrophication; and
- Temperature modelling for the fish bearing section in M20 Creek.

The FNITR expressed throughout application review that comparing selenium concentrations to the SPOs in the Wolverine River and the B.C. WGQ-FAL in M20 Creek was inappropriate, as the FNITR stated that these guidelines are not based on an assessment of risk of adverse effects. In the case of selenium, the FNITR indicated that western science indicates that the B.C. WQG-FAL of 2 ug/L may not be protective, as speciation to more bioavailable forms of selenium has been shown to cause bioaccumulation at even very low water concentrations. The FNITR expressed that these comparisons have not allowed for a thorough consideration of the effect of changes in water quality on Treaty rights, as elevated selenium in water would have an adverse effect in Indigenous fisheries and the level at which this would have an effect is unknown.

Cumulative Effects

Based on the cumulative effects assessment provided by Conuma, the EAO concludes that the Amendment would interact cumulatively with the Murray River Coal project, causing changes in water quality within the HDA receiving environment, including M20 Creek (total selenium, sulphate, nitrate, nitrite, cobalt, uranium, dissolved aluminum, and dissolved cadmium) and Murray River (dissolved cadmium).

Conuma's assessment showed that cumulative concentrations of parameters of concern in M20 Creek were predicted to peak in December, as a result of the reduction in flows in M20 Creek and associated with inputs from the Murray River Coal Project.

The EAO predicted cumulative effects to be limited to the LAA, as concentrations in M20 Creek were expected to be quickly diluted by flows into the Murray River. This effect would be regular, long-term, and expected to be reversible once the HDA and the Murray River Coal Project are reclaimed.

In addition to the proposed mitigation measures outlined for potential impacts to surface water quality from the Amendment, Conuma proposed a cumulative effects monitoring program to determine Conuma's contributions to any cumulative change in water quality.

6.12.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would have residual adverse and cumulative effects on surface water quality.

6.13 Aquatic Resources

6.13.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Aquatic resources were selected as an intermediate valued component, as mining activities may adversely affect primary and secondary producers (such as periphyton and benthic invertebrates), that are important ecological components of the aquatic food web system. Aquatic resources can provide food sources for higher trophic level species (such as fish) and are useful indicators of overall aquatic health.

The assessment of groundwater quantity and quality (Section 6.10), surface water quantity (Section 6.11), surface water quality (Section 6.12) were inputs to the assessment of aquatic resources. Aquatic resources were classified as an intermediate valued component, as the effects on aquatic resources would also move along pathways to influence other valued components. The results from the aquatic resources effects assessment were thus carried forward to the assessment of wildlife and wildlife habitat (Section 6.16) and

fish and fish habitat (Section 6.14).

The Amendment has the potential to alter or remove aquatic habitat, which could result in the decrease in abundance or density of benthic invertebrates, decrease in biomass of periphyton, and possibly cause shifts in aquatic community composition.

Conuma used a variety of data sources to describe existing conditions and predict the effects of the Amendment on aquatic resources, including previous environmental assessments conducted for the Wolverine Coal Mine Application (2004; including environmental effects monitoring programs in 2014 and 2017), the Hermann Mine Project (2004 and 2006 field programs), and HD Mining's Murray River Project. Conuma also conducted additional studies in 2018 and 2019 for a permit application.

Conuma assessed the following potential effects on aquatic resources:

- Changes in periphyton and/or benthic invertebrate communities (specifically taxonomy, biomass and tissue chemistry for periphyton and taxonomy, abundance/diversity and tissue chemistry for benthic invertebrates); and
- Changes in sediment quality (specifically chemical concentrations for variables of potential concern.

The spatial boundaries for aquatic resources included the HDA, the Coal Haul Road and the Wolverine Mine. The LAA included the M20 Creek watershed, South Hermann Creek, M14 Creek, Murray River from the confluence of M20 Creek to a location approximately 4 km downstream, a 200 m buffer around the Coal Haul Road and the Wolverine Mine, and Perry Creek and Wolverine River adjacent to the Wolverine Mine. The RAA included the entirety of the Murray River and Wolverine River watersheds upstream of their confluence and downstream to the confluence of Quality Creek. The aquatic resources valued component was assessed for construction, operations, reclamation and closure, and post-closure.

The following is an overview of existing conditions in the LAA/RAA as described by Conuma for periphyton, benthic invertebrates, and sediment quality.

Periphyton

Periphyton are freshwater organisms that attach to plants and other objects in sediment. Conuma found that periphyton communities in all watercourses varied annually but were generally dominated by diatoms. Algae tended to comprise a low proportion of the periphyton communities, except in select years where blue-green algae or green algae was dominant. Familial richness (the diversity of periphyton families) was generally consistent between locations on the same watercourse from year to year. Conuma found that richness in 2012 was lower than other years across sampling sites on M20 Creek and Murray River.

Overall, there was low biomass of periphyton found, as all samples were below the provincial water quality guideline for periphyton biomass (10 µg/cm^2) in any year. Conuma also analyzed total metals in periphyton tissue samples collected during almost all field programs. Generally, selenium concentrations

in M20 Creek periphyton were higher than those in the Murray River and other HDA tributaries and exceeded guidelines at most sites in 2014 and 2017. In Perry Creek and Wolverine River, selenium concentration increased in an upstream to downstream direction.

Benthic Invertebrates

Benthic invertebrates are organisms that live in sediment or at the bottom of a waterbody or watercourse. Conuma found that benthic invertebrate communities in watercourses in the HDA varied across time and among sampling locations, however, the more sensitive taxa were generally dominant. The benthic invertebrate community in the Murray River was highly variable and tended to have the highest proportion of more tolerant taxa such as mites and non-biting midges and lowest proportion of sensitive taxa. The benthic invertebrate communities in the watercourses near the Wolverine Mine appeared to be relatively stable between 2014 and 2017.

In the watercourses near the HDA, selenium in benthic invertebrate tissue exceeded the guideline in almost all sample locations in 2005, 2012, 2013 and 2018, although the Amendment Application noted that selenium in samples collected in 2011 were below guidelines. While selenium concentration in samples collected from Perry Creek and Wolverine River exceeded the guideline in 2014 and 2017 at most sites, concentrations appeared to stay relatively stable from 2014 to 2017.

Sediment Quality

Of the 30 metals screened in sediment samples, ten have respective guidelines for the protection of aquatic life. Of these ten variables, arsenic, cadmium, and nickel concentrations regularly exceeded the Interim Sediment Quality Guidelines across multiple sample locations and years. There were no other exceedances of the guidelines between 2004 and 2018. Selenium concentrations in sediment at all HDA sample locations were below the guideline for protection of aquatic life but did exceed guidelines in several oxbows near the Wolverine River locations.

A total of 17 polycyclic aromatic hydrocarbons (PAHs) were analyzed at each sample site, 13 of which have respective guidelines for the protection of aquatic life. Three samples exceeded the Interim Sediment Quality Guidelines at all sampled stations across most sample years, including for chrysene, fluorene, and pyrene.

Potential Effects of the Amendment

The following are potential effects of the Amendment on aquatic resources as described by Conuma.

Habitat Loss or Alteration

Within the HDA, Conuma noted that habitat loss or alteration due to ground disturbance could have direct and indirect effects on aquatic resources. The Coal Haul Road would cross several watercourses, and culvert extensions or replacements may be required, but Conuma predicted minimal environmental damage with the application of mitigation.

Conuma also noted that the Amendment would alter the upper portions of M20 and Nabors creeks as part of the water management activities and construction of mine components. Conuma provided a conservative estimate of the effect by assuming that all watercourses within the HDA would be permanently altered or lost. With this assumption, Conuma estimated that construction of the Hermann Pit, waste rock dumps, water management infrastructure and roads would permanently alter or remove about 10.9 km of aquatic habitat in M20 Creek tributaries and 6.7 km of aquatic habitat in Nabors Creek tributaries. A total of 42.3 ha of riparian habitat in the M20 Creek watershed and 26.5 ha of riparian habitat in the Nabors Creek watershed would also be permanently lost or altered as a result of the same activities (taking a 20 m riparian buffer into account).

These changes were predicted to have adverse residual effects to aquatic resources by permanently altering or removing the aquatic and riparian habitat in the M20 Creek headwaters and Nabors Creek. Because riparian habitat provides food and nutrient input to periphyton and benthic invertebrates, the alteration or removal of this habitat was predicted to cause a localized decrease in growth, decrease abundance/biomass, and potential shifts in community composition. However, Conuma stated that their contribution to downstream reaches in M20 Creek would be limited given more direct inputs from other established riparian habitats adjacent to the watercourse that are intact and would not be disturbed by the Amendment activities.

Conuma did not anticipate any pathways of disturbance at the Wolverine Mine and thus did not identify any interactions with aquatic resources.

Change in Surface Water Quantity

Within the LAA, Conuma noted that aquatic habitat is comprised primarily of lotic conditions (where water is flowing). As the ecosystem and organisms living within it have evolved with natural flow fluctuations, there is therefore a dependence on natural variation for survival and reproduction. Changes in surface flow can alter ecological function, including habitat for periphyton and benthic invertebrates as well as invertebrate drift (the downstream movement of invertebrates). An increase in stream velocity can increase stream bed scouring, thereby reducing periphyton and benthic invertebrate community composition.

Although it is expected that habitat losses in M20 Creek and Nabors Creek headwaters could potentially alter the quantity of invertebrate food exported downstream in M20 Creek, Conuma predicted that the relative contribution of these areas to the total invertebrate biomass is predicted to be minimal when compared to that generated by mainstem M20 Creek. Compared to the headwaters, the M20 Creek mainstem provides substantially more invertebrate habitat for and conveys a much greater volume of water compared to the tributaries under existing conditions. The predicted changes to surface flow in the tributaries are expected to have no influence on the downstream contribution of invertebrate productivity in both non-fish-bearing and the fish-bearing reaches of M20 Creek. Conuma noted that flow losses were predicted from January to March during both average and dry scenarios. As invertebrate abundance and species composition peaks during late summer or early fall, Conuma concluded that reduced surface flows during the winter would have negligible residual effect on invertebrates.

Overall, Conuma predicted that the aquatic and riparian habitat losses as a result of the Amendment would affect upper M20 Creek and Nabors Creek invertebrate communities, but that these changes are predicted to be localized to the headwaters and would not affect the lower portions of M20 Creek.

Change in Surface Water Quality

Conuma noted that the Amendment could cause a change in surface water quality during construction, operations and reclamation and closure, and post-closure through ground disturbance and discharge of contact and non-contact water (see Section 6.12: Surface Water Quality for additional information).

Effects to periphyton and benthic invertebrates may occur due to changes in surface water quality through the chemical and physical alteration of their habitat. Chemical alteration includes an increase in the concentration of water quality parameters that could cause toxicity (either chronic or acute effects) to aquatic life; chronic effects may include changes in growth, reproduction, physiology or behaviour. Physical alteration includes elevated suspended sediments, affecting benthic macroinvertebrate and periphyton production. Eutrophication includes chemical and physical alteration and can cause changes in periphyton and benthic invertebrate production as well as taxonomic shifts.

The potential risk of eutrophication (excessive richness of nutrients) was assessed based on a request from ENV. Concerns were raised regarding surface water quality and potential nutrient increases relative to existing conditions in M20 Creek, which could lead to eutrophication. Conuma provided an updated Aquatic Resources Assessment in September 2020 that considered the proposed SeHAWK water treatment system. Conuma stated that the potential changes in aquatic resources due to elevated eutrophication risk from the Amendment were expected to be low in magnitude relative to Amendment-only residual effects. Additionally, Conuma noted the predicted risk of effects are limited both spatially (predominantly in lower M20 Creek) and temporally (most pronounced in August and September during reclamation and closure phase).

Conuma predicted that there would be elevated concentrations of selenium, uranium, and total suspended solids caused by the Amendment. The B.C. WAG-FAL for selenium recommends a concentration of 2 µg/L for the prevention of chronic effects to aquatic life. Even with the application of the mitigation measures for surface water quality, guideline exceedances of selenium were consistently predicted in M20 Creek and Wolverine River as a result of the Amendment with a magnitude of maximum exceedance 2.5 times the B.C. WAG-FAL. Following the implementation of mitigation, concentrations of selenium that would be elevated above the B.C. WAG-FAL suggested potential impacts on fish, birds and amphibians, decrease in abundance or density of benthic invertebrates, decrease in periphyton biomass, and/or shifts in periphyton/benthic invertebrate taxonomy and tissue chemistry, and an increasing probability of dietary bioaccumulation.

Conuma also predicted a slight exceedance of uranium at one monitoring location in M20 Creek, including concentrations exceeding the provincial working guideline for short periods of time each year at a peak concentration. However, given the small degree of predicted exceedance and limited time per year that the exceedance would occur (August and December), coupled with the high degree of protection provided

in the working WQG for uranium, Conuma did not predict any residual effects to aquatic resources due to Amendment-related changes to uranium concentrations.

For surface water quality, Conuma has a target concentration of less than 35 mg/L for total suspended solids. This target is below the provincial guidelines, which recommend a discharge limit of 50 mg/L for coal mining effluent. Conuma's surface water quality modelling predicted some exceedances of the provincial water quality guideline in upper M20 Creek; however, Conuma also noted that dilution decreases the concentration of total suspended solids. Under existing conditions, Conuma noted that the mid- to lower reaches of M20 Creek experience large pulses of total suspended solids, attributed to a natural sediment source.

Change in Sediment Quality

Conuma noted that shifts in sediment quality may alter community density, composition and tissue chemistry of aquatic resources.

Under existing conditions, Conuma found that selenium concentrations in the sediment sampled at the HDA were below the sediment alert concentration guideline for protection of aquatic life but did exceed it at certain Wolverine River locations.

Conuma noted that there are no sediment quality guidelines for uranium and that any potential adverse effects to periphyton and benthic invertebrates due to elevated concentrations of uranium in water have been assessed through the surface water quality pathway.

Proposed Mitigation Measures

Conuma did not propose any specific mitigation measures targeting effects to aquatic resources as mitigation measures targeting surface water quality (Section 6.12), fish and fish habitat (Section 6.14) and surface water quantity (Section 6.11) would mitigate any effects to aquatic resources.

6.13.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the following key issues related to aquatic resources were raised, which are summarized below.

Selenium Exceedances and Bioaccumulation

The FNITR, HRFN, MLIB, ENV and Northern Health expressed concerns throughout application review about the potential for metals to bioaccumulate in aquatic resources in M20 Creek and the Wolverine River. This was of particular concern with respect to selenium, as reviewers noted high levels of selenium in M20 Creek and predicted exceedances of selenium SPOs (to be developed in the permitting process) at the Wolverine Mine. For information regarding the effect of selenium on fish, human health, and Indigenous interests, please see Section 6.14 (Fish and Fish Habitat), Section 6.17 (Human Health) and

Section 7 (Assessment of Impacts to Treaty Rights and Interests).

While selenium is essential to most animals, it can be toxic at high levels and toxicity can result in effects on reproductive success of egg laying vertebrates. As the main pathway for selenium to enter these vertebrates is through the food chain, protective selenium threshold concentrations for fish tissues (ovary tissue and muscle) were developed.

To determine the effect of the B.C. WQG for selenium in the food chain, Conuma developed a regional bioaccumulation model, based on data from several mines in the Peace Region, to develop a preliminary protective threshold of selenium in water specific to the HDA. Using this model, Conuma estimated at water concentration of 76 µg/L to be that the protective for fish in lower M20 Creek. Throughout application review, ENV, SFN, WMFN and MLIB requested additional information and clarification about the bioaccumulation model level for selenium in water would be at 76 µg/L.

ENV reviewers noted that, in the absence of a limit determined at permitting, the WQG-FAQ of 2 µg/L should be used to assess effects to aquatic resources and in turn, fish. Reviewers provided feedback that the model may not be representative of the specific conditions within the HDA, and that high levels of selenium in fish tissue had been found with very low corresponding selenium water concentrations. The FNITR indicated that they were concerned with the way the model was developed and concerned with Conuma's preliminary protective threshold and the impact that underestimating bioaccumulation would have on the Indigenous communities that consumed fish in this region. For additional discussion about selenium and fish, please Section 6.14 (Fish and Fish Habitat) and Section 7 (Assessment of Impacts to Treaty Rights and Interests).

Conuma responded that the B.C. WQG-FAL to protect freshwater aquatic life for selenium was based on a review of available studies and reports on selenium toxicity and bioaccumulation from a wide range of ecosystems and species. The B.C. WQG-FAL was intended to provide generally applicable guidelines to all waters in B.C. (2 µg/L). The Technical Report for the B.C. WQG-FAL for selenium specifically noted the challenges of applying aqueous selenium guidelines and noted to be used as a trigger for further assessment. Conuma noted that the regional bioaccumulation study indicated that selenium bioaccumulation would occur at a much lower degree in lotic (flowing) watercourses and, therefore, the selenium would not likely reach toxicity thresholds in benthic invertebrates and fish. FNITR reviewers noted that lentic habitats exist in the downstream fish-bearing reaches, and reviewers continued to request additional information and data to support this assertion and the use of the model.

To enhance reviewers' confidence in the assessment for aquatic resources, the EAO developed an information request for Conuma that required:

- Updates to the bioaccumulation model with recent 2019 data;
- Additional analysis to demonstrate how the regional selenium bioaccumulation model compares to tissue collected from M20 Creek and the Wolverine River in 2019; and
- Additional detail about Conuma's planned monitoring program for aquatic resources, including how Conuma planned to mitigate selenium speciation.

In response to reviewers' comments and discussions with Indigenous nations, Conuma provided an updated bioaccumulation model with 2019 site-specific data and conducted sensitivity analysis supporting the representativeness of the bioaccumulation model, the consistency of selenium bioaccumulation patterns, and the sensitivity of the model to assumptions and data selection. Conuma indicated that site-specific models can only describe existing patterns in selenium bioaccumulation, which have limited value for predicting the effects of changes in selenium concentration in water and aquatic biota. Conuma also stated that a regional model supports predictions of selenium bioaccumulation because of the general consistency of selenium bioaccumulation patterns in M20 Creek, Wolverine River, Murray River, reference waterbodies, and across nearby waterbodies in the area.

ENV reviewers indicated that the existing data from the site appeared to be a reasonable fit with the predictions of the regional bioaccumulation model and that this information was acceptable at the EA level. In a final memo to the EAO, ENV used the selenium B.C. WQG-FAL of 2 µg/L as the protective threshold to perform their final effects assessment and noted that 10 µg/L (the drinking water guideline) would be a preliminary selenium threshold at the EA stage, as. ENV further noted that a level of 76 µg/L would not be acceptable as a science based environmental benchmark at permitting and that additional, site-specific data would be required at the permitting level to develop protective guidelines for aquatic resources and fish.

Reviewers from Indigenous nations did not support the use of the regional bioaccumulation model in the assessment. SFN, WMFN, MLIB and HRFN stated that the mechanics of the model were not well described and that the assumptions underlying the model were not realistic (e.g. that selenium speciation is identical in all environments). The FNITR disagreed that the 2019 data was a reasonable fit with the regional bioaccumulation model, and that the data from Blind Creek (collected by Conuma at their nearby Brule Mine) is controlling the model at high aqueous selenium concentrations.

Ultimately, Indigenous nations contended that the regional selenium bioaccumulation model is not constructed properly, which casts doubt on its predictions. Throughout the review, the FNITR requested site-specific bioaccumulation models be developed for M20 Creek. Citing the small number of observations and range of selenium concentrations, Conuma elected to perform sensitivity analyses and plot data from M20 Creek using the regional bioaccumulation model instead of a site-specific model. Conuma indicated that the model results were unstable, to which the FNITR responded that an inappropriate modelling technique had been used. For detailed information regarding Indigenous nations' views on the selenium bioaccumulation model, please see Section 7 (Assessment of Impacts to Treaty Rights and Interests).

Following multiple discussions about the use of the model, SFN and WMFN indicated that developing a site-specific model at the permitting level would be an acceptable course of action. In light of the concerns regarding selenium bioaccumulation, the EAO proposed the following conditions:

- Condition #9: Indigenous-Led Monitoring Program, which requires that monitoring programs be developed and implemented in consultation with Indigenous nations;
- Condition #11, Aquatic Resources Monitoring Plan, requiring Conuma to model bioaccumulation of selenium and monitor aquatic resources, including specific triggers for additional responses and

mitigation; and
- Condition #13: Water Quality Management Plan, requiring monitoring of selenium, nitrate, and nitrite.

Cumulative Effects Assessment

Reviewers from ENV, the FNITR, and HRFN expressed concern about the cumulative effect of water quality exceedances on aquatic resources. Reviewers indicated that, despite exceedances of surface water quality guidelines, the change in aquatic resources was not carried forward as residual effect and a cumulative effects assessment was not performed.

Conuma responded that, based in the original Aquatic Resources Assessment, its assessment considered the potential for residual effects to aquatic resources due to changes in surface water quality, including selenium and uranium, and asserted that an exceedance of a water quality guideline did not necessarily constitute a residual effect. Reviewers continued to disagree with the lack of identified cumulative effects in the Amendment Application, given that there were guideline exceedances and that the receiving environment (M20 Creek) is shared directly with two other mines (Teck's Mesa-Wolverine Mine, which has been in care and maintenance since 2014, and the Murray River Coal Project, currently in the permitting process).

In response to reviewers' concerns, the EAO developed an information request requiring Conuma to evaluate the cumulative effects specific to exceedances of pertinent water quality guidelines on aquatic resources. Conuma provided a supplemental cumulative effects assessment specific to selenium that considered the Amendment's potential residual effects on aquatic resources. Conuma asserted that the likelihood of any cumulative residual effects on aquatic resources occurring during the life of the Amendment was low with the implementation of mitigation measures and that the levels of selenium predicted would only occur if both the Amendment and the Murray River Coal Project were to be built and operated concurrently. Conuma also noted that this assessment relied on predictions from the water balance model, the surface water quality model, and the regional bioaccumulation model, all of which were subject to uncertainty.

Ultimately, ENV reviewers indicated that they were satisfied with the responses and any that residual uncertainty would be addressed in the permitting process. ENV provided a final memo to the EAO dated November 3, 2020, stating their remaining comments from the final round of application review had been addressed at the EA level. FNITR reviewers indicated that they did not agree with Conuma's assessment that likelihood of cumulative effects on aquatic resources were low.

In its final memo to the EAO, ENV indicated that exceedances of several other contaminants were cause for concern related to aquatic resources. ENV indicated that additional increases in concentrations of beryllium, dissolved cadmium, uranium, cobalt and sulphate over the existing exceedance of WQGs for the protection of aquatic life or exceedances during dry or very dry conditions or upper cases increase the risk for a potential cumulative effect from these parameters.

Reviewers from the FNITR also provided a memo in response to Conuma's eutrophication cumulative effects assessment for aquatic resources and noted that the potential effect of increased phosphorous remained an outstanding concern from their perspective. The FNITR requested that potential algal growth be monitored, and that benthic invertebrate sampling is adequate to detect an effect from this change, to which Conuma has committed.

In recognition of the uncertainty in the water modelling and Indigenous nations' outstanding concerns, the EAO has proposed the following conditions:

- Condition #9: Indigenous-Led Monitoring Program, which requires that monitoring programs be developed and implemented in consultation with Indigenous nations;
- Condition #11: Aquatic Resources Monitoring Plan, which would require surface water quality monitoring, including monitoring of periphyton and benthic invertebrates; and
- Condition #12: Water Treatment Technology, requiring Conuma to implement SeHAWK as the primary water treatment.

Other Water Quality Exceedances

In a final memo to the EAO dated November 3, 2020, ENV provided additional information about exceedances of other contaminants with the potential to affect aquatic resources.

ENV noted that WQG exceedances of dissolved aluminum are difficult to evaluate, as the WQG is based on lab tests with dilution waters that have low complexing (i.e. binding to other materials) capacities. Since complexing can cause a metal to be less bioavailable, the same concentrations could be less toxic in waters where organic and other complexing materials exist. Since the exposure to aluminum would likely be short-term for invertebrates and aquatic plants, it is uncertain whether effects caused by high aluminum concentrations would occur for short periods due to this Amendment.

ENV further noted that, while most predicted nutrient concentrations did not exceed WQGs, the nitrate long-term WQG for the protection of aquatic life is predicted to be slightly exceeded in very dry conditions in M20 Creek. While the slight WQG exceedance and potentially low frequency of this occurrence may not lead to a significant effect related to toxicity, ENV noted that this exceedance bears a small risk. Nitrate is also predicted to exceed the approved site performance objective of 1.5 mg/L in upper and dry scenarios in the Wolverine River.

ENV also indicated that the predicted substantial increase of nitrogen species (nitrate, nitrite, ammonia) and phosphorus over background would very likely lead to eutrophication of M20 Creek and has the potential to impact the aquatic receiving environment, including aquatic plant, invertebrate and fish habitat, as well as associated species compositions in M20 Creek. Once eutrophication has occurred and plant growth has proliferated, it would be difficult to reverse this condition.

6.13.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS ON AQUATIC RESOURCES

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in the following residual adverse effects on aquatic resources:

- Loss of periphyton and benthic invertebrate habitat due to loss or alteration within the HDA;
- Effects on egg-laying vertebrates due to selenium exceedances of WGGs and uncertainties associated with a regional bioaccumulation model; and
- Effects on plant growth; plant and invertebrate habitat; community and food chain composition due to a substantial increase in nutrients.

The EAO views the residual adverse effects related to the loss of periphyton and benthic invertebrate habitat to be high magnitude, limited to the HDA, continuous, long-term and irreversible following closure and reclamation. The EAO's confidence in this prediction is high.

The EAO views the residual adverse effects related to selenium exceedances and the increase in nutrients to be moderate magnitude, limited to the HDA, continuous, long-term and irreversible following closure and reclamation. The EAO's confidence in this prediction is high.

Due to the residual adverse effects following mitigation, the EAO has proposed the following conditions to reduce the potential residual effects on aquatic resources:

- Condition #11: Aquatic Resources Monitoring Plan, requiring Conuma monitor for bioaccumulation of selenium in aquatic resources and undertake surface water quality monitoring;
- Condition #12: Water Treatment Technology, requiring Conuma to implement the SeHAWK technology as the primary water treatment; and
- Condition #13: Water Quality Management Plan, requiring Conuma to use the water treatment system effectively, to monitor selenium, nitrate, and nitrite in the receiving environment and to indicate how the Murray River Water Quality Objectives would be met.

Cumulative Effects

The EAO has identified that there is a risk for potential cumulative effects on aquatic life due to B.C. WQG-FAL exceedances from dissolved cadmium, cobalt, uranium, dissolved aluminum and sulphate in M20 Creek. The EAO views these residual adverse cumulative effects to be low magnitude, limited to the HDA, continuous, long-term and reversible following closure and reclamation. The EAO's confidence in this prediction is moderate.

6.13.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would have residual adverse effects on aquatic resources.

The effects on aquatic resources intermediate valued component are carried forward to the related assessment of other valued components (fish and fish habitat and human health) in this report.

6.14 Fish and Fish Habitat

6.14.1 SUMMARY OF CONUMA'S ASSESSMENT

Fish and fish habitat were selected as a valued component due to its value by the public for recreational purposes, Indigenous people for traditional purposes, as well as its value as part of a healthy aquatic ecosystem.

The results of the effects assessments for surface water quantity (Section 6.11), surface water quality (Section 6.12), aquatic resources (Section 6.13) were inputs into the fish and fish habitat assessment. Conuma also noted that effects on fish and fish habitat would move along pathways to influence other valued components including wildlife and wildlife habitat (Section 6.16), land use (Section 6.6), human health (Section 6.17), and Assessment of Impacts to Treaty Rights and Interests (Section 7).

The spatial boundaries of Conuma's assessment included the HDA, the Coal Haul Road, and the Wolverine Mine. The LAA included the M20 Creek watershed, South Hermann Creek, M14 Creek, Murray River from the confluence of M20 Creek to a location approximately 4 km downstream, a 200 m buffer around the Coal Haul Road and the Wolverine Mine, and Perry Creek and Wolverine River adjacent to the Wolverine Mine. The RAA included the entirety of the Murray River and Wolverine River watersheds upstream of their confluence and downstream to the confluence of Quality Creek. The fish and fish habitat valued component was assessed for construction, operations, reclamation, and post-closure.

Existing Conditions

Conuma used existing data sources to describe existing conditions for fish and fish habitat in the LAA from previous EAs conducted for the Wolverine Coal Mine Application (2004), Hermann Mine Project Application (2007) and HD Mining's Murray River Project. Conuma also conducted additional studies in 2019, including fish habitat assessments, fish community inventories and fish tissue collections in M20 Creek, the Murray River, the Wolverine River and reference sites.

Conuma assessed the following potential effects on fish and fish habitat:

- Harmful alteration, disruption, or destruction of fish habitat; and
- Change in fish health and mortality, including lethal and sub-lethal effects on fish.

M20 Creek

M20 Creek is a tributary of the Murray River and is approximately 15 km long. Tributaries of M20 Creek include Nabors Creek and K6 Creek, both of which drain into M20 Creek upstream of an impassable bedrock chute located approximately 2 km upstream from the confluence with the Murray River. Both

tributaries are, therefore, non-fish bearing.

Eight fish species have historically been present in the fish-bearing portion of M20 Creek: mountain whitefish (*Prosopium williamsoni*), bull trout (*Salvelinus confluentus*), brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), Arctic grayling (*Thymallus arcticus*), burbot (*Lota lota*), longnose sucker (*Catostomus catostomus*), and slimy sculpin (*Cottus cognatus*). Of these, only bull trout are blue-listed (species of concern) in B.C. There are no fish species listed under the federal SARA using M20 Creek. Indigenous nations also indicated that fish species including bull trout, Dolly Varden, arctic grayling, whitefish, rainbow trout, char sucker, and pickerel were species of importance.

Slimy sculpin was found to likely be the only year-round resident fish species in M20 Creek; the other species known to use M20 Creek were believed to be seasonal migrants from Murray River fish populations. Mountain whitefish were the most abundant sportfish species observed in M20 Creek. Only juveniles of bull trout have been captured in M20 Creek. No adults or young-of-year (YOY, or less than one year old) bull trout were captured, suggesting that bull trout do not use M20 Creek for spawning.

Brook trout are an introduced species to the Murray River watershed and their presence was considered detrimental to bull trout. Despite the presence of a mature male brook trout in October 2006, there was no evidence of brook trout spawning in M20 Creek as no YOY brook trout were captured.

Murray River

The Murray River is a tributary of the Pine River, which eventually joins the Peace River near Fort St. John, B.C. It has a watershed area of approximately 6500 km^2, including the Wolverine River watershed. There were no barriers to fish passage found in the Murray River within or downstream of the LAA; however, Kinuseo Falls is a barrier to fish passage, located approximately 50 km upstream of M20 Creek. There were also numerous oxbows within the Murray River floodplain found, which are connected to the mainstem channel seasonally, during high flows.

The Murray River supports populations of Arctic grayling, bull trout, burbot, finescale dace (*Phoxinus neogaeus*), longnose dace (*Rhinichthys cataractae*), longnose sucker, mountain whitefish, northern pike (*Esox lucius*), and slimy sculpin. Mountain whitefish are the most abundant sportfish species in the Murray River. Three non-native species have been introduced to the Murray River: rainbow trout, brook trout, and westslope cutthroat trout (*Oncorhynchus clarki lewisi*). Arctic grayling is yellow-listed in B.C. (apparently secure) while bull trout and westslope cutthroat trout are blue-listed (species of concern). Treaty 8 First Nations also identified several fish species that are traditionally important food sources to their communities that may be impacted by the Amendment, including bull trout, Dolly Varden, arctic grayling, whitefish, rainbow trout, char sucker, and pickerel. For additional information regarding the effect of the Amendment on Treaty rights, please see Section 7.

There are no commercial fisheries on the Murray River; however, recreational fisheries exist for rainbow trout, brook trout, cutthroat trout, bull trout, mountain whitefish, Arctic grayling, and northern pike. Fish species typically harvested by members of SFN, WMFN, MLIB, and HRFN include bull trout/Dolly Varden,

Arctic grayling, rainbow trout, burbot, northern pike, suckers, and whitefish.

Perry Creek

Perry Creek is approximately 15 km long with a 60 km^2 watershed area between Mount Spieker and Mount Reesor. In addition to some natural barriers, twin culverts at the railway crossing of Perry Creek located approximately 800 m upstream from the Wolverine River are barriers to upstream fish passage during all but high flow conditions.

The fish-bearing reaches of Perry Creek are used by bull trout, Arctic grayling, mountain whitefish, spoonhead sculpin (*Cottus ricei*), and slimy sculpin. Spawning habitat for bull trout, Arctic grayling, and mountain whitefish was found to be limited by the availability of suitable gravel and cobble substrates. Suitable bull trout rearing habitat was limited by the rarity of undercut banks, root clumps, and back eddies while high turbidity in spring also limited the suitability of Perry Creek for Arctic grayling spawning.

Wolverine River

The Wolverine River is approximately 45 km long and drains into the Murray River at the town of Tumbler Ridge, B.C, with a watershed area of approximately 840 km^2. The river has a relatively low gradient over most of its length and no natural obstructions to fish passage. There are numerous oxbows within the Wolverine River floodplain that are seasonally linked to the main river at high flows.

The Wolverine River supports populations of Arctic grayling, bull trout, mountain whitefish, rainbow trout, longnose sucker, spoonhead sculpin, and slimy sculpin. Similar to the Murray River, there are no commercial fisheries on the Wolverine River; however, recreational fisheries for rainbow trout, brook trout, cutthroat trout, bull trout, mountain whitefish, Arctic grayling, and northern pike do exist. Fish species typically harvested by members of SFN, WMFN, MLIB, and HRFN within their traditional territories include bull trout/Dolly Varden, Arctic grayling, rainbow trout, burbot, northern pike, suckers, and whitefish.

Fish Tissue

Slimy sculpin was chosen as the indicator species for the analysis of tissue metal concentrations because it has a small home range (i.e., <10 m), has a relatively short life span (i.e., four to five years), and a relatively high fertility. Bull trout were also sampled for tissue metals because they are a top-predatory fish species in the Murray River watershed and are also a fish species likely to be eaten by humans. Slimy sculpin was considered a conservative fish receptor because other fish species tended to have lower tissue selenium concentrations across the range of selenium tissue concentrations observed in benthic invertebrates.

Mercury and selenium were the only two parameters for which federal or provincial fish tissue guidelines exist. Therefore, although metal concentrations for other parameters were analyzed, only mercury and selenium tissue concentrations were assessed.

Mean and maximum mercury concentrations in all slimy sculpin collected from all sites in M20 Creek and

in the Murray River were lower than the Health Canada guideline of 0.5 mg/kg.

Selenium concentrations in slimy sculpin samples from M20 Creek and from the Murray River upstream and downstream of M20 Creek have been consistently above the B.C. guideline of 4.0 mg/kg since 2004 and the proposed federal selenium whole body trigger value (2.9 mg/kg). Selenium concentrations from bull trout sampled from M20 Creek in 2011 and 2012 were 3.84 mg/kg and 3.91 mg/kg, respectively. These concentrations are lower than the B.C. selenium whole body tissue guideline (4.0 mg/kg) but higher than the proposed federal selenium whole body trigger value (2.9 mg/kg). Selenium is known to bioaccumulate in higher trophic levels and to bio-magnify in individuals with greater exposures. This would seem to support Conuma's assessment that the bull trout sampled in M20 Creek in 2011 and 2012 were not resident fish and were instead migrants from the Murray River. As a result, selenium concentrations in slimy sculpin were considered more representative of fish tissue metal concentrations in M20 Creek.

Potential Effects of the Amendment

As all Amendment components and activities at the HDA would be located in the non-fish-bearing headwaters of M20 Creek, Conuma noted that only potential direct effects of construction, operations, and reclamation and closure of the Amendment in M20 Creek on fish and fish habitat are predicted from potential changes in surface flow and water quality.

Conuma also noted that physical alteration of non-fish bearing headwater tributaries of M20 Creek may be considered harmful alteration, disruption, or destruction (HADD) of fish habitat (thus requiring a *Fisheries Act* Authorization from Fisheries and Oceans Canada), which would be determined by Fisheries and Oceans Canada. This HADD of fish habitat could result in potential indirect effects to fish in lower M20 Creek via potential effects on periphyton and benthic invertebrate communities. If a HADD is determined, additional mitigations and/or an offsetting plan would be discussed with DFO as part of the application to Fisheries and Oceans Canada, prior to construction.

Conuma assessed the Amendment, with mitigation, to result in a low to moderate magnitude residual effect on fish habitat in M20 Creek. This would be confined to the LAA but would result in a continuous, long-term residual effect that would be partially reversible following closure and reclamation. The likelihood of these residual effects to fish and fish habitat occurring was predicted by Conuma to be high.

In the Application, Conuma proposed the use of BCRs as the primary water treatment, although the water treatment technology was changed by Conuma during application review – please see Section 6.12 (Surface Water Quality) for more details. Following the change to the active SeHAWK water treatment system as a primary water treatment source, Conuma predicted the removal rates for selenium, nitrate, and nitrite to be 90 percent, which would not result in the accumulation of selenium in fish tissues at levels which would result in acute or chronic physiological or reproductive impairment. For the Murray River, the geographic extent of this residual effect would be limited to the LAA, low magnitude, medium-term and reversible. For the Wolverine River, the geographic extent of this residual effect would be limited to the LAA, long-term and irreversible because water quality in the Wolverine River would not be expected to return to pre-mine conditions following closure.

All effluent discharges from the Wolverine Site are currently permitted under *EMA* Effluent Permit 17756. A condition of this permit is that a full review of the Wolverine Selenium Management Plan be conducted if SPOs are exceeded in the Wolverine River downstream of the Wolverine Mine.

Proposed Mitigation Measures

Conuma proposed the following key mitigation measures to reduce the potential effects on fish and fish habitat:

- Construction and operation of water treatment infrastructure and non-contact water diversions to reduce selenium, nitrate, and sulphate concentrations in the contact water to levels that will avoid acute and chronic toxicity to fish and aquatic biota in M20 Creek prior to release to the receiving environment;
- Construction and operation of sediment ponds to reduce total suspended solid concentrations in the final end-of-pipe effluent discharge;
- SeHAWK would be used as primary water treatment, which would maintain at least a 90 percent continuous removal efficiency for selenium, nitrate, and nitrite; and
- Development of a Selenium Management Plan to control potential selenium inputs to the receiving environment at the Hermann and Wolverine Mine sites, including source control, clean water diversions, overburden management, progressive reclamation, contact water management, water treatment, and adaptive management.

6.14.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, the following key issues related to fish and fish habitat were raised, which are summarized below.

Bioaccumulation of Selenium

There were concerns raised by HRFN, SFN, WMFN, MLIB, Northern Health, EMLI, and ENV about the potential for bioaccumulation of selenium in fish. PGL, on behalf of SFN and WMFN, raised that selenium concentrations are already elevated in the HDA and Wolverine Mine areas, and in some instances fish tissue samples sometimes already exceed the B.C. Guideline threshold for selenium in tissue samples of 4 µg/g, stating that Conuma has not done efficient analysis of cumulative effects as this pre-existing selenium would increase with the increase of mine activity.

Conuma predicted selenium to exceed B.C. WQG-FALs for the protection of aquatic life and occasionally the preliminary threshold and drinking water guideline of 10 µg/L in M20 Creek above the fish bearing section. ENV indicated that while void of fish, this section provides food for fish downstream and thus could lead to selenium bioaccumulation into fish and other egg laying vertebrates downstream. The predicted B.C. WQG-FAL exceedance during reclamation and closure phase in the fish bearing section can further aggravate this situation.

The FNITR expressed that the B.C. WQG-FAL of 2 ug/L for surface water quality was not protective of the environment, and that this guideline was insufficient against which to evaluate Treaty rights. Throughout the review, the FNITR also requested site-specific bioaccumulation models be developed to assess the effect of the Amendment on fish and subsequently, on Treaty rights. Citing the small number of observations and range of selenium concentrations, Conuma elected to perform sensitivity analyses and plot data from M20 Creek using the regional bioaccumulation model instead of a site-specific model. Conuma indicated that the model results were unstable, to which the FNITR responded that an inappropriate modelling technique had been used.

Moreover, the FNITR noted that the levels employed in the assessment were based on consumption by an adult, and that it would be important to monitor the levels of selenium in children and women of childbearing age. For additional information regarding Indigenous nations' views on the selenium bioaccumulation model, please see Section 7 (Assessment of Impacts to Treaty Rights and Interests).

Conuma agreed to update their selenium bioaccumulation model to be in accordance with B.C. WQG-FAL, developing a Regional Selenium Bioaccumulation Study (Hatfield, 2020), which was based on regional data, including baseline data from the Hermann and Murray River Coal projects, to assess the bioaccumulation of selenium in periphyton, benthic invertebrates and fish. The study used data from the Murray River watershed specifically to assess the bioaccumulation of selenium in aquatic organisms in M20 Creek and the Wolverine River and demonstrated that changes in aqueous selenium would result in modest increases in selenium in the tissues of periphyton, benthic invertebrates, and fish in the region. In both the Murray River and M20 Creek, the mean selenium concentrations for slimy sculpin are predicted to be above the 4 mg/kg provincial guideline.

In light of the concerns regarding selenium, the EAO proposes a condition (#11) to require Conuma to develop an Aquatic Resources Monitoring Plan to monitor for potential bioaccumulation of selenium in fish tissue.

Insufficient Sampling

Ecora, on behalf of HRFN, stated that the habitat data that was collected over a 200 m site in M20 Creek was not a representative sample of the area. Conuma responded that the minimum requirement for data collection is a length of 100 m in a creek, and that the data collected in 2004-2006 was double the minimum amount. It was also stated that the data was collected using Fish Habitat Assessment Procedures (FHAP) and was updated in 2019 to determine current conditions of M20 Creek. It was for these reasons that Conuma found that the sampling methods for habitat data in M20 Creek to be sufficient.

ENV and the FNITR were also concerned that the tissue sampling for selenium in fish was isolated to one species of fish, slimy sculpin, in the area, and that additional sampling areas were needed to understand the potential effects. Source Environmental, on behalf of MLIB, requested that further information was needed to better understand selenium concentrations in all fish species in the lentic habitats downstream of the Wolverine Mine. The FNITR also noted that lentic waters are more susceptible to selenium concentrations (e.g. sediment and benthic invertebrate uptake). Conuma responded that M20 Creek was

not assessed for selenium in fish because there are five sequential fish barriers in the lower mainstem of M20 Creek that prevent fish from migrating upstream, and that slimy sculpin was the most representative fish to sample, as described in the Amendment Application.

The EAO proposes a condition (#15) to require additional fish tissue sampling through a Country Foods Monitoring Plan, developed in consultation with ENV and Indigenous nations.

6.14.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS ON FISH AND FISH HABITAT

After considering the proposed mitigation measures, the EAO concludes that the Amendment would result in the following residual adverse effects on fish and fish habitat, as detailed in Section 6.14.2:

- Decrease in fish health and an increase in fish mortality through contaminant (including selenium), nutrient (nitrogen and phosphorus), and sediment discharge and loss of surface flows into M20 Creek, Perry Creek, and the Wolverine River; and
- Loss of fish habitat through construction of infrastructure.

Overall, the EAO views these residual adverse effects to be low to moderate magnitude, limited to the LAA, continuous, long-term and partially reversible following closure and reclamation.

The EAO has proposed the following conditions to reduce the potential residual effects on fish and fish habitat:

- Condition #11: Aquatic Resources Monitoring Plan, including measures to address potential for bioaccumulation of selenium in fish; and
- Condition #15: Country Foods Monitoring Plan, including additional fish tissue sampling.

Cumulative Effects

Projects or activities with the potential to interact cumulatively with residual effects from this Amendment included the Quintette Coal Mine, which includes the Babcock-Shikano and Mesa-Wolverine mines, Roman-Trend Coal Project, Bullmoose Mine, forestry cut-blocks, located primarily in the Murray River watershed, active or abandoned water licenses, located exclusively in the Murray River watershed, and existing roads. Reasonably foreseeable projects and activities within the RAA are the Murray River Coal Project, future forestry, and future roads.

Conuma did not propose any additional mitigation measures to reduce or eliminate potential cumulative effects to fish habitat due to changes in water quantity other than those proposed to reduce or eliminate potential project-specific effects. The mitigation measures proposed for the Amendment and for the Murray River Coal Project would still result in potential changes to surface flows in M20 Creek and increased concentrations of selenium. Therefore, a potential cumulative residual effect to fish habitat would be likely to occur should both projects operate during the same time periods. These flow reductions would likely result in impacts to the fish-bearing reaches of M20 Creek, particularly in low-flow periods,

resulting in a reduction of available pool habitat for juvenile and adult fish and a reduction in egg incubation habitat due to reductions in flow velocity and water depth.

Conuma assessed the effects of these flow reductions in winter to have a moderate magnitude effect to individual fish and fish eggs in M20 Creek; however, no significant overall effect was predicted to any recreationally or culturally important fish populations in the Murray River, where most fish in the M20 Creek overwinter.

Including the potential effluent discharge from the Murray River Coal Project, total selenium was the only parameter predicted to exceed BC WQG-FAL in the M20 Creek and the Murray River, but the concentrations were not expected to cause an adverse effect to fish as they would not be high enough or of long enough duration to have a negative effect on individual fish health and mortality. Conuma plans to implement a Selenium Management Plan which includes monthly water quality monitoring, biennial sediment and periphyton sampling, benthic invertebrate and fish tissue sampling in M20 Creek, and trigger response selenium concentrations for each of these media. This potential cumulative effect to fish health and mortality was expected to be limited to the M20 Creek downstream of the HDA as the selenium concentrations would be diluted once they reach the much larger Murray River. This would be a multiple, regular event which would be reversible following reclamation.

ENV indicated that cumulative effects may result in selenium exceeding BC WQG-FAL in the fish-bearing section of M20 Creek for about four months of each year during the reclamation and closure phase and in Murray River downstream of Wolverine River during one month in early spring each year throughout all mine phases.

The EAO concludes that cumulative effects on fish and fish habitat are of moderate magnitude, limited to the LAA, medium to long-term duration, high likelihood, and are not significant. Due to the uncertainty in the ability of the proposed water treatment technology to remove selenium, the EAO has proposed a condition (#11) to require an Aquatic Resources Monitoring Plan to address the potential effects of selenium on fish and fish habitat.

6.14.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and subsequent permitting processes, the EAO is of the view that this Amendment would not have significant adverse effects on fish and fish habitat.

The effects on fish and fish habitat are carried forward to the related assessment of other valued components (human health and Treaty rights) in this report.

6.15 Soil Quality and Quantity

6.15.1 SUMMARY OF CONUMA'S ASSESSMENT

Soil quality and quantity was chosen as a valued component, as the Amendment has the potential to affect soils through land clearing, alteration and movement of soil and underlying parent materials, and change to the shape of the landscape.

The results of the effects assessment for air quality (Section 6.9), surface water quality (Section 6.12) and surface water quantity (Section 6.11) were inputs into the soil quality and quantity assessment. Conuma also noted that effects on soil quality and quantity would move along pathways to influence other valued components including vegetation (Section 6.4), wildlife (Section 6.16), and human health (Section 6.17).

Conuma assessed the potential effects of the Amendment on soil quality and quantity, including assessing the changes to surficial geology, or terrain. The spatial boundaries of the assessment included the HDA, since soil impacts would be mainly associated with disturbance, and the LAA used included a 200 m buffer around the HDA. The RAA was the same as the LAA, as there were not expected to be substantial sources of other air pollution within 5 km of the Amendment. The soil quality and quantity valued component was assessed for construction, operations, and reclamation closure.

Disturbed land that has been cleared of soil account for 2.8 percent of the LAA. Conuma noted that four baseline soil samples had elevated metal concentration levels, with one above Canadian Council of Ministers of the Environment (CCME) soil quality guidelines.

Conuma indicated that the potential effects included:

- A potential decrease in soil quality due to admixing[43], compaction, rutting, decreased fertility, and contamination; and
- A potential loss of soil volume from erosion following removal of vegetation or other disturbance or incomplete soil salvage or loss.

Conuma determined that most of the LAA is at a moderate risk for erosion due to wind or water, and that the majority of the soil that would be salvaged had a good to fair suitability for reclamation. See Section 6.20 of this Report for more details on Conuma's proposed reclamation and closure plan.

A draft Soil Salvaging, Stockpiling, and Replacement Plan was provided with the Amendment Application, outlining proposed mitigation measures to reduce potential effects to soil quality and quantity. Conuma proposed a number of mitigation measures to reduce project effects on soils (Tables 3.8-25 and in the draft soil replacement plan in the Conceptual Reclamation and Closure Plan in Section 8.0 of the application). Key mitigation measures included:

- Prevention of contamination with hydrocarbons, heavy metals, and other bioavailable trace elements;

[43] Loss of soil structure when different soils are mixed, such as dilution of topsoil with poorer quality soils

- Salvaging suitable topsoil and overburden, and maximizing occurrence of direct soil placement during salvage;
- Following erosion control best management practices and control measures;
- Identification of erosion problems through regular monitoring, so that site-specific mitigations can be adapted and/or remedial work can be conducted immediately;
- Controlling stripping depths to avoid over-stripping and admixing of lower quality subsoil materials (stony or gravelly subsoils, chemically unfavorable overburden, and bedrock) with good quality topsoil materials;
- Backfilling pits and re-sloping pit walls that have been excavated into overburden to reduce the un-reclaimed surface area;
- Capping historically disturbed mine areas that fall within the HDA with salvaged overburden; and
- Monitoring soil fertility and the nutrient status of vegetation on reclaimed sites, and tailor fertilizer application to address deficiencies.

Conuma predicted that with the proposed mitigation measures, there would be no residual effects to soil quality from admixing[44], compaction[45], rutting[46], and decreased fertility. Changes to soil quality due to contamination along the Coal Haul Road and changes in soil quantity due to soil loss in the HDA were assessed by Conuma as moderate in magnitude, continuous, medium-term, and irreversible if reclamation is not successful. These residual effects were not anticipated to interact spatially with the residual effects of other projects, and so Conuma did not conduct a cumulative effects assessment for soil quality and quantity.

6.15.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, no comments were raised by the Working Group and Indigenous nations in direct relation to soil quality and quantity. Related concerns are described in human health (Section 6.17), vegetation (Section 6.4), and reclamation and closure (Section 6.20) in this Report.

The EAO noted that comments from EMLI related to the requirements of the Soil Management Plan that must be updated and submitted with the *Mines Act* permit application would be carried forward into the subsequent permitting processes.

6.15.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that this Amendment could result in the following residual effects: a decrease in soil quality and a loss of soil volume.

These residual effects would be of moderate magnitude, continuous, medium-term, and irreversible if

[44] Loss of soil structure when different soils are mixed, such as dilution of topsoil with poorer quality soils
[45] Greater density and reduced rate of water infiltration and drainage due to soil particles being compacted
[46] Damages to soil structure due to objects sinking into soils, causing trenches or furrows

reclamation is not successful. The EAO has proposed the following conditions related to reducing the potential residual effects on soils:

- Condition #16: End Land Use Plan: to describe end land use objectives and how these would be achieved;
- Condition #6: Construction Environmental Management Plan: to require soil and erosion control measures during construction; and
- Condition #7: Operations Environmental Management Plan: to require soil and erosion control measures during operations.

The EAO noted that Conuma would also be required to develop a Soil Management Plan, Air Quality and Dust Control Plan, Reclamation Plan, and Surface Erosion and Sediment Control Plan as part of the *Mines Act* and/or *EMA* permit requirements.

6.15.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is of the view that this Amendment would have significant adverse effects on soil quality and quantity.

6.16 Wildlife

6.16.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Conuma's assessment included wildlife as a valued component because the Amendment could have potential impacts on wildlife and wildlife habitat.

Conuma assessed potential impacts to the following wildlife species, subgroups of species and their habitat: ungulates (including caribou), large predators and furbearers, non-furbearer and small mammals, bats, birds, reptiles and amphibians, terrestrial invertebrates, species of conservation concern, and important wildlife features and sensitive areas.

The spatial boundaries for the wildlife assessment included the HDA, the Coal Haul Road, and existing Wolverine Mine Coal Processing Plant. The Local Assessment Area (LAA) included a one km buffer of the HDA. For the wildlife assessment other than woodland caribou, the Regional Assessment Area (RAA) for understanding potential cumulative effects was represented by the Wolverine Landscape Unit as defined in the Dawson Creek Land and Resource Management Plan. The RAA included the Wolverine River watershed and the western tributaries of the Murray River from Albright Ridge to the confluence of the Wolverine River southwest of the Tumbler Ridge town site. For woodland caribou, the Quintette caribou

herd boundary was used as the RAA for understanding cumulative effects. These boundaries are shown on Figure 6. The wildlife valued component was assessed for construction, operations, reclamation and closure. Post-closure activities were not expected in the application to affect wildlife and wildlife habitat.

Four potential pathways of effect on wildlife and wildlife habitat were identified by Conuma in the application: change in habitat availability (through removal of habitat, habitat fragmentation, dust deposition, and sensory disturbance), change in movement (through alteration or blockage of wildlife movement along corridors), change in mortality risk (through interactions with project activities and equipment, traffic, and change in predator presence), and change in wildlife health (through contaminants such as selenium and dust). These potential effects were identified based on the impacts from vegetation clearing and ground disturbance during construction, sensory disturbance during construction and operations, increased traffic volume during construction and operations, and the presence of environmental contaminants, including selenium and dust, during and after operations.

Conuma used a number of existing data sources to understand the existing conditions in the region for wildlife and wildlife habitat, such as provincial and federal data, previous data collected for the Hermann Mine and Murray River Coal Projects, traditional land use information, and scientific literature. Conuma also conducted the following surveys and modelling: habitat suitability modelling (including for elk growing season habitat and moose growing season habitat), breeding bird and common nighthawk surveys, amphibian presence/absence surveys, remote cameras, bat acoustic monitoring, and incidental wildlife sightings.

The wildlife LAA is almost entirely composed of subalpine forest, specifically Engelmann Spruce-Subalpine Fir Moist Very Cold subzone. This type of forest typically has a closed canopy at lower and middle elevations and open canopy to discontinuous subalpine parkland at upper elevations. Wildlife that typically live in this subzone include ungulates such as moose, mountain goat, woodland caribou and mule deer, furbearers such as American marten, fisher, red squirrel, and wolverine, and seed-eating migratory birds such as crossbills, pine siskins and Clark's nutcracker. It is one of the most productive zones for grizzly bear. Few reptiles and amphibians are found in this zone, but do include common garter snake, western toad, Columbia spotted frog, and long-toed salamander[47].

While Conuma assessed the wildlife LAA for all species and focal groups listed at the beginning of this section; the subsections below focus on the detail provided in the application for species and focal groups that became the focus of concerns during the application review.

Woodland Caribou

The Amendment is located within critical habitat of the Quintette caribou herd, which forms part of the Central Mountain Unit for Southern Mountain Caribou. This group is designated as Threatened under

[47] Coupé, R., A.C. Stewart, and B.M. Wikeem. 1991. Engelmann Spruce – Subalpine Fir Zone. Chapter 15. Pages 223 – 235 in Meidinger, D. and Pojar, J. 1991. Ecosystems of British Columbia. British Columbia Ministry of Forests, Victoria, B.C. 330 pp.

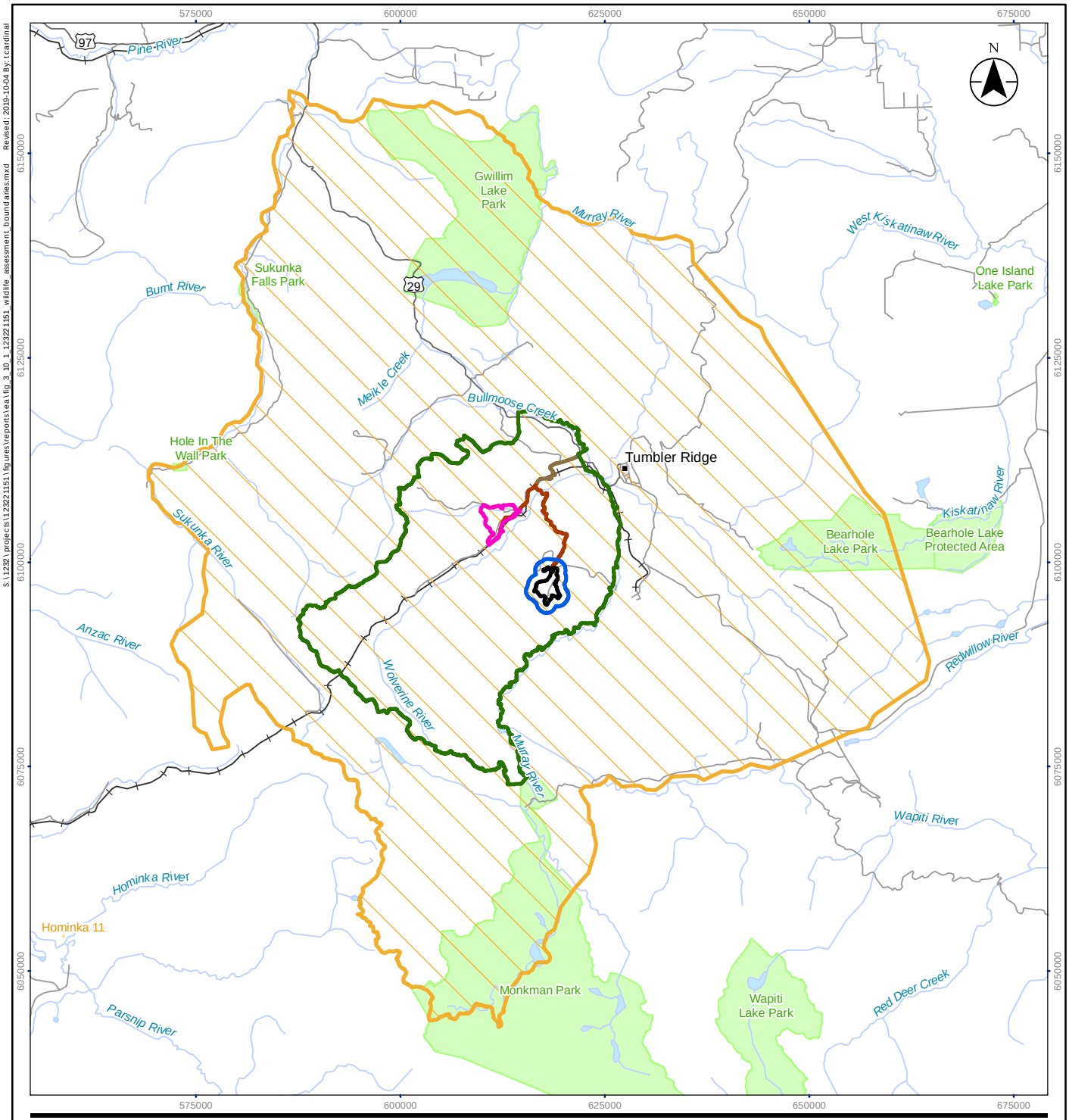
Schedule 1 of the federal SARA and listed as Endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Seven herds in the South Peace area are managed together by the Government of B.C. as South Peace Northern Caribou through the *Implementation Plan for the Ongoing Management of South Peace Northern Caribou (Rangifer tarandus caribou pop. 15)*[48] *in British Columbia*[49], also known as the Peace Northern Caribou Plan (PNCP). Provincially, the Quintette herd is red listed in B.C., which is a Conservation Status Ranking of extirpated, endangered, or threatened in B.C.

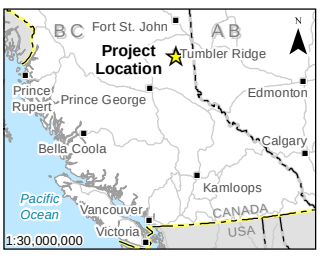
The federal and provincial governments have negotiated a conservation agreement[50] under Section 11 of SARA to establish a framework for cooperation and describe the commitments, measures, and strategies that will be undertaken to support the recovery of southern mountain caribou in B.C. to self-sustaining populations, aligning outcomes with the 2014 Federal Recovery Strategy and with the rights of directly-affected Indigenous nations. The conservation agreement is also intended to align with B.C.'s Provincial Caribou Recovery Program.

[48] 'Pop. 15' refers to the identification of separate populations of caribou across Canada. The Quintette herd, although considered part of the Peace Northern Caribou group, has been reclassified to the Central Mountain Group and is now listed as Pop. 18. Available online: https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/caribou/implementation_plan_for_the_ongoing_management_of_south_peace_northern_caribou.pdf

[49] B.C. Ministry of Environment. 2013. Implementation Plan for the Ongoing Management of South Peace Northern Caribou (*Rangifer tarandus caribou* pop. 15) in British Columbia. Available online: http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do?subdocumentId=9341.

[50] Canada and British Columbia (Government of Canada and Government of British Columbia). 2020. Conservation Agreement for Southern Mountain Caribou in British Columbia, February 2020. Available online: https://species-registry.canada.ca/index-en.html#/consultations/3202





Notes
1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: DataBC, Government of British Columbia; Natural Resources Canada

- City, Town, or Village
- Highway
- Road
- Railway
- Watercourse
- Waterbody
- First Nations Reserve
- Park, Ecological Reserve, or Protected Area
- Coal Haul Road
- Wolverine Forest Service Road
- Wolverine Mine Site
- Hermann Disturbance Area
- Wildlife Local Assessment Area
- Wildlife Regional Assessment Area
- Quintette Caribou Herd Boundary

0 5 10 15 20 25 km

1:700,000 (at original document size of 8.5x11)

Stantec

CONUMA COAL RESOURCES LIMITED

Project Location
Near Tumbler Ridge, BC
NTS Map: 093I14, 093P03

Project Number 123221151
Prepared by SPARKER on 20190207
Discipline Review by CBRYDEN on 20190726
GIS Review by TCARDINAL on 20190730

Client/Project/Report
Conuma Coal Resources Limited
Wolverine-Hermann Amendment Project
EA Amendment Application

Figure No.
6

Title
Wildlife Assessment Boundaries

The federal and provincial governments, WMFN, and SFN have also negotiated a Partnership Agreement[51] which sets out the actions that the parties agree to take to stabilize and grow the Central Group of southern mountain caribou to levels that are self-sustaining and support the re-establishment of a traditional First Nations' harvest. The Partnership Agreement defines and spatially identifies moratorium areas that prohibit provincial statutory decision makers from adjudicating applications for all resource development activities. Moratorium areas are implemented under Section 7 of the *Environment and Land Use Act* as well as a Part 13 Order under the *Forest Act.*

The wildlife LAA for the Amendment includes 90.3 ha of high elevation winter range for caribou, 1,114.6 ha of high elevation summer range, and 1,117.7 ha of Type 1 matrix range. The wildlife LAA also overlaps with 396.1 ha of designated ungulate winter range and 18.0 ha of wildlife habitat area. Since 2002, the Province has collected telemetry data on this herd: 58 telemetry locations are found in the wildlife LAA representing two individuals in 2003 and 2011. Since then the closest telemetry data location near the Amendment was located 9 km west of the wildlife LAA. The Province conducted censuses in 2016, 2017 and 2019 but did not record any caribou in the wildlife LAA. In 2018, three adult caribou were recorded 15 km southwest of the wildlife LAA (Seip and Jones 2018).

Conuma noted three nearby caribou observations in June 2019: 1) a male caribou observed on Nabors Road, within the HDA; 2) a male caribou recorded by a remote camera, on the boundary of the HDA, on June 15; and 3) a single, recent set of caribou tracks observed within the HDA on June 21.

Grizzly Bear

The wildlife LAA is located in the Hart Grizzly Bear Population Unit, which was evaluated last in 2012 and considered viable. Grizzly bear is designated as Special Concern under Schedule 1 of SARA and listed as Special Concern by COSEWIC. The wildlife RAA has an estimated grizzly bear density of less than 10 bears per 1,000 km^2, which is considered high risk and flagged for management attention (FLNRORD and ENV 2018).

Conuma assessed that there are 41.4 ha of effective grizzly bear spring feeding habitat, 109.1 ha of effective grizzly bear summer feeding habitat, and 129.0 ha of effective grizzly bear fall feeding habitat in the wildlife LAA. These habitats are considered moderate to high suitability for summer and fall feeding habitat for grizzly bear. Grizzly bear and bear sign have been occasionally observed within the wildlife LAA and along the Coal Haul Road.

There are regional initiatives in effect in the Hart Grizzly Bear Population Unit, including a ban on hunting throughout the province that took effect on November 30, 2017, followed by a total ban (excluding First Nations harvest for food, social, or ceremonial purposes or treaty right) on December 18, 2017. The Conservation Officer Service also has tools and resources to reduce illegal activities and human/bear

[51] Canada, British Columbia, Saulteau and West Moberly (Government of Canada, Government of British Columbia, Saulteau First Nations, and West Moberly First Nations). 2020. Intergovernmental Partnership Agreement for the Conservation of the Central Group of the Southern Mountain Caribou, February 2020. Available online: https://species-registry.canada.ca/index-en.html#/consultations/3202.

conflicts. For example, the Province has been working to increase Indigenous nations' involvement with the Conservation Officer Service by developing an Aboriginal Liaison Program that includes grizzly bear monitoring. In October 2017, an independent audit of grizzly bear management in B.C. was completed. The auditor provided several recommendations for improvement such as securing key grizzly bear habitat and creating a grizzly bear management plan. Regional recovery initiatives for other species, such as for caribou, may also be beneficial to grizzly bear, such as reducing linear features within caribou range can lead to increased core security habitat for grizzly bear.

Fisher

Fisher is provincially blue-listed and is a special concern species in B.C. Conuma assessed the wildlife RAA as low to nil value as fisher natal denning habitat. Fishers were observed within the wildlife LAA, outside the HDA, in 2018, and Conuma assessed that fisher may use habitat within the HDA for purposes other than natal denning (such as resting, security, and hunting). Conuma indicated that after post-closure, there would be a permanent loss of 67.1 ha of low potential fisher habitat.

Proposed Mitigation Measures
Conuma proposed a number of mitigation measures to reduce project effects on wildlife and wildlife habitat and specific mitigation measures for caribou through a Caribou Mitigation and Monitoring Plan (CMMP). Key mitigation measures included:

- Limit vegetation clearing to clearing boundaries and use existing trails, roads, and disturbed areas to reduce new disturbance;
- Sensitive wildlife timing windows for migratory bird nesting, caribou and mountain goat will be considered when planning construction activities;
- Firearms, feeding wildlife, hunting, fishing, pets, littering, and outdoor cooking are prohibited for personnel;
- Measures to limit predator and human access along permanently deactivated linear features will be undertaken;
- Maximum speed limits on roads and trails will be communicated;
- Detailed engineering design of ditches, sediment ponds, embankments, and dams will consider need to reduce hazards to wildlife;
- Wildlife monitoring of ten years to understand use of wildlife habitat areas near the mine and in reclaimed areas, including for caribou;
- Financial contribution to fund restoration activities in tenure areas identified by FLNRORD as suitable habitat; and
- Reclamation of the HDA to include end land use objectives supporting wildlife and wildlife habitat, including caribou.

Potential Effects of the Amendment with Mitigation
Overall, Conuma identified the loss of wildlife habitat for all focal species with the exception of fisher. The loss of habitat was identified primarily at the construction/ground disturbance stage, would last medium

to long term, with all species other than woodland caribou assessed as resilient to the change in the region. The potential effects on wildlife (non-caribou) movement and mortality were assessed as low to moderate depending on location. The potential effects on wildlife (non-caribou) health were assessed as negligible to moderate depending on the species. All pathways were assessed to have residual but non-significant impacts to wildlife (non-caribou).

For woodland caribou, Conuma assessed any incremental loss of caribou high elevation range as significant due to the threatened status of this species and the regulatory context for Southern Mountain Caribou. The Quintette local population unit (or herd) is already below ECCC's disturbed habitat threshold of 65 percent undisturbed habitat (Environment Canada 2014) at 57.6 percent disturbed (ECCC and Government of British Columbia 2017a). Conuma also assessed mortality risk, movement, and health to be significant at baseline regardless of duration and reversibility of the impacts of the Amendment. Conuma summarized the following impacts to caribou habitat:

- Permanent direct loss of 323 ha of high elevation habitat;
- Permanent direct loss of 344 ha of matrix habitat;
- Indirect loss of up to 3,915 ha of matrix habitat for the life of the mine; and
- Indirect loss of up to 1,463 ha of high elevation habitat for the life of the mine.

6.16.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, a number of key issues related to wildlife and wildlife habitat were raised, which are summarized below.

Impacts to Woodland Caribou and their Critical Habitat

Although Conuma acknowledged that the potential impact of the Amendment on woodland caribou would be significant, FLNRORD and the Indigenous nations raised a number of additional concerns regarding potential impacts to woodland caribou and their critical habitat, in particular:

- The proposed monitoring period of ten years is not enough to understand the response of this species to any restoration efforts since restoration of some caribou habitat is estimated to take over 240 years;
- Uncertainty in predicting the effectiveness of restoration and in the amount required to offset the residual effects;
- Wanting to understand who would be responsible for effectiveness monitoring of any restored caribou habitat;
- Fragmentation of habitat leading to decreased habitat availability;
- Current disturbance to caribou range area already exceeds recommended thresholds and has led to uncharacteristic habitat use patterns and population decline;
- Increased opportunistic predation of caribou resulting from increased proportion of disturbed habitat and abundance of early seral habitat;

- Interest in requiring additional support measures for caribou populations such as: supplemental feeding, predator control programs, procurement of lands for habitat offsets, linear corridor rehabilitation/decommissioning, long-term funding, and Indigenous monitors to measure success at achieving targets, and means for continuous improvement; and
- Construction of another pit in critical caribou habitat while the East Bullmoose Pit is still undergoing regulatory processes.

Conuma provided a CMMP with the application that provided detail on the proposed mitigation, offsetting, monitoring, and reporting for caribou. At the request of FLNRORD and the Indigenous nations, Conuma also updated the CMMP in August 2020 with an analysis on indirect effects of the Amendment on caribou (through disturbance, including noise effects), including the scope and methods, and addressing the Intergovernmental Partnership Agreement for Conservation of the Central Group of Southern Mountain Caribou (Partnership Agreement).

Following a series of meetings between FLNRORD, the Indigenous nations, and Conuma to determine what would constitute an overall neutral effect to caribou, Conuma provided an inventory of candidate tenures within high-value caribou habitat that were available for targeted restoration. The information was supplemented by information provided by the B.C. Caribou Recovery Program. Conuma committed to an initial financial contribution of $744,560 (that the EAO has required to be included in a proposed EA condition) towards the habitat restoration component of the Provincial Caribou Recovery Program, in acknowledgement of the significant potential effect on caribou. This was based on an average cost per kilometer of linear feature restoration of $13,415, rounding up to $15,000 per kilometer and based on an offset ratio of 13.5:1 (totaling a 4,364 ha offset for the permanent removal of 323 ha of caribou habitat).

After reviewing Conuma's updated financial offsetting proposal, and in consideration of candidate tenures for restoration, Indigenous nations provided additional views including:

- Science-based evidence indicates that buffer distances (indirect effects) are likely to be in the range of 3,000 m to 5,000 m and that the area impacted is closer to 5,378 ha;
- Due to uncertainty in predicting effectiveness of restoration the amount to offset residual effects should be higher and closer to an offset ratio of 31.3:1;
- Agreement with approach of targeted restoration towards reconstruction of contiguous functional habitat but recommended consideration of additional tenures for restoration;
- The restoration offset proposed will not achieve a net-positive or even a net-neutral outcome for caribou; and
- Actual offset ratios that would be realized by the restoration are much lower than recommended and the funding offered to achieve the restoration is insufficient by more than $2,000,000.

On November 10, 2020, the FLNRORD member of the working group provided a technical assessment outlining the adequacy of mitigations proposed by Conuma with respect to caribou. These assessments included the following:

- After applying provincial criteria, the 11 candidate tenures identified combine to represent 3,256

ha with 61.5 km of disturbance eligible for restoration;
- The previously suggested offsetting ratio of 13.5:1 assumed a lower quality of offsetting area whereas the proposal of targeting tenures in very high value habitat resulting in a 9.2:1 ratio acceptable to FLNRORD;
- The offsetting proposal of $744,560 would be sufficient to restore approximately 50 km of linear disturbance over an area of 2,961 ha which represents an offsetting ratio of 9.2:1;
- No offsetting or additional measures were proposed in the CMMP to mitigate the direct loss of matrix habitat and the indirect loss of both matrix and high elevation habitat;
- FLNRORD was of the opinion that the financial contribution and mitigation measures in the CMMP were adequate to offset direct disturbance to 323 ha of high-elevation habitat which is the highest magnitude impact of the project and that the offset ratio is appropriate given the targeted restoration of high-value high elevation habitat;
- Based on current Provincial monitoring data, the area surrounding the proposed project is rarely used by caribou in any season, which is attributed to the extensive disturbance on nearby high elevation habitat caused by the Teck Mesa-Wolverine Mine, which constitutes permanent habitat loss;
- Any temporary indirect loss of matrix habitat is not expected to significantly alter caribou habitat usage patterns based on the current extent of the herd, or the potential for herd expansion; and
- Indirect loss of high elevation habitat could potentially restrict the expanding needs of the herd.

On January 26, 2021, the EAO was made aware that had Conuma entered into an agreement with WMFN to provide an additional contribution of $745,000 for caribou habitat offset measures[52]. On January 22, 2021, WMFN stated in a letter to the EAO that this contribution will help offset some of the Amendment's impacts on caribou habitat, including indirect effects in high elevation habitat and effects in low elevation and matrix habitat.

Through discussions between Conuma, the Province, and participating Indigenous nations, the following commitments were confirmed:

- Conuma has agreed to allow the Province to permanently secure an additional 292 ha of caribou habitat in support of the ongoing maternal pen program;
- The Province will also be providing additional funding of $300,000 to support caribou habitat restoration as detailed in a letter provided from FLNRORD and EMLI to EAO on December 20, 2020[53]; and
- An additional $745,000 contribution from Conuma towards caribou habitat mitigation measures, secured through an agreement with WMFN, combined with the $744,560 financial commitment

[52] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019ba732090f10020b5303b/download/2021%2001%2022%20Ltr%20THT%20to%20EAO%20re%20Hermann%20Caribou%20Offsets.pdf
[53] Available online: https://projects.eao.gov.bc.ca/api/public/document/601996d7901afe0020553e52/download/2021.01.29%20FLNRORD%20caribou%20response%20combined.pdf

from Conuma that is referenced in the proposed EA condition results in a total of $1,489,560 towards caribou mitigations.

Overall, the FLNRORD Caribou Recovery Program, Species at Risk Recovery Branch provided its views in consideration of the technical aspects of the application, proposed mitigations as well as strategic commitments and guarantees provided by Conuma related to their operations in this area. The Caribou Recovery Program highlighted the following strategic commitments:

- Conuma's commitment to defer applying to develop the East Bullmoose mine site until 2025, was a pivotal component in successfully negotiating the Partnership Agreement;
- Conuma's decision to apply to develop Wolverine-Hermann Pit instead of East Bullmoose Pit (an area that is acknowledged to be in core high elevation range with evidence of high caribou use) directly supports the Shared Recovery Objective as articulated in the Partnership Agreement; and
- Conuma also offered 36 tenures, comprising an area of 4,830 ha of high elevation habitat to be secured in Zone A2 of the Partnership Agreement.

On December 22, 2020, SFN stated in a letter to the EAO that the further commitments made by the Province, together with ongoing and future collaboration on caribou recovery initiatives, will help to support the recovery of caribou populations.

Given the impact on the Quintette caribou herd, the FNITR and HRFN concluded that the Amendment does not effectively address Treaty 8 rights related to the ability to hunt Quintette herd caribou at this time. Additional information regarding the effect on Treaty rights can be found in Section 7.

The EAO has proposed a condition (#14) which requires the financial contribution commitment described by Conuma to be provided to the Provincial Caribou Recovery Program prior to disturbance of caribou habitat.

Identification of Wildlife Habitat Features

Although Conuma assessed the habitat in the wildlife LAA to not contain any suitable habitat for fisher denning, FLNRORD asked Conuma to provide more specific detail about the size and state of trees observed and use of FLNRORD's fisher habitat tool to understand if there is overlap with the Amendment and any type 1 fisher habitat. Conuma indicated that their surveys identified some maturing cottonwood trees near the proposed water management system with an average diameter of 30-40 cm, with low potential for cavities, and that the fisher habitat tool was not developed to be used in the forest type that occurs near the Amendment. No additional analysis using FLNRORD's fisher habitat tool was provided.

Conuma has committed to undertaking pre-disturbance wildlife habitat surveys to identify and protect dens, cavities (including those that might be occupied by raptors or owls), mineral licks, protected nests, other nests and important wildlife habitats (e.g., wetlands, terrestrial lichen ecosystems, bat hibernacula) that may be affected by the Amendment. The EAO has also proposed Condition #6: Construction Environmental Management Plan indicating how wildlife management will be addressed.

Impacts to Wildlife Movement

HRFN identified a caribou and grizzly movement corridor in an area identified as Englemann Spruce Parkland and requested that this area be removed from the disturbance footprint. Conuma responded that it is not feasible to remove this area from the disturbance footprint as it is along the edge of the proposed pit, which would require steepening of this area, heightening geotechnical risk. Doing so would also reduce the amount of coal mined from the pit, reducing economic feasibility.

Conuma has monitored this area using remote cameras and has committed to continuing this monitoring with HRFN during construction and operations.

6.16.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that this Amendment would result in residual adverse effects on wildlife and wildlife habitat, including:

- Decrease in wildlife habitat availability;
- Decrease in wildlife movement through the HDA;
- Increase in wildlife mortality risk; and
- Decrease in wildlife health.

These residual effects would be low to moderate in magnitude, continuous, long-term, and generally irreversible over the life of the mine for non-caribou wildlife. The impacts to caribou were assessed by the EAO as high in magnitude due to the sensitivity of this species, but a similar characterization otherwise to non-caribou wildlife.

The EAO has proposed the following conditions related to wildlife and wildlife habitat to reduce the potential residual effects on wildlife and wildlife habitat:

- Condition #14: Caribou Mitigation and Monitoring Plan: including linear feature restoration and financial offsetting; and
- Condition #16: End Land Use Plan: to describe end land use objectives and how these will be achieved.

Cumulative Effects

Conuma identified a number of past, present and reasonably foreseeable future projects and physical activities that are within the wildlife RAA and the Quintette caribou herd boundary that are likely to interact cumulatively with the Amendment's effects. With mitigation, the overall cumulative effect on wildlife (non-caribou) habitat availability, mortality, and movement was characterized as negligible to moderate magnitude (depending on the focal species or species group), defined by the wildlife RAA, long term, continuous, partly reversible, and moderate to high likelihood. Conuma assessed the overall cumulative effect to be not significant for wildlife (non-caribou) and the Amendment's contributions to the overall cumulative effect to be small and not predicted to cause a change in the long-term persistence or

viability of wildlife (non-caribou) species in the RAA.

With mitigation, the overall cumulative effect on caribou habitat availability, mortality, and movement was characterized as moderate to high magnitude, defined by the Quintette caribou herd boundary, long term, continuous, partly reversible to irreversible, and moderate to high likelihood. The overall cumulative effect was considered significant for caribou because although the Amendment's contributions would be small, the overall cumulative effects on caribou in the Quintette caribou herd boundary are already significant.

For both wildlife (non-caribou) and caribou, no cumulative effects on wildlife health were identified by Conuma.

Residual effects to wildlife (non-caribou) from the Amendment are likely to interact with reasonably foreseeable future projects to create additional cumulative effects. For indicators of change in habitat availability, mortality risk, movement, and health, given that the increased impact of the Amendment in the RAA is anticipated to be low, the EAO concludes that significant cumulative effects generally to wildlife, other than caribou, are not expected as a result of the effects of the Amendment interacting with the effects of other past, present, and reasonably foreseeable future projects and activities.

Residual effects to caribou from the Amendment are likely to interact with reasonably foreseeable future projects to create additional cumulative effects. These cumulative effects are considered to be high in magnitude, and long-term to permanent in duration. Development of a CMMP as proposed by Conuma and proposed as a condition (#14) by the EAO is a key mitigation to address the contribution of the Amendment to cumulative effects on caribou. The potential for cumulative effects from the additional projects and activities identified by Conuma is considered significant because cumulative effects on caribou habitat resulting from industrial development are already significant at existing conditions, resulting in the decline of caribou numbers over the past decades and designation of caribou as threatened.

6.16.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that this Amendment is issued), the EAO is of the view that this Amendment would not have significant adverse effects on wildlife and wildlife habitat (non-caribou).

Given the sensitivity of caribou to further human disturbance, the EAO is of the view that this Amendment would likely have significant adverse effects on caribou; however, it is noted that if the proposed mitigation, monitoring, and offsets from Conuma is effective, which are included in EAO's proposed condition #14, the effect would be net neutral.

The effects on wildlife are carried forward to the related assessment of other valued components (human health and Treaty rights) in this report.

6.17 Human Health

6.17.1 SUMMARY OF CONUMA'S ASSESSMENT

Existing Conditions

Conuma's assessment included human health as a valued component due to the potential effects of the Amendment on human health from the inhalation of CACs and trace metals in coal dust, and the consumption of country foods (such as fish and vegetation), groundwater, surface water near the Amendment area. Human health was assessed as a valued component, given that changes in human health may affect residents including Indigenous nations, workers, and recreational land users (e.g. campers, hunters, hikers).

The spatial boundaries for the human health assessment included the LAA/RAA of the air quality and water quality valued components because predicted future environmental conditions are provided from these other valued components. The human health valued component was assessed for construction, operations, reclamation and closure, and post-closure. The lands within the LAA and RAA were found by Conuma to be frequently used by both Indigenous nations and the public for recreation, traditional land use, and cultural uses. More information on the specific uses of the land in HDA can be found in Section 6.6 (Land Use).

When all three components of health risk (exposure, receptor, and hazard) are present, the exposure pathway is characterized as "operable". The human receptors, chemical hazards, and the means for exposure are described for each operable pathway. An operable pathway requires a more detailed assessment in the HHRA to quantitatively characterize the Amendment contribution to changes in human health. If any of these three components of health risk is absent, there would be no potential health risk and the exposure pathway is characterized as "inoperable". For each inoperable exposure pathway, a rationale is provided for the pathway characterization. Inoperable exposure pathways were not considered further in the HHRA.

Among the pathways that Conuma determined were inoperable were dermal contact and ingestion of soil and coal dust; ingestion of traditional plants; consumption of fish; dermal contact with surface; and consumption of groundwater. These exposure pathways were determined to be inoperable if there were no human receptors present in the area, no chemical hazards identified, or there were limited means to exposure.

Among the operable pathways that could affect human health, the following were assessed further by Conuma: inhalation of CACs, inhalation of metals in coal dust, and ingestion of surface water.

Inhalation of CACs and trace metals from coal dust in the air

Baseline data for air quality for SO_2, nitrogen dioxide (NO_2), coarse and fine particulate matter (PM_{10} and

$PM_{2.5}$) was modelled by Conuma using data from ambient air quality stations in the region, but not specifically within the air quality LAA/RAA. Under existing operations at the Wolverine Mine, most emissions of CACs and coal dust are produced within the mine fence-line. Conuma found that under the existing conditions at the Wolverine Mine, the inhalation exposure to CACs and metals in coal dust at the maximum point of impingement are less than their respective toxicological reference value, indicating that the existing health risk from the inhalation of CAC and trace metals in coal dust is below the health-based criteria. More information on air quality can be found in Section 6.9 (Air Quality), including measurements of baseline data. The concentration of CACs and metals in the air from coal dust were found to be below the inhalation risk thresholds.

Ingestion of metals in surface water and groundwater

Conuma monitored surface water quality existing conditions incorporating data collected from 2017 to 2019 by Conuma, as well as information from the Wolverine Mine and HD Mining Murray River Coal Project. Historical data collected for the Wolverine Coal Project Application Report (WCCC 2002), Hermann Environmental Assessment Application (WCCC 2007), and HD Mining Murray River Coal Project Environmental Assessment Application (ERM Rescan 2014) have been included to identify changes to water quality over the years. More information about surface water quality can be found in Section 6.12.

Conuma found that there are no active potable groundwater wells within the LAA/RAA currently, and that the closest domestic wells are 10 km and 15 km away from the HDA and would not be adversely affected. More information on groundwater effects can be found in Section 6.10.

For the consumption of surface water from M20 Creek, Conuma assumed that people may consume surface water up to two times per week from within 100 m of the HDA mine discharge pipe. Under this scenario, the risk to Indigenous adults for all metals, and the risk to Indigenous toddlers from all metals except uranium would be below the risk threshold. An Indigenous toddler may be exposed to non-radiological uranium at an exposure ratio of 0.20, where the risk threshold is 0.20 or greater. Since the Amendment-related change in metal concentrations would further dilute with increasing distance from the HDA, it is reasonable to conclude that the predicted risk to an Indigenous toddler would be negligible (i.e., less than the risk threshold of 0.20) if the water consumption rate is less than two times per week, or if M20 Creek surface water is consumed from a location further than 100 m downstream of the discharge pipe.

Ingestion of trace metals in freshwater fish

Conuma also assessed availability of fish species in Murray River and trace metal concentrations in fish tissue, which are described in detail in Section 6.14 (Fish and Fish Habitat) of this Report. Conuma identified that the Murray River is the most likely location for humans to harvest and consume fish from, which would potentially be affected by discharges from Wolverine Mine and the HDA. The M20 Creek is approximately 12 km long, and the upper 10 km portion of M20 Creek contains small-bodied fish (such as slimy sculpin) that are not typically consumed by people. Fish access from the Murray River to the upper M20 Creek is blocked by five impassible fish barriers. The lower 2.1 km portion of M20 Creek has limited

potential to supply harvestable fish for Indigenous nations because it is fish rearing habitat for juveniles rather than long-term habitat for adult fish. The Wolverine River and Perry Creek would have limited changes to water quality from the Amendment relative to existing mining operations.

Total mercury concentrations in all slimy sculpin collected from all sites in M20 Creek and in the Murray River in 2004 and 2012 were measured as lower than the federal Health Canada human health guideline (0.5 mg/kg). Methylmercury concentrations were not distinguished from total mercury. Selenium concentrations in bull trout from M20 Creek in 2011 and 2012 were reported to be 3.84 mg/kg and 3.91 mg/kg, respectively. In comparison, Health Canada's tolerable daily intake of selenium is age-dependent and ranges from 5.5 to 6.3 mg/kg body weight per day (Health Canada 2012) (e.g., the tolerable daily intake of selenium for an 80 kg adult is 5.7 mg/kg body weight per day, for a tolerable daily intake of selenium of 456 mg/day)[54].

Incidental exposure of trace metals in soil from coal dust deposition to the ground

Soil samples from 2007 in HDA were analyzed by Conuma and found to be above the CCME agriculture guidelines for total barium, total cadmium, and total selenium. More samples were taken by Conuma in 2019 in Wolverine Mine LAA that had levels above the above guideline for total selenium, barium and cadmium were not measured with those samples. For further information about effects to soil please refer to Section 6.15.

Conuma took 30 unique vegetation samples from 2004 and 2006 to conduct metal analysis of plant tissue for 33 metals; there was no information available regarding specific toxicity thresholds for implications of the results for either human or wildlife health consumption. Section 6.4 has more information on the effects to vegetation.

Proposed Mitigation Measures

Conuma did not propose specific mitigation measures for human health as they noted that mitigation measures proposed for other valued components such as air quality (Section 6.9), surface and groundwater quality (Section 6.10), soil quality (Section 6.15), would be effective in reducing the potential effect on human health.

Potential Effects of the Amendment

Conuma identified the following potential adverse effects of the Amendment on human health:

- Changes to human health from emissions of CACs and coal dust, which could affect the quality of air that people breathe; and
- Changes to human health from discharges to surface water bodies that are used for drinking water

by people.

Conuma assessed the overall residual effects on human health as negligible magnitude, limited to the LAA/RAA, long-term but limited to operations for inhalation of CACs (and all phases for consumption of surface water), continuous, reversible, and not significant because emissions and discharges from the Amendment would exist at similar levels to the Wolverine Mine, but now these emissions and discharges would be spread across a larger land area.

6.17.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During application review, the following key concerns were raised by the Working Group in relation to human health.

Consideration of Bioaccumulation

Northern Health, SFN, WMFN and HRFN raised a concern that there was inadequate justification for screening out the human health pathways that included ingestion of fish and traditional plants. They noted that the CCME agricultural guidelines are generally for livestock and herbivores, and any bioaccumulation is measured at the endpoint of secondary and tertiary carnivores, not humans. Organic chemicals of potential concern (COPCs) and metals can easily bioaccumulate in country foods. Northern Health also noted that the statement that emitted metals are in the form of inorganic metals, without further evidence and discussion, is not sufficient justification to exclude the potential for bioaccumulation from the assessment.

Selenium bioaccumulation in fish was also a concern raised by Indigenous nations, which is addressed in greater detail in Section 6.12 (Surface Water Quality) and Section 6.14 (Fish and Fish Habitat).

Conuma responded that the screening process used in the assessment is consistent with the Health Canada guidance, since that guidance recommends comparing a criterion to environmental quality guidelines and provided additional bioaccumulation information for PAHs in the memo "Pathways Screening in Conuma HHRA" (May 8, 2020). In this memo, Conuma indicated that PAHs should be removed from further consideration because studies show that the PAHs in coal are locked in the carbon structure and are not absorbed by biota.

The Ministry of Health indicated that environmental quality guidelines are not used for screening in prospective HHRAs, as the guidelines are not necessarily protective of exposure to multiple mediums or bioaccumulation. If a substance that bioaccumulates is potentially present in multiple media, all media should be assessed to determine cumulative exposure. This was also particularly of concern to Northern Health with respect to soil and vegetation.

To address reviewers' concerns related to the uncertainty in the human health assessment and lack of adequate sampling data, the EAO has proposed a condition (#15) that requires the development of a Country Foods Monitoring Plan, including requirements to sample and monitor contaminants that may

affect human health, including CACs, soils, vegetation, fish, water quality and small mammals. This plan would be developed in consultation with Indigenous nations and Northern Health.

Exclusion of Fish Consumption from Assessment

Northern Health, ENV, and Indigenous nations stated that the exclusion of fish consumption in the human health risk assessment (HHRA) as an exposure pathway was unacceptable. Northern Health indicated that any COPCs that bioaccumulate or bio-magnify should be considered with regards to human consumption of country foods.

Conuma indicated that harvestable fish that are suitable for human consumption are not present in M20 Creek above the fish barriers. Therefore, exposure to Amendment-related metals through the consumption of fish from M20 Creek was considered an inoperable exposure pathway. The FNITR strongly disagreed with this rationale, citing connectivity to downstream fish-bearing waters and there are clear pathways of effects to water through the food chain to fish that occur in M20 creek and may be harvested there or elsewhere. Additional information regarding Indigenous nations' concerns regarding fish, selenium bioaccumulation, and impact to Treaty rights can be found in Section 6.14 (Fish and Fish Habitat).

Conuma further explained that fish for human consumption can be harvested from the Murray River which receives water from M20 Creek. The water quality modelling results indicate that M20 Creek has a negligible effect on water quality in the Murray River. In most months, the predicted increase in metal concentrations in the Murray River are lower than the maximum predicted increase. These negligible changes in water quality in the Murray River would have a negligible effect on fish tissue quality and corresponding negligible effect on the existing risks to human health. No additional information was provided on fish consumption and potential risks to human health.

To address reviewers' concerns related to fish, the EAO has proposed a condition (#15) that requires the development of a Country Foods Monitoring Plan, including requirements to sample and monitor fish as it relates to human health. This plan would be developed in consultation with Indigenous nations and Northern Health.

Identification of Chemicals to Assess

Northern Health expressed a concern that innocuous chemicals were screened out of COPCs and were unable to locate the Health Canada 2019 reference to explain these methods. Further, Northern Health and ENV requested greater transparency in the identification of COPCs, as it was found that some were excluded because of non-toxicity, while others (aluminum, lithium) were excluded because of relative concentrations compared to surface soil. Northern Health asked for clarification of which COPCs were excluded for being non-toxic.

Conuma explained that Health Canada's 2016 Detailed Quantitative Risk Assessment (DQRA) guidance states that several naturally occurring substances such as calcium, iron, magnesium, potassium, and sodium are included in routine analytical chemical analysis, and these do not have associated regulatory

criteria. Conuma further stated that, unless the substances are knowingly associated with on-site activities, they should be excluded from the risk assessment. Conuma provided further references for metals including bismuth, calcium, iron, magnesium, potassium, rubidium, sodium, strontium, titanium, tungsten, and zirconium to demonstrate that they were considered innocuous substances.

To address reviewers' concerns in the human health assessment, the EAO has proposed a condition (#15) that requires the development of a Country Foods Monitoring Plan, including a full suite of metal concentration analysis in monitoring of surface waters.

Reduction of CACs

Northern Health expressed concern that some CACs (for example, PM and NO_2) have no safe level of exposure and that Conuma has stated concentrations for these are small or close to negligible, but there would still be some level of detrimental health risks since the contaminants are non-threshold. Northern Health would like these CACs to be reduced to as low as reasonably achievable.

Conuma agreed that any degree of exposure could be associated with some level of human health risk but stated that at very low concentrations the risks are negligible. Conuma noted that reducing CAC concentrations to as low as reasonably possible would help limit potential human health risks associated with inhalation.

To address reviewers' concerns in the human health assessment, the EAO has proposed a condition (#10) that requires the development of an Air Quality and Emissions Monitoring Plan, including mitigation measures to monitor and reduce CACs for non-threshold contaminants.

Lack of Groundwater Assessment

Northern Health also raised concerns with Conuma excluding groundwater consumption in the HHRA due to the fact that there are no current or proposed groundwater wells. Northern Health and the Ministry of Health recommend that human consumption of groundwater be assessed regardless of existing or proposed operating permits or remoteness if a viable aquifer has sufficient water quality and quantity to supply one household with drinking water. Northern Health also requested a comparison of total dissolved solids, hydraulic conductivity, classification under Ministry of Environment protocols to be provided to assess whether there are reasonably foreseeable points of consumption.

Conuma reiterated their previous rationale regarding the consideration and designation of groundwater use for drinking as an inoperable pathway. Conuma stated Health Canada's risk assessment guidance for screening pathways is based on the presence of a hazard, human receptor, and exposure and that given there are no active potable groundwater wells registered for domestic use and no reasonably foreseeable locations of consumption for drinking groundwater, this pathway remains inoperable. Conuma also noted that in the Ministry of Environment protocols, future drinking water use does not apply to the aquifer because the aquifer is not mapped in the B.C. Water Resource Atlas. No additional analysis was provided by Conuma.

To address reviewers' concerns in the human health assessment, the EAO has proposed a condition (#11) that requires the development of an Aquatic Resources Monitoring Plan, which includes requirements for monitoring groundwater.

6.17.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

After considering the proposed mitigation measures, the EAO concludes that this Amendment would result in the following residual adverse effects on human health:

- Increase in CACs;
- Increase in deposited COPCs; and
- Increase in bioaccumulation in vegetation and country foods.

These residual adverse effects on human health would be of low magnitude, limited to the LAA/RAA, long-term, continuous and reversible. The EAO agrees with Conuma that these effects would be not significant given that emissions and discharges from the Amendment would exist at similar levels to the Wolverine Mine, but now these emissions and discharges would be spread across a larger land area.

The EAO has proposed the following conditions related to human health to reduce the potential residual effects on human health:

- Condition #15: Development of a Country Foods Monitoring Plan, which would identify the COPCs and related human health thresholds, require monitoring of dustfall on vegetation and soil, and require sampling and monitoring of water quality;
- Condition #11: Development of an Aquatic Resources Monitoring Plan, which would include requirements to monitor water quality; and
- Condition #10: Development of an Air Quality and Emissions Management Plan, which would include mitigation measures to reduce CACs and requirements to monitor air quality, in consultation with Indigenous nations and Northern Health.

Cumulative Effects

Conuma concluded that there are no cumulative environmental effects from other existing or reasonably foreseeable projects in regards to human health. The application noted that the only project within the LAA/RAA that could potentially have cumulative effects with inhalation of CACs is Tumbler Ridge Wind Energy, but this operating project has negligible emissions of CACs. Conuma determined that there were no other past, present, and reasonably foreseeable future projects and activities in the Wolverine-Hermann area that would overlap with any Amendment changes in environmental exposures. Therefore, Conuma did not complete additional analysis of cumulative effects to human health from this Amendment.

The FNITR and HRFN indicated that they had concerns regarding cumulative effects on human health from effluent and the degradation of traditional food supply. Additional comments on cumulative effects to

Treaty rights are discussed further in Section 7 (Assessment of Impacts to Treaty Rights and Interests).

Considering the lack of interaction with past, present and reasonably foreseeable future projects, the mitigation proposed, and existing regulatory standards requirements regulating industrial activities, the EAO is satisfied that there are no expected cumulative adverse effects to human health.

6.17.4 CONCLUSIONS

Considering the above analysis and having regard to the conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that an EAC is issued), the EAO is of the view that this Amendment would not have significant adverse effects on human health.

6.18 Accidents and Malfunctions

Accidents and malfunctions could occur during all phases of the Amendment and have the potential to result in effects to environmental, social, health, heritage or economic values. These values were included in Conuma's assessment to evaluate the potential effects of an accident of malfunction.

6.18.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma used a three-step process to assess potential project-related accidents and malfunctions. First, the potential accidents and malfunctions that might occur during the life of the project were identified using historical performance data for other similar projects and professional judgement. The analysis focused on events that may result in risk to personnel, the environment, and human health. Second, Conuma considered the potential interactions between each event scenario and relevant valued components. The interactions were analyzed to establish the potential magnitude and likelihood of the effects. Third, Conuma conducted a risk assessment using the likelihood and severity of the event in each scenario.

Conuma's assessment of the potential effects and risks of any project-related accidents or malfunctions considered the following scenarios:

1. Physical failure of pit walls;
2. Physical failure of waste rock dumps;
3. Fuel spills (into water and on land);
4. Chemical spills;
5. Accidental explosions; and
6. Motor vehicle accidents.

For each scenario, Conuma proposed several project design measures to reduce risk, mitigation measures, operational procedures and proposed emergency response approaches and clean-up methods, including:

- Procedures that would reduce or eliminate the potential for accidents and malfunctions to occur;
- Initial response measures following an accident or malfunction; and
- Processes to remediate and restore the environment to a pre-incident state, including follow-up and monitoring programs.

The determination of the overall risk by Conuma was done with the support of a risk matrix, which combined the probability of an accident and malfunction with its potential consequences. Based on this risk matrix, Conuma assessed risk using the following scale: negligible, very low, low, moderately low, moderate, moderately high, high, and very high.

In each of the six scenarios, Conuma outlined that the Emergency Response Plan would be triggered. Conuma stated that the Emergency Response Plan sets out a guide to assist onsite personnel and external emergency responders in timely identification, evaluation and response to each type of emergency.

Physical Failure of Pit Walls

A failure or slumping of a pit wall would result in the deposition of pit wall material into the bottom of the pit, which could result in an injury or fatality to one or more Amendment personnel or staff. This scenario would be applicable during the operations and the reclamation and closure phases. After the implementation of emergency response and clean up measures, Conuma predicted a high potential interaction with Socio-Community and Human Health valued components. After considering the probability and potential consequences, Conuma assessed the overall risk to Human Health and Socio-Community as moderate to moderately low, respectively.

Physical Failure of Waste Rock Dumps

A failure or slumping of the waste rock dumps could result in the movement of waste rock into contact water management infrastructure via the collection ditches at the toe of the dumps, damage to the collection water infrastructure, and release of off-specification effluent into the receiving environment. This scenario would be applicable during the operations and reclamation and closure phases. After the implementation of emergency response and clean-up measures, Conuma predicted a moderate to high potential interaction with Surface Water Quality, Aquatic Resources, Socio-Community and Human Health valued components. After considering the probability and potential consequences, Conuma assessed the overall risk of this event to these valued components as moderate to moderately low.

Fuel Spills

The transport, storage, and use of hydrocarbons have associated risks for the unintended release of these compounds into aquatic and terrestrial environments. Failure modes include vehicle accidents, failures of tanks and containment systems, spills during maintenance or fueling operations, or releases associated with other failures such as fires. These scenarios are applicable during construction, operations, and the reclamation and closure phases. For spills into the aquatic environment, after the implementation of emergency response and clean-up measures, Conuma predicted a moderate to high potential interaction

with the Surface Water Quality, Aquatic Resources, and Fish and Fish Habitat, and Vegetation valued component. The overall risk to surface water quality and fish and fish habitat from a truck losing an entire load and from a small, reportable fuel spill (100 litres) was assessed to be low and moderately low, respectively. The overall risk to aquatic habitat from a truck losing an entire load and from a reportable fuel spill into water was assessed to be moderately low and moderate, respectively. The overall risk to wetlands from a truck losing an entire load and from a small, reportable fuel spill was assessed as low and moderately low, respectively. For spills contained to the terrestrial environment, after the implementation of emergency response and clean-up measures, Conuma predicted a moderate to high potential interaction with the Soil Quality and Quantity, and Groundwater Quality and Quantity valued component. After considering the probability and potential consequences, Conuma assessed the overall risk to these valued components to be low.

Chemical Spills

For chemical spills, Conuma considered the loss of ammonium nitrate and fuel oil containment to the environment, either along the shipping route or at site. This scenario would be applicable during the operations phase. After the implementation of emergency response and clean-up measures, this scenario was assessed as having a moderate to high potential interaction with Surface Water Quality, Groundwater Quality and Quantity, Aquatic Resources, Fish and Fish Habitat, Soil Quality and Quantity, and Wildlife and Wildlife Habitat valued components. After considering the probability and potential consequences, Conuma assessed the overall risk to these valued components in this event to be low.

Accidental Explosions

A fire or explosion at the surface may be caused by several failure modes, including explosion or malfunction of equipment, improper use or storage of explosives, combustion of temporary coal stockpiles, or smoking. After the implementation of emergency response and clean-up measures, this scenario was assessed as having a high potential interaction with the Socio-Community and Human Health valued components. After considering the probability and potential consequences, Conuma assessed the overall risk to Human Health and Socio-Community as moderate and moderately low, respectively.

Motor Vehicle Accidents

A motor vehicle accident may occur under a range of conditions including road conditions, driver fatigue, collisions with wildlife, vehicle malfunctions, and radio malfunctions. These accidents could occur during all Amendment phases but are most likely to occur during construction and operations when Amendment traffic would be the highest. After the implementation of emergency response and clean-up measures, this scenario was assessed as having a high potential interaction with the Wildlife and Wildlife Habitat, Socio-Community, and Human Health valued components. After considering the probability and potential consequences, Conuma assessed the overall risk to Wildlife and Wildlife Habitat, including risk to woodland caribou, as moderate. Further, Conuma assessed the overall risk to Human Health and Socio-Community as moderately high and moderate, respectively.

6.18.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, no comments were raised by the Working Group or Indigenous nations in direct relation to accidents and malfunctions. No conditions were proposed by the EAO related to accidents and malfunctions.

6.18.3 CONCLUSIONS

Considering the above analysis, the subsequent permitting processes, and the strict regulation and standards that apply to the design, construction, and operation of the Amendment, the EAO is satisfied that the likelihood of occurrence of accidents and malfunctions to the Amendment would be low to moderate, and the magnitude of potential adverse effects following mitigation would likely be low to moderate.

6.19 Effects of the Environment on the Amendment

Changes in the environment itself could have effects on the Amendment and have the potential to result in effects to environmental, social, health, heritage or economic values. They were included in Conuma's assessment to evaluate the potential effects of changes in the environment on the Amendment.

6.19.1 SUMMARY OF CONUMA'S ASSESSMENT

Conuma assessed the following environmental effects and processes that have the potential to affect the Amendment and result in changes or effects to valued components assessed in the Amendment Application:

- Climate change (such as temperature rise, trend of increasing precipitation);
- Extreme weather and weather-related events (such as heavy precipitation, extreme temperatures and high wind) including flood events;
- Natural seismic activities/events; and
- Wildfires.

These are described further in the following sections.

Climate Change

When assessing climate change, Conuma focused on future forecasted climatic conditions. Conuma used regional climate change forecasts from the Plan2Adapt Tool from the Pacific Climate Impacts Consortium. A changing climate could affect the Amendment and associated infrastructure through more frequent and extreme weather events, freeze-thaw cycles, lower freshwater lake or river levels, overabundance of precipitation, and rising temperatures.

Since the Amendment 's operations phase would be relatively short (less than ten years), Conuma predicted that most climate change effects might occur during the reclamation and closure and post-closure periods. To accommodate climate change considerations, Conuma's water management structures have been designed to convey/withstand design flows that include a ten percent allowance for the effects of climate change, which is consistent with Association of Professional Engineers in B.C. guidelines. The Amendment's design would incorporate accepted industry standards and best management practices to address the potential effects of climate change on infrastructure and subsequently the valued components during the lifetime of the Amendment. With the application of the mitigation measures, Conuma assessed the likelihood that climate change could affect the Amendment's infrastructure and valued components as low. Conuma assessed the consequence of the potential climate change effects to the Amendment's infrastructure and valued components also as low due to the design, construction and operation standards that would be applied.

Extreme Weather Events

Conuma outlined that effects of extreme weather events such as extreme amounts of precipitation over a short timeframe can overwhelm the mine site drainage and hydrologic regime, including runoff and flooding of pits. Extreme weather events can also wash out roads or decrease slope stability, which can affect the stability of pits, waste rock dumps, and other foundations of the mine infrastructure. Similarly, long periods of unusually warm/dry or cold/dry spells can affect soil conditions affecting water infiltration and soil integrity, which in turn could lead to implications for pit management, dust suppression and water usage.

Conuma described that the potential effects of extreme weather events on the Amendment's infrastructure and subsequently the valued components would be addressed by project design, adherence to industry standards, and adaptive management. Conuma would also follow best management practices and design standards including allowances for extreme weather events in the design of water management structures. With the application of mitigation measures, Conuma assessed the likelihood that extreme weather could affect the Amendment's infrastructure and the valued components as low. Conuma also assessed the consequence of the potential extreme weather effects to the Amendment's infrastructure and the valued components as low due to the design, construction and operations standards that would be applied.

Seismic Events

Conuma stated that the seismic hazard for the Amendment site is defined as moderately low based on the 2015 seismic hazard map for B.C. developed by Natural Resources Canada. Further, based on the surficial geology map from Geoscience B.C., Conuma determined the soils within the HDA to not be susceptible to liquefaction. Project structures and slopes would be analyzed to meet the seismic design criteria and use best management practices. Conuma described several management plans, which would be required at permitting, that would mitigate the potential effects from a future seismic event on the Amendment, which included:

- An Erosion and Sediment Control Plan to properly stabilize unconsolidated materials to mitigate the potential consequences from a seismic event;
- A Fuel Management and Spill Control Plan that would define proper and adequate bulk fuel storage systems that are less susceptible to significant damage during and after a seismic event;
- A Chemicals and Materials Storage and Handling Plan that would reduce the potential for chemical releases during and after a seismic event;
- A Mine Emergency Response Plan would be developed and trained first responders would be on-site when there are workers at the site; and
- The Conceptual Reclamation and Closure Plan contains key closure objectives that would provide long-term stability and safety of drainages, landforms and mine features based on the post-closure end land use objectives.

With the application of the mitigation measures, Conuma assessed the likelihood that natural seismic events could affect the Amendment's infrastructure and the valued components as low. Conuma also assessed the consequence of the potential natural seismic events effects to the Amendment's infrastructure and the valued components as low due to the design, construction and operation standards that would be applied. However, Conuma noted where infrastructure is not built on firm ground, or where unconsolidated material is deposited in slopes, damage to infrastructure and risk to valued components and workers could be greater.

Wildfires

Conuma outlined that wildfires have the potential to affect the Amendment by delaying or bringing mine operations to a stop as well as by damaging the Amendment's infrastructure or the Coal Haul Road or local highways and other access routes. Further, smoke from wildfires (near or far) can affect visibility and hence safe work conditions, on site and on the access roads. The Amendment would be in a heavily forested area and historical fire data has shown that fires are common in the surrounding area. For these reasons, Conuma would implement and follow comprehensive fire prevention and fire smart strategies that would mitigate the risk to the Amendment and workers, which may include: fire buffers around the Amendment's facilities and access roads, maintaining onsite fire prevention and fire response equipment, and adjusting work procedures and schedules during construction and operation of the Amendment in the case of a severe fire danger. Further mitigation strategies would be outlined in Conuma's Emergency Response Plan which would include appropriate policies and procedures for responding to forest fires including the necessary detection, reporting and, if deemed necessary, evacuation plans.

Project mitigation measures would reduce the potential effects of fire on the Amendment's infrastructure and subsequently the valued components during the lifetime of the Amendment. With the application of mitigation measures, Conuma assessed the likelihood that fire could affect the Amendment's infrastructure and the valued components as moderate. Conuma assessed the consequence of the potential fire effects to the Amendment's infrastructure and the valued components as low due to the application of the mitigation measures that would prevent, avoid and/or reduce the potential effects.

6.19.2 KEY ISSUES IDENTIFIED DURING APPLICATION REVIEW

During review of the Amendment Application, no comments were raised by the Working Group and Indigenous nations in direct relation to effects of the environment on the Amendment.

6.19.3 THE EAO'S ASSESSMENT OF RESIDUAL EFFECTS

The EAO proposes the following conditions related to the effects of the environment:

- Condition #6: Construction Environmental Management Plan, which would include mitigation measures for emergency response, erosion and sediment control, and spill prevention and response during construction; and
- Condition #7: Operations Environmental Management Plan, which would include mitigation measures for emergency response, erosion and sediment control, and spill prevention and response during operations.

The EAO is satisfied that the proposed design, mitigation and contingency measures would lower the likelihood and reduce the severity of a potential effects of the environment on the Amendment. Considering Conuma's proposed mitigation and the EAO's proposed conditions, the EAO is of the view that the potential effects of the environment would have a low to moderate likelihood to occur and the potential consequence to be low.

6.19.4 CONCLUSIONS

Considering the above analysis and having regard to the proposed mitigation measures and conditions identified in the Certified Project Description and Table of Conditions (which would become legally binding in the event that the Amendment is issued) and the subsequent permitting processes, the EAO is satisfied that the effects of the environment on the Wolverine Mine would not be significant.

6.20 Reclamation and Closure

Conuma's Amendment Application included a conceptual Reclamation and Closure Plan, which included an End Land Use Plan, a comparison of pre-mining land use and wildlife capability to post-closure predicted ecosystems following closure, and mitigation measures. A detailed Reclamation and Closure Plan will be required as part of *Mines Act* permitting.

The primary ecosystems targeted for reclamation would be the forested ecosystems within the HDA, which is primarily montane forest (Engelmann Spruce-Subalpine Fir type). Reclamation practices were proposed to focus on re-establishing this forest ecosystem to provide wildlife habitat for the permanently reclaimed areas. Some infrastructure (the generator, portions of the HDA road network, and water management and treatment infrastructure) was proposed to be permanent and so was not included in the proposed reclamation area. The Reclamation and Closure Plan would reclaim an additional 6.6 ha of

previously disturbed area from previous forestry activities. A total of 34.6 ha of area was disturbed for the previous Early Works Amendment (#6), which will also be included in this Reclamation and Closure Plan.

Conuma's principles for achieving end land use and capability objectives were:

- Creating geotechnically and geochemically stable landforms at closure;
- Managing water quality through maintenance and monitoring of non-contact water diversions and treatment of contact water;
- Implementing soil salvage and replacement strategies and re-vegetation strategies that would achieve ecological conditions that are similar to pre-mining conditions;
- Targeting post-closure ecosystems that would re-establish wildlife habitat capable of supporting a diversity of wildlife at various successional stages including caribou, grizzly bear, black bear, elk, moose, furbearers (such as marten), grouse, woodpeckers, raptors, ground-nesting songbirds, and forest songbirds; and
- Selecting plant species for revegetation that have Indigenous traditional use value and support native plant diversity.

Conuma assessed wildlife habitat capability for three 'umbrella' species which were expected to represent the habitat needs of other wildlife species, namely caribou, grizzly bear, and marten. It was recognized that wildlife habitat function would change as the reclaimed habitat ages through different successional stages. Conuma compared pre-mining and post-closure wildlife habitat capability in the Amendment Application. The largest changes between these two time periods included:

- Increase by 8.2 percent of very high-quality wildlife habitat;
- Reduction by 23 percent of high-quality wildlife habitat; and
- Close to no change in moderate and low-quality wildlife habitat.

Conuma proposed the following mitigation measures to improve land and wildlife habitat capability following reclamation:

- Site preparation, soil replacement and revegetation to facilitate the recovery of habitat that supports a diversity of wildlife, with a focus on species of conservation concern, associated with Engelmann Spruce-Subalpine Fir type ecosystem;
- Habitat enhancements through creation of wildlife habitat features (such as incorporation of snags, coarse woody debris, rock piles) that support and encourage use by wildlife, with a focus on species of conservation concern, associated with Engelmann Spruce-Subalpine Fir type ecosystem; and
- Line of sight management and incorporation of linear access control to protect prey species recovery.

Conuma indicated that progressive reclamation would occur as project components are no longer required for operations. Conuma also proposed reclamation success monitoring to measure the success of the reclamation program for five years following post-closure, with additional vegetation and wildlife surveys at years 10, 15, and 20.

The following concerns by the Working Group and Indigenous nations regarding Conuma's proposed reclamation and closure plan were raised during application review:

- SFN and WMFN requested further consultation with Conuma to consider culturally important vegetation species, such as black huckleberries, in the plan for reclamation. Conuma indicated that these species would be considered in the Reclamation and Closure Plan to be submitted under the *Mines Act*, that Conuma will consult with Indigenous nations regarding culturally important species and their community-level function in reclamation planning. SFN and WMFN further requested a Reclamation Work Plan for this consultation to be developed with the Indigenous nations. Conuma indicated Indigenous nations will be consulted with during the development of the Reclamation and Closure Plan submitted under the *Mines Act*; and
- HRFN was concerned about reclamation including primarily only one vegetation species. Conuma indicated that it would limit the use of seeding native grasses to locations where erosion control is a priority and would use multiple, native plant species associated with the forested ecosystems most common in the HDA prior to mining.

The EAO proposes to require implementation of the End Land Use Plan submitted as part of the Amendment Application through condition #16. Conuma will also be required to complete a Reclamation and Closure Plan to comply with the Health, Safety and Reclamation Code for Mines in B.C. (MEMLI 2017) and the *Mines Act* during permitting.

7 ASSESSMENT OF IMPACTS TO TREATY RIGHTS AND INTERESTS

The Amendment is proposed within the boundaries of Treaty 8 and would impact the traditional territories of the SFN, WMFN, MLIB and HRFN (the "Consultation Indigenous Nations").

Treaty 8, initially signed in 1899, covers an area of approximately 840,000 km^2 of what is now northern Alberta, northeastern B.C., northwestern Saskatchewan, and the southern portion of the Northwest Territories. The Treaty granted signatory Indigenous nations the right to "pursue their usual vocations of hunting, trapping and fishing" in accordance with the Nations' way of life.

The Amendment has the potential to adversely impact the Consultation Indigenous Nations' Treaty 8 rights and interests associated with hunting, trapping, and gathering. Amendment-related effects (such as sensory disturbances) could also adversely impact the Consultation Indigenous Nations' peaceful enjoyment of their constitutionally-protected Treaty rights and/or could adversely impact their members' use of sites in proximity to, or potentially impacted by, the HDA to practice such rights. In addition, the Amendment could restrict access to sites used by the Consultation Indigenous Nations and their members to practice Treaty rights, engage in cultural activities or ceremonies, and share traditional knowledge.

The Consultation Indigenous Nations' Treaty 8 rights to hunt, fish, and trap and the incidental activities associated with carrying out these rights are recognized and affirmed under Section 35 of the *Constitution*

Act, 1982. In understanding the scope and nature of the rights and obligations under Treaty 8, the Crown is guided by the text of the Treaty, as well as the understandings and intentions of the Indigenous and Crown participants to the making of the Treaty or subsequent adhesions. The EAO's consultation process focused on impacts to the Consultation Indigenous Nations' Treaty 8 rights to hunt, trap and fish, and also considered other concerns and interests expressed by the Consultation Indigenous Nations. The EAO's assessment of potential impacts to Treaty 8 rights and interests was influenced by information provided by each Consultation Indigenous Nation and, as such, the EAO assessed potential impacts to Treaty 8 rights and interests for each respective Consultation Indigenous Nation[55].

The following sections include a description of issues and concerns that were raised by each of the Consultation indigenous Nations (Section 7.2), followed by a description of factors that informed the EAO's assessment of potential impacts to the Treaty 8 rights to fish, hunt and trap, and potential impacts to traditional gathering practices (Section 7.3). The subsequent sections describe additional key issues raised by each of the Consultation Indigenous Nations, followed by a description of the EAO's considerations and conclusions on the seriousness of impacts to the Treaty rights and interests of each respective Indigenous Nation (Section 7.4 discusses potential impacts to Saulteau First Nations' and West Moberly First Nations' Treaty rights and interests, Section 7.5 discusses potential impacts to McLeod Lake Indian Band's Treaty rights and interests, and Section 7.6 discusses potential impacts to Halfway River First Nation's Treaty rights and interest).

7.1 Summary of Consultation

This section discusses the procedural elements of consultation and engagement activities undertaken by the EAO and Conuma with Indigenous nations.

7.1.1 EAO-LED CONSULTATION ACTIVITIES WITH INDIGENOUS NATIONS

On June 27, 2019, the EAO issued a Procedural Letter which specified the consultation activities that both the EAO and Conuma would undertake with all Indigenous nations potentially affected by the Amendment. Indigenous nations were listed in two schedules in the Procedural Letter: Indigenous nations engaged at the deep end of the consultation spectrum ("Consultation Indigenous Nations" – including MLIB, SFN, WMFN and HRFN); and Indigenous nations consulted primarily through notification ('Notification Indigenous Nations' – including DRFN, Blueberry River First Nation (BRFN) and Horse Lake First Nation (HLFN)). To determine how an Indigenous nation would be consulted, consideration was given to areas of traditional use understood by the Province to be where Treaty rights were historically or are currently exercised and discussed further with each Indigenous nation. DRFN was originally part of the Consultation Indigenous Nation group; however, DRFN subsequently indicated a preference to be included in the Amendment at the notification level and so was included in the Notification Indigenous Nation group.

[55] Potential impacts to SFN and WMFN's Treaty rights and interests are assessed together as SFN and WMFN participated in the EA and provided information to the EAO jointly.

The EAO provided Consultation Indigenous Nations with capacity funding to support participation in the Amendment. The EAO has been engaging at the deep end of the consultation spectrum with HRFN, MLIB, SFN and WMFN on the Amendment since October 2018. To date, as part of the Amendment, each of these Indigenous nations have participated in Working Group meetings, provided analysis and comments on Conuma's submissions and responses, and have participated in numerous technical meetings aimed at developing resolutions to key issues. Along with the Working Group, the EAO provided the draft AAIR, Conuma's Amendment Application and supplemental materials to Indigenous nations for review, asking for their comments and to identify any concerns that they may have with the proposed amendment. The proposed Amendment conditions, which are intended to mitigate impacts to effects of the Amendment Activities, including impacts to Treaty rights, were developed collaboratively with the Consultation Indigenous Nations in an iterative and transparent process.

At the outset of the Amendment EA process, SFN and WMFN worked together with MLIB through a FNITR committee to provide technical review and comment on the pre-application documents, as well as the Application and its appendices. In June 2019, MLIB elected to participate in the Amendment EA independent of the FNITR. WMFN and SFN opted to continue joint participation as part of the FNITR for the remaining stages of the EA process. In February 2020, the FNITR provided to the EAO the *Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited* (2019). This report provided non-confidential analysis of mapped knowledge and use data in the vicinity of the proposed Hermann site, collected during interviews and site visits conducted with SFN and WMFN's community members. In November 2020, MLIB provided to the EAO a knowledge and use study titled *McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts* (2020), which also provided an analysis of mapped knowledge and use data collected from MLIB community members.

In addition to Working Group meetings, the EAO held initial government-to-government meetings with SFN and WMFN (working together as the FNITR), and separately with HRFN and MLIB. The EAO provided the draft referral materials, including the Assessment Report (this Report), Certified Project Description and the proposed Table of Conditions, for review. Each of the Consultation Indigenous Nations provided written comments on the draft referral materials and/or participated in government-to-government meetings to discuss these materials, as well as any outstanding issues the Indigenous nations had. This section, Assessment of Impacts to Treaty Rights, was provided to Indigenous nations for comment prior to any other parties.

The Consultation Indigenous Nations also have an opportunity to submit a separate submission outlining their views on the Assessment Report, proposed conditions, and project description to be included in the package of materials sent to the EAO's Chief Executive Assessment Officer when the Amendment was referred for decision.

Parallel to the EA process, Consultation Indigenous Nations participated in the Mine Review Committee, which is a project-specific interagency committee convened to coordinate the review of *Mines Act* and *EMA* permit applications. The Mine Review Committee is coordinated by the Major Mines office of EMPR.

7.1.2 PROPONENT-LED CONSULTATION ACTIVITIES WITH INDIGENOUS NATIONS

In the Procedural Letter for the Amendment, the EAO directed Conuma to undertake certain procedural aspects of consultation during the EA with Consultation Indigenous Nations and required Conuma to develop and share drafts of its Indigenous Consultation Plan[56] with the Consultation Indigenous Nations for their review and feedback. A summary of Conuma's engagement activities with each Indigenous nation is provided in Section 11.1 of Conuma's Application.

7.2 Concerns Shared by Consultation Indigenous Nations

SFN, WMFN, MLIB and HRFN identified a number of shared key concerns related to potential impacts of the Amendment on their Treaty rights, as described in the following sections.

7.2.1 CUMULATIVE IMPACTS TO TRADITIONAL TERRITORIES

The Consultation Indigenous Nations all expressed concern about the cumulative effects of legacy and ongoing energy, industrial, forestry, and agricultural development as well as increased motorized recreational activities within their traditional territories. The Consultation Indigenous Nations stated that these cumulative effects constrain their abilities to meaningfully exercise their Treaty rights within culturally-preferred areas, as well as their ability to peacefully enjoy[57] the exercise of those rights. Representatives from these Nations cited various examples of the ways in which they view their exercise of Treaty rights as already curtailed due to cumulative effects in the landscape. The Nations described that the Treaty 8 right to hunt in accordance with cultural protocols is currently impacted by declines in animal populations and health, reduced access to sites, and competition with non-Indigenous hunters. As a result, Indigenous community members reported reduced yields from hunting and trapping, describe experiences of unreasonable interference from traffic and noise while hunting or trapping in their traditional territories, and reported that they are increasingly compelled to travel long distances in order to be able to harvest minimally sufficient country foods to meet community needs and to do so while peacefully enjoying their rights to hunt or trap. And yet, the FNITR noted that the need to travel further afield in order to hunt or trap is itself destructive of the peaceful enjoyment of the right to hunt, while also imposing time and financial burdens on community members.

[56] The Indigenous Consultation Plan is available online at https://projects.eao.gov.bc.ca/api/public/document/5d659ab92f3e4f00223e98f4/download/2019-08%20Final%20Indigenous%20Consultation%20Plan.pdf.

[57] Saulteau First Nations and West Moberly First Nations defined *peaceful enjoyment* of a Treaty right as "the degree to which the Crown, and other in their use of Crown lands and resources, show respect for the right of Treaty 8 peoples not to be unreasonably interfered with in their exercise of governance over their way-of-life, and their interactions with "all their relations". The EAO understands peaceful enjoyment of Treaty 8 rights to incorporate consideration of unreasonable disturbance by other users of Crown land or resources, sensory disturbances from air or noise emissions, impacts to visual quality, and concerns related to the spiritual and physical contamination of resources.

Indigenous nations' voluntary suspension of the caribou hunt until the Quintette herd of caribou can once again be sustainably hunted by Indigenous nations[58] is described as a compelling example of how cumulative effects have impacted their Treaty 8 rights to hunt. Because caribou are not presently hunted in the region, moose have become a particularly high-value resource. The Consultation Indigenous Nations noted, however, that moose is not as abundant as it has previously been, causing community members to further change the focus of the traditional hunt to other species, such as deer and elk.

The Consultation Indigenous Nations reported that the cumulative effects in their traditional territories and the restrictions that these effects impose on their Treaty 8 right to hunt and trap has had adverse outcomes on food security, for example, reducing the proportion of wild foods in community members' diets and also compelling some community members to forego harvesting culturally preferred animals. Beyond the implications to food security, the FNITR notes that adverse impacts on the Treaty 8 right to hunt is likely to have negative outcomes on community cohesiveness, community health, cultural transmission and mental health. Section 7.4.1 provides further description of the FNITR's comments on this topic.

The Consultation Indigenous Nations also raised concerns about the diminished water quality and altered flows of water bodies in the region due to industrial activity, agricultural use, and climate change, which they report have resulted in declines in the quantity and quality of aquatic life. At present, the Consultation Indigenous Nations note that very few areas in their traditional territories remain safe to harvest fish for consumption. The Murray River, which is fed by M20 Creek, is generally understood by the Consultation Indigenous Nations to be one of these few waterbodies where it remains relatively safe to fish, although many community members express concerns that legacy and existing mining operations have also negatively impacted the quality of Murray River's water and fish. As such, the Murray River is particularly valuable as an Indigenous fishery for the Consultation Indigenous Nations but also particularly vulnerable to additional impacts to water quality.

Similarly, the Consultation Indigenous Nations reported that the availability and quality of food and medicine plants in the region has declined as a result of the encroachment land clearing and industrial operations. The Consultation Indigenous Nations repeatedly stressed that the Amendment would be situated within traditional territories that have, in their view, sustained considerable adverse effects from development and that every new development would further impede their abilities to exercise their Treaty rights, including rights to hunt, trap, fish, and gather food and medicine plants in the region.

In assessing the potential adverse effects resulting from the Amendment to valued components, the EAO considered the context in which the potential effects could arise. Further detail related to the assessment of potential impacts to individual valued components are described in other sections of this Report, including vegetation (Section 6.4), surface water quality (Section 6.12), surface water quantity (Section 6.11), aquatic resources (Section 6.13), fish and fish habitat (Section 6.14), wildlife (Section 6.16) and human health (Section 6.17). Key issues related to these valued components, including concerns raised by Indigenous nations, are summarized in these sections, including Conuma's responses, the EAO's

[58] Indigenous nations concerns related to caribou are described in more detail in Section 7.2.2 of this Report.

assessment and conclusions, and proposed conditions to address the concerns.

7.2.2 CARIBOU

The Consultation Indigenous Nations expressed strong concerns about the effects that the Amendment would have on caribou, which would impact the Nations' Treaty 8 right to hunt, which includes hunting caribou. Caribou are an essential part of each of the Consultation Indigenous Nations' culture and history, having historically provided sustenance in the form of food, medicine, clothing, regalia, and other manufactured items. Further, caribou have spiritual and social importance to the Consultation Indigenous Nations' Treaty right to hunt, connection to the land, and the passing of values, language, and knowledge to others in their communities.

The Consultation Indigenous Nations have generally made community-level decisions to stop hunting caribou and have indicated an intent to defer hunting caribou until herd sizes have recovered to a level that would sustain harvesting by Indigenous nations, consistent with their Treaty rights. Additionally, the B.C. government and some of the Consultation Indigenous Nations have undertaken caribou population management efforts (such as maternal penning, predator culling, and feeding programs), which have resulted in positive short-term effects on caribou numbers. Notwithstanding the positive benefits to caribou populations brought on by these efforts, the federal Minister of Environment has indicated that these population management measures must be complemented by significant habitat protection and restoration measures to improve the likelihood for eventual recovery of caribou populations[59].

To that end, in February 2020, the governments of Canada and B.C. signed the Agreement for the Conservation of the Southern Mountain Caribou pursuant to Section 11 of SARA[60] (Section 11 Agreement). The Section 11 Agreement establishes a framework for cooperation and sets out immediate and long-term measures in support of Southern Mountain Caribou conservation and recovery. In February 2020, SFN, WMFN, and the governments of Canada and B.C., signed the Intergovernmental Partnership Agreement the Conservation of the Central Group of the Southern Mountain Caribou[61] ('Partnership Agreement'). The Partnership Agreement sets out actions intended to expeditiously recover the central group of Southern Mountain Caribou to self-sustaining levels that support traditional Indigenous harvesting activities, consistent with Aboriginal and Treaty rights. MLIB is also engaged with B.C. and Canada on caribou recovery and management efforts, and actively carry out targeted stewardship activities for caribou herds.

Recognizing that the Amendment would have the potential to cause significant effects to caribou, the Consultation Indigenous Nations indicated that their goal is to protect all critical habitat within the Quintette herd and focus on caribou recovery at a pace and scale that allows caribou populations to recover to a level where such Nations can begin again to hunt caribou pursuant to their Treaty right to hunt. Through the course of consultation, the Indigenous nations expressed concern about the following

[59] Government of Canada, 2018.
[60] Available online: https://engage.gov.bc.ca/app/uploads/sites/373/2019/03/Draft-Section-11-Bilateral-Conservation-Agreement-2019_03_08.pdf
[61] Available online: https://engage.gov.bc.ca/app/uploads/sites/373/2019/03/Caribou-Partnership-Agreement.pdf

aspects related to potential effects to caribou stemming from the Amendment:

- The funds that Conuma had proposed to contribute towards offsetting effects to caribou are insufficient to execute and monitor long-term habitat recovery that would be sufficient to create a net-positive or net-neutral impact on caribou within the context of the predicted residual effects of the Amendment. Collaborating with the FNITR, the Province and Conuma continued to further develop and/or recognize a suite of measures aimed at offsetting impacts to caribou. In addition to Conuma's originally proposed financial contribution of $744,560, these measures included:
    - Protection of 4,830 ha of Conuma tenured areas in the A2 zone of the Partnership Agreement;
    - Securement of an additional 292 hectares of caribou habitat;
    - Additional funding of $300,000 from the Province to support caribou habitat restoration; and
    - An additional contribution of $745,000 from Conuma towards caribou habitat mitigation measures, to be secured through an agreement with WMFN.

  Ultimately, FLNRORD's Caribou Recovery Program expressed the view that taken together, these measures adequately address both direct and indirect impacts resulting in net neutral or better effects to caribou and caribou habitat;

- Critical habitat for the Quintette herd has already exceeded the 35 percent disturbance threshold stipulated in the Federal Strategy for Caribou[62]. WMFN, SFN, MLIB and HRFN indicated that their understanding was that the exceedance of this threshold should signify that no additional impact to critical habitat for the Quintette herd should take place, although some of the Consultation Indigenous Nations were amenable to additional disturbance provided that it is offset by measures that would be of net neutral or better effects to caribou viability.
- The Province's draft Caribou Habitat Offset Decision Support Tool, which was used to calculate the area required to offset the effects to caribou, had not yet been finalized, nor had participating Indigenous nations endorsed the offset area that this tool had been used to calculate;
- Contrary to Conuma's previous assertions that the proposed HDA site is no longer used by caribou, there is evidence of current use within the proposed footprint. In addition to sightings of an individual animal and tracks recorded in the Application, Conuma documented a photo of an uncollared caribou using a wildlife camera positioned at the edge of the proposed Hermann Pit. HRFN understands this high elevation area to be an alpine wildlife corridor for caribou and grizzly that could become increasingly important, given the obstruction to wildlife movement that the Hermann pit would become. For this reason, HRFN has repeatedly requested that Conuma alter the mine footprint to exclude alpine wildlife corridor. Conuma replied that it would not exclude high elevation area, as requested by HRFN, because to do so would reduce the coal available to development by eight percent. Conuma further noted that its Caribou Management and Monitoring Plan (CMMP) would further mitigate potential impact to caribou. HRFN specified that it

[62] Government of Canada, 2012. Available online: https://www.registrelep-sararegistry.gc.ca/virtual_sara/files/plans/rs_caribou_boreal_caribou_0912_e1.pdf

does not agree that Conuma's mitigation proposal for this corridor will mitigate further potential impact to caribou;
- Conuma has not provided an analysis of caribou demographics, which WMFN and SFN noted is important information for a herd that is already suffering from overly disturbed range and in need of direct population management in order to avoid extirpation;
- Conuma's proposal to monitor reclamation annually for the first five years, and then at roughly five-year intervals until 20 years post-closure was viewed by WMFN, SFN and HRFN as insufficient to assess the habitat reclamation success and reestablishment of caribou habitat. HRFN specified that it would take approximately 200 years to successfully re-establish high elevation caribou habitat;
- Additional disturbance to the Quintette herd would have negative implications to ongoing caribou recovery initiatives;
- In addition to the threats to the Quintette herd's survival being threatened by the cumulative effects related to previous and current industrial development, SFN and WMFN noted that there are several applications for coal development currently in an EA process that further threaten the extirpation of the Quintette herd; and
- SFN and WMFN indicated that the Province has a history of approving projects in spite of potential significant impacts to caribou and caribou habitat. These approvals are based, in part, on unproven and ineffective mitigation measures, weak cumulative impact assessments, and the discounting of Indigenous concerns and traditional knowledge.

Section 6.16 of this Report provides further detail about the EAO's assessment of biophysical assessment of caribou, including the federal and provincial status, key mitigation measures proposed by Conuma, and conditions proposed by the EAO. In that section, the EAO assessed that the Amendment would have high magnitude and irreversible residual adverse effects on caribou. The EAO concluded that, given the sensitivity of caribou to further human disturbance, this Amendment would likely have significant adverse effects on caribou. The EAO further noted, however, that the effective implementation of proposed mitigation and monitoring measures, coupled with Conuma's proposal for offsetting effects to caribou (all of which are included in EAO's proposed condition #14) and additional funding by the Province to support caribou habitat recovery, would ultimately result in a net neutral impact to caribou and caribou habitat.

SFN provided a letter to the EAO on December 22, 2020 indicating that SFN is not opposed to the Amendment and looks forward to further discussions and collaboration as the project proceeds. WMFN provided a letter on January 22, 2021[63], indicating that Conuma's additional financial contribution for reclaiming, restoring and otherwise caribou habitat would, in WMFN's view, help offset some of the Amendment's impacts on caribou habitat. As such, WMFN indicated that it would not seek additional caribou offsetting funds but remains eager to work with Conuma and the Province to identify additional funds and commitments to restore and protect caribou habitat throughout the region.

[63] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019ba732090f10020b5303b/download/2021%2001%2022%20Ltr%20THT%20to%20EAO%20re%20Hermann%20Caribou%20Offsets.pdf

7.2.3 EAST BULLMOOSE PIT

Prior to the initiation of the Amendment, Conuma intended to develop the East Bullmoose Pit, which was approved at the EA-level as part of the Wolverine Mine EAC in 2004. During the early stages of the permitting process aimed at developing East Bullmoose Pit, the Province and Consultation Indigenous Nations raised concerns about the significant impacts to caribou that the development of East Bullmoose Pit would impose. In response, Conuma undertook to move the expansion of the Wolverine Mine from the East Bullmoose Pit to the Hermann Pit.

At the outset of the Amendment, SFN, WMFN, HRFN and MLIB expressed that they initially understood that Conuma had committed to deferring the development of the East Bullmoose Pit permanently. The Indigenous nations and provincial caribou biologists indicated that this commitment was a meaningful mitigation for potential adverse effects to caribou that would result from the development of the Hermann Pit. The commitment to permanently defer the development of East Bullmoose Pit appeared to also be in alignment with the ongoing development of provincial and federal caribou policy[64]. As such, under the premise of the permanent deferment of developing East Bullmoose Pit, SFN, WMFN, MLIB and HRFN agreed to participate in the expedited review schedule for EA and permitting proposed by Conuma. Later in the Amendment process, Conuma informed the Indigenous nations that it would only defer seeking permits to develop East Bullmoose Pit until the year 2025. This deferral commitment, which amounted to a total of approximately six years from the time that the commitment was made, fell significantly short of what the Indigenous nations understood Conuma had offered when it was seeking the Nations' participation in supporting an expedited timeline.

Indigenous nations expressed dismay that Conuma could intend to develop East Bullmoose Pit after 2025, despite the broad acknowledgement that developing East Bullmoose Pit would have an adverse and irreversible effect to high elevation winter range currently used by the Quintette herd.

7.2.4 WATER QUALITY

SFN, WMFN, MLIB and HRFN consistently stressed that their ability to drink the water and eat the fish in their traditional territories is a paramount concern. Water is of central importance to the continued exercise of Treaty 8 rights, as it is a sustaining force in the health and abundance of the animals, plants, and fish upon which their community members have always relied for sustenance. Beyond supporting Treaty 8 rights to hunt, trap, fish and gather, the water and waterbodies within these Nations' traditional territories provide drinking water to their community members and support important cultural and spiritual practices.

SFN, WMFN, MLIB and HRFN expressed a deep and shared concern about the cumulative water quality effects of previous and ongoing industrial, agricultural and mining development in the region and stressed that they view any incremental adverse effect to water quality resulting from the Amendment to be a

[64] See Section 2.1.1 of this Report for more information about the East Bullmoose Pit.

serious impact on Treaty rights. This being the case, the Indigenous nations unanimously urged that Conuma's water treatment system be able to achieve the B.C. Water Quality Guidelines at the point of discharge (described as "end of pipe") rather than relying on mixing the discharge with fresh water and precipitation runoff to dilute the effluent to achieve compliance, which is what Conuma has proposed for their water treatment system.

SFN, WMFN, MLIB and HRFN also noted that Conuma has not scientifically demonstrated that the B.C. Water Quality Guidelines are protective of the receiving environments of M20 Creek, the Wolverine River and Perry Creek. Rather than the 10 µg/L benchmark for selenium established in the B.C. Water Quality Guidelines, SFN, WMFN, MLIB and HRFN noted that a benchmark of 2 µg/L would be more appropriate to protect aquatic life and should possibly be lower in the oxbows located near the Wolverine River.

In the effects assessment, Conuma predicted that selenium concentrations as a result of the Amendment would exceed the B.C. Water Quality Guidelines at the Wolverine Mine and the HDA. Understanding that Conuma intends to propose a Science-Based Environmental Benchmark (SBEB) values for the HDA following permitting, which could change the water quality target, Indigenous nations stressed the importance of first developing a site-specific selenium bioaccumulation model in consultation with Indigenous nations, which Conuma plans to do during permitting.

Key issues related to surface water quality and groundwater quality are discussed in greater detail in Sections 6.12 and 6.10 of this report, respectively. These sections include the biophysical assessment of surface water and ground water quality, concerns raised by Indigenous nations, responses from Conuma, key mitigation measures proposed by Conuma, the EAO's assessment and conclusions, and conditions proposed by the EAO to address these concerns.

In surface water quality (Section 6.12), the EAO concluded that the Amendment would have residual adverse and cumulative effects on surface water quality. In groundwater quality and quantity (Section 6.10), the EAO concluded that the Amendment would have residual adverse effects on groundwater quality. The EAO proposes the following condition to address concerns related to water quality:

- Condition #11: Aquatic Resources Monitoring Plan, which would include a requirement to develop a plan in consultation with Indigenous Nations that describes monitoring related to surface water chemistry, specific monitoring triggers, and corresponding responses and mitigation measures should the triggers be reached; and
- Condition #12: Water Treatment Technology, requiring Conuma to implement the SeHAWK technology as the primary water treatment; and
- Condition #13: Water Quality Management Plan, requiring Conuma to use the water treatment system effectively, to monitor selenium, nitrate, and nitrite in the receiving environment and to indicate how the Murray River Water Quality Objectives would be met.

7.2.5 WATER TREATMENT

Water Treatment at the HDA

MLIB, HRFN, WMFN and SFN raised concerns that Conuma failed to demonstrably evaluate all viable water treatment options for the HDA prior to selecting BCRs for the primary water treatment in operation and post-closure. Indigenous nations consistently noted that Conuma's assessment of the best achievable water treatment technology at the HDA failed to incorporate water quality objectives that were agreed upon by Indigenous nations (i.e., achieving B.C. Water Quality Guidelines at the end of pipe). In selecting BCRs for water treatment, Conuma's assessment predicts that selenium concentrations would exceed B.C. Water Quality Guidelines in M20 Creek. Indigenous nations further noted that Conuma's assessment of the efficacy of its proposed BCRs is predicated on the assumption that the BCRs would consistently operate with a 90 percent removal efficiency for selenium, which far exceeds the removal efficiencies reported by Conuma for its other operating BCR system at Brule.

Conuma and technical reviewers from EMPR, ENV, MLIB, HRFN, SFN and WMFN engaged in a protracted process of commenting and submitting information requests aimed at better understanding the viability and efficacy of BCRs, which ultimately did not provide technical reviewers sufficient confidence in BCRs and the primary water treatment mitigation at the HDA. As a result, Conuma proposed an alternate plan for primary water treatment, known as a SeHAWK system. Although Conuma expressed the intent to switch to the BCRs as primary water treatment, once it can obtain permits for their use, the SeHAWK system would remain in place throughout the life of mine unless an alternate water treatment technology can be proven to be effective.

Although some uncertainty remains regarding operational and site-specific details of the proposed SeHAWK system, the EAO is of the view that the information provided about the SeHAWK was sufficient to conceptually demonstrate that the proposed water treatment system would meet the stated removal efficiencies. WMFN and SFN noted that the SeHAWK appeared to have the capability of outperforming the previously proposed BCRs and provided technical feedback on Conuma's Design Basis Report, which included recommendations to optimize the SeHAWK's performance and minimize risk of selenium speciation.

Water Treatment at the Wolverine Mine

MLIB, WMFN, SFN and HRFN all raised concerns about the lack of water treatment at the Wolverine Mine, where the coal from the Hermann Pit would be processed. Noting that the addition of the Hermann Pit would prolong the operating life of the Wolverine Mine, the Nations advocated for including operations at the Wolverine mine within the scope of the EA for the Amendment and reconsidering Wolverine's established SPOs.

Conuma indicated a preference to address permit limits at the Wolverine Mine at permitting instead. Conuma provided further information about mitigations employed at Wolverine, which included source control, water management, progressive reclamation, a trigger action response plan and monitoring. MLIB raised concerns regarding Conuma's trigger action response plan, which described a mitigation process that would initiate only after Wolverine's SPOs have been exceeded for multiple months.

Storage Capacity

HRFN, SFN and WMFN expressed concern that the storage capacity of the water treatment system was insufficient, which could result in untreated water being discharged during times of peak flows (such as during freshet or times of unusually high precipitation). Conuma responded that the proposed storage capacity met provincial guidelines, noting that bypasses of the water treatment system would likely only occur during freshet and would not result in exceedances of the B.C. Water Quality Guidelines.

Key issues related to the biophysical assessment of surface water quality are discussed in greater detail in Section 6.12. This section includes a discussion of concerns raised by Indigenous nations, responses from Conuma, key mitigation measures proposed by Conuma, the EAO's assessment and conclusions, and conditions proposed by the EAO to address these concerns.

In the surface water quality section (Section 6.12), the EAO concluded that the Amendment would have residual adverse and cumulative effects on surface water quality. The EAO recognizes that the design of the water treatment system, including storage capacity, is an issue that will be required to be addressed at permitting. This issue will be included in a carryover list for permitting[65], that describes issues identified by reviewers that, while sufficiently addressed at the EA level, will required additional information and detailed discussion during the production permitting process.

7.2.6 SELENIUM BIOACCUMULATION IN FISH

SFN, WMFN, MLIB and HRFN raised concerns that the Amendment would contribute to selenium bioaccumulation in fish and questioned the method that Conuma used to assess the potential for this effect to occur, a regional selenium bioaccumulation model. Conuma, using this model, predicted that aqueous selenium concentrations of 26 µg/L would be protective of slimy sculpin, which Conuma noted is the most sensitive species in the RAA's waterbodies. This model assumed that tissue selenium concentrations of 10 mg/kg is safe for fish, which MLIB, SFN and WMFN indicated was far in excess of the published provincial guidance of 4 mg/kg in fish and invertebrate tissue. In the absence of site-specific toxicity studies in fish and fish habitat in the receiving environments at the HDA or Wolverine Mine, demonstrating that selenium concentrations higher than the Provincial guidance would be safe, WMFN and SFN stressed that Conuma must adhere to the Provincial guidance selenium concentrations, instead of the 10 mg/kg benchmark it proposed.

The Consultation Indigenous Nations raised concerns regarding the appropriateness of Conuma's regional bioaccumulation model because it 1) is drawn from a widely scattered dataset, which is skewed by a small number of data points from a single water sample, 2) is based on fish tissue from only slimy sculpins, which are not harvested species but, rather, are prey for some harvested species, 3) differentiates between trophic levels – some of which have very few sample data points, 4) incorrectly assumes that fish only uptake selenium through their diet, and 5) inappropriately assumes that selenium speciation is identical in all environments. WMFN and SFN further noted that the model's mechanics are not well understood. Ultimately, the Indigenous nations expressed concern that the regional selenium bioaccumulation model is

[65] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019bdfe2090f10020b5315f/download/Wolverine%20Combined.pdf

not constructed properly, which casts doubt on its prediction that fish tissue selenium concentrations deemed safe by Conuma (up to 10 mg/kg) corresponds to high aqueous selenium concentrations (26 µg/L). Further, SFN and WMFN noted that the model produces a population-level prediction, which means that some individual harvested fish would have selenium concentrations in their tissue what is above 10 mg/kg, which exceeds the threshold that Conuma proposes is safe for consumption.

SFN, WMFN, MLIB and HRFN proposed that Conuma's regional bioaccumulation model does not represent the conditions that have been observed at M20 Creek, pointing out that there are currently documented occurrences fish in M20 Creek that exceed the lowest effect level proposed by Conuma of 10ug/g with very low corresponding water concentrations (average selenium concentration of 1.17 µg/L). These documented occurrences are not in line with Conuma's regional bioaccumulation model predications. SFN, WMFN and MLIB suggested that this may be linked to groundwater seepage from a legacy mining project that may include a more bioavailable species of selenium, which causes organisms to accumulate it more readily into their tissue.

Key issues related to fish and fish habitat are discussed in greater detail in Section 6.14 of this Report. That section includes the biophysical assessment of fish and fish habitat, concerns raised by Indigenous nations, responses from Conuma, key mitigation measures proposed by Conuma, the EAO's assessment and conclusions, and conditions proposed by the EAO to address these concerns. In this section, the EAO assessed that the Amendment would result in low to moderate magnitude residual adverse effects to fish and fish habitat due to loss of habitat and decline in fish health resulting from contaminant discharge and loss of surface flows. The EAO has proposed the following conditions to reduce the potential residual effects on fish and fish habitat:

- Condition #12: Water Treatment Technology, requiring Conuma to implement the SeHAWK technology as the primary water treatment;
- Condition #13: Water Quality Management Plan, requiring Conuma to use the water treatment system effectively, to monitor selenium, nitrate, and nitrite in the receiving environment and to indicate how the Murray River Water Quality Objectives would be met;
- Condition #11: Aquatic Resources Monitoring Plan, which would include a requirement to develop a plan to monitor fish tissue chemistry, fish communities, and fish health; undertake bioaccumulation modelling; and develop specific monitoring triggers and corresponding responses and mitigation measures that would be implemented if the triggers are reached; and
- Condition #15: Country Foods Monitoring Plan, including requirements that Conuma develop a plan to monitor effects to foods for consumption, undertake fish tissue sampling, and incorporate specific measure to ensure the sampling plan is informed by discussions with Indigenous nations.

7.2.7 FLOW REDUCTIONS DURING WINTER

SFN, WMFN and HFN expressed concern about potential effects to fish due to the reductions in water flow in M20 Creek during the winter months (December through March) when Conuma does not intend to discharge treated water. The Application, they note, did not provide baseline information about

overwintering fish in M20 Creek, meaning that it is unknown whether fish spend the winter months in M20 Creek. As such, it is not possible to understand how the flow reductions could affect overwintering fish.

In response to the Consultation Indigenous Nations' concerns, Conuma indicated that collecting baseline data on overwintering fish was unsafe and unnecessary. Instead, Conuma indicated a preference to monitor stream flows and dissolved oxygen as an indicator of change in potential overwintering habitat. Conuma further noted that mitigation measures (such as flow augmentation) could be applied if Conuma deemed it warranted through water monitoring.

SFN and WMFN noted that the insufficiency in baseline data and the uncertainty in the risk to fish gives rise to the need for a precautionary approach, which should include environmental offsetting through a Fisheries Compensation Plan. Conuma responded that it would consider offsetting if water monitoring shows a measurable effect to overwintering habitat for which offsetting is deemed necessary by Fisheries and Oceans Canada. SFN and WMFN responded that Conuma has insufficient baseline data to determine if an effect has taken place and, as such, would not be able to adaptively manage this potential effect. Similarly, the absence of baseline data would likely prevent Fisheries and Oceans Canada from being able to judge whether offsetting would be warranted.

Key issues related to fish and fish habitat are discussed in greater detail in Section 6.14 of this Report. That section includes the biophysical assessment of fish and fish habitat, concerns raised by Indigenous nations, responses from Conuma, key mitigation measures proposed by Conuma, the EAO's assessment and conclusions, and conditions proposed by the EAO to address these concerns. In that section, the EAO assessed that the Amendment would result in low to moderate magnitude residual adverse effects to fish and fish habitat due to loss of habitat and decline in fish health resulting from contaminant discharge and loss of surface flows. The EAO noted that, while effects related to flow reduction would have a moderate magnitude effect to individual fish and eggs in M20 creek during winter, these effects would not extend to Murray River (where most fish from M20 Creek spend the winter months).

7.2.8 INDIGENOUS MONITORING PROGRAM

SFN, WMFN, MLIB and HRFN expressed importance that the Nations themselves, rather than Conuma, would prefer to carry out the compliance monitoring for the Amendment. To that end, the Consultation Indigenous nations requested that Conuma fund an Indigenous Monitoring Program to ensure greater confidence on the part of community members in the information that is gathered. Further, SFN and WMFN specified that Indigenous nations' active and fairly compensated role in water monitoring would be a key part of securing WMFN and SFN's consent as it relates to water quality impacts of the Amendment.

SFN, WMFN and MLIB have indicated that they have capacity to carry out compliance monitoring and are working to further develop this capacity.

The EAO proposes a condition #9 to require Conuma to develop an Indigenous-Led Monitoring Program in consultation with the Consultation Indigenous Nations, which would be funded by Conuma.

7.3 Potential Impacts to Treaty Rights and Interests

7.3.1 FISHING

The Consultation Indigenous Nations identified several fish species that are traditionally important food sources to their communities that may be impacted by the Amendment. These include, bull trout, Dolly Varden, arctic grayling, whitefish, rainbow trout, char sucker, and pickerel[66,67], most of which are known to occur in M20 Creek, which is immediately adjacent to the HDA. A review of secondary information in the Application indicated that burbot and Northern pike (jackfish) are also typically harvested by the Consultation Indigenous Nations within their traditional territories.

In the Application, Conuma predicted that the Amendment could negatively impact the exercise of the right to fish by causing the alteration or destruction of fish habitat, through changes in stream flow of M20 Creek and the Murray River. Conuma also reported that the Amendment may cause fish mortality or declines in fish health, with higher residual effects expected in M20 Creek as compared to the Murray River, where changes metal concentrations in fish tissue are expected to be marginal. Further details related to the potential biophysical effects to fish are described in Section 6.14 of this Report.

Beyond the potential physical and chemical effects to fish and fish habitat, Conuma recognized that the Consultation Indigenous Nations' right to fish may be impacted due to their community members' perceptions of decreased environmental quality, or because atmospheric disturbances (e.g., noise, air emissions) and/or changed visual aesthetics may reduce community members' peaceful enjoyment of their Treaty rights to fish. The loss or reduction of Indigenous nations' ability to practice the right to fish, whether through biophysical effects, reduced access or reduced preference for specific fishing areas, would impact not only the right to fish and the ability to have peaceful enjoyment while fishing, but also the spiritual and cultural connection to the land and cultural learning practices associated with the practicing the right to fish.

The following factors have informed the EAO's assessment of potential impacts of the Amendment on the Consultation Indigenous Nations' Treaty rights associated with fishing:

- The assessment of potential effects of the Amendment on the Consultation Indigenous Nations' Treaty rights to fish, as informed by the biophysical assessment of impacts to fish and fish habitat (Section 6.14), aquatic resources (Section 6.13), surface water quality (Section 6.12) and surface water quantity (Section 6.11), as well as discussions with, and information provided by the Consultation Indigenous Nations;
- Due to cumulative effects of industrial and other development, the Murray River, which is fed by M20 Creek, is generally understood by the Consultation Indigenous Nations to be one of the few

[66] Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited, 2019.
[67] McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts, 2020.

remaining waterbodies in the region where it is safe to harvest fish for consumption. As such, the Murray River and its tributaries are very important to the Treaty 8 right to fish;
- Conuma's population-level bioaccumulation model predicts that the Amendment would cause increased levels of selenium in fish tissue, with some individual harvested fish having selenium tissue concentrations above levels that are deemed safe to eat. In those cases, this would present a risk for consumption. Additionally, the knowledge that ingesting fish could pose an increased risk could compel Indigenous nations' members to forego practicing their right to fish in the area;
- Increased motorized boat traffic and recreational use by non-Indigenous people could diminish peaceful enjoyment of the Treaty right to fish in this area;
- Conuma does not presently intend to offset fish habitat impacted by restricted winter flows unless monitoring indicates a measurable effect to overwintering habitat and is therefore deemed to be required by Fisheries and Oceans Canada. Uncertainty exists as to whether Conuma has sufficient baseline information to determine whether an effect to overwintering habitat has taken place;
- A potential increase of recreational and/or subsistence fishing among non-Indigenous people who are drawn to the area as a result of the Amendment would serve as competition to the Consultation Indigenous Nations' community members exercising their right to fish. The FNITR is of the view that this would create unreasonable disturbance to the peaceful enjoyment of the Treaty 8 right to fish; and
- The permitting process could require additional mitigation beyond that which is considered for the EAC, should it be issued.

MONITORING, MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO FISHING

Conuma has proposed mitigation to avoid and minimize potential effects to water quality and fish, and other concerns associated with fishing activities raised by the Consultation Indigenous Nations. Key monitoring and mitigation measures that address the issues described above included:

- Construction and operation of water treatment infrastructure, including SeHAWK active water treatment, sediment ponds, and contact water diversions;
- Development and implementation of a site-specific Selenium Management Plan at the HDA and Wolverine mine. Mitigations would include source control, water management, progressive reclamation and a trigger action response plan; and
- Monitoring the effects of mine effluent on the receiving environment, including for periphyton, benthic invertebrates and fish.

Conditions proposed by the EAO include:

- Condition #13: Water Quality Management Plan, including measures to address potential for bioaccumulation of selenium in fish;
- Condition #15: Country Foods Monitoring Plan, including additional fish tissue sampling; and
- Condition #9: Indigenous-Led Monitoring Program, to monitor water quality and fish.

The proposed conditions, which are intended to mitigate impacts to effects of the Amendment Activities,

including impacts to Treaty rights, were developed collaboratively with the Consultation Indigenous Nations in an iterative and transparent process, and were discussed in a number of meetings with each Indigenous nation. The potential impact of the Amendment on SFN's and WMFN's Treaty rights to fish is described in Section 7.4.2 of this Report. The potential impact of the Amendment on MLIB's Treaty right to fish is described in Section 7.5.2 of this Report. The potential impact of the Amendment on HRFN's Treaty right to fish is described in Section 7.6.2 of this Report.

7.3.2 HUNTING AND TRAPPING

The Consultation Indigenous Nations identified several wildlife species that are traditionally important food sources to their communities that may be impacted by the Amendment. These include ungulates, such as caribou, moose, elk, white-tailed and mule deer, mountain goats and sheep. Valued carnivores and omnivores include grizzly bear, black bear, wolf, lynx, wolverine, marten, fox, mink, coyote, beaver, muskrat, porcupine, rabbit, groundhog and squirrel. Harvested birds include geese, ducks, grouse and ptarmigan[68,69]. Species of interest to the Consultation Indigenous Nations that were identified through a review of secondary information were considered in the development of the key indicators for the wildlife and wildlife habitat VC in the AIR.

In the Application, Conuma predicted that the Amendment could negatively impact the exercise of the right to hunt or trap due to habitat loss, changes to wildlife movement and predator-prey dynamics, adverse effects to wildlife health or by presenting a direct mortality risk. For non-caribou wildlife, Conuma assessed that these effects would be low to moderate in magnitude, depending on the species affects, and generally irreversible. For caribou, Conuma assessed that the irreversible loss of high elevation habitat and increased mortality risk would cause significant effects to the threatened Quintette herd. Further details related to the potential biophysical effects to wildlife are described in Section 6.16 of this Report.

Beyond the potential biophysical effects to wildlife, Conuma recognized that the Consultation Indigenous Nations' right to hunt and trap may be impacted due to their community members' perceptions of decreased environmental quality, or because atmospheric disturbances (e.g., noise, air emissions) and/or changed visual aesthetics may reduce community members' peaceful enjoyment of their Treaty 8 rights to hunt and trap. The loss or reduction of Indigenous nations' ability to practice to the right to hunt and trap, whether biophysical effects, reduced access, or reduced preference for specific areas, would impact not only the right to hunt and trap, as well as the ability to have peaceful enjoyment while hunting, but also the spiritual and cultural connection to the land and cultural learning practices associated with hunting.

The following key factors have informed the EAO's assessment of potential impacts of the Amendment on the Consultation Indigenous Nations' rights to hunt and trap:

- The biophysical assessment of impacts to wildlife (Section 6.16 of this Report), as well as

[68] Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited, 2019.
[69] McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts, 2020.

discussions with, and information provided by the Consultation Indigenous Nations;

- The EAO assessed high-magnitude, irreversible residual effects to caribou, which Conuma assessed as significant due to the threatened status of the species;
- Conuma's initial proposal for offsetting (including the CMMP) and subsequent commitments, including Conuma's relinquishment of 292 ha of caribou habitat, an additional $300,000 of funding provided by the Province to support caribou habitat recovery, and Conuma's additional contribution of $745,000 towards caribou mitigation measures through an agreement with WMFN;
- The exercise of the right to hunt caribou on the part of MLIB, HRFN, WMFN and SFN has already been seriously impacted to the point that these Nations have voluntarily suspended exercising the right until caribou can again be sustainably hunted;
- The exercise of the right to hunt non-caribou wildlife on the part of MLIB, HRFN, WMFN and SFN has already been impacted to the point that community members routinely have to travel far afield to exercise the right to hunt;
- The Amendment could introduce a potential increase of recreational and/or subsistence hunting among non-Indigenous people who are drawn to the area as a result of the Amendment;
- The Consultation Indigenous Nations' peaceful enjoyment while exercising the right to hunt and trap may also be impacted by sensory and visual disturbances and altered visual aesthetics, which would begin at construction and persist through operations and post-closure;
- Conuma predicted the permanent loss of 160.0 ha of wetland and riparian ecosystems (combined) for which habitat offsetting is not proposed;
- The permitting process could require additional mitigation beyond that which is considered for the EAC, should it be issued; and
- Mitigation measures, including proposed conditions, as discussed below.

MONITORING, MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO HUNTING AND TRAPPING

Conuma has proposed mitigation measures to avoid and minimize potential effects to wildlife and wildlife habitat, and other concerns associated with hunting activities raised by the Consultation Indigenous Nations. Key monitoring and mitigation measures that address the issues described above included:

- Offsetting impacts to caribou habitat by way of financial contribution to fund restoration activities in tenure areas identified by FLNRORD as suitable habitat;
- Progressive reclamation of the HDA to include end land use objectives supporting wildlife and wildlife habitat, including caribou;
- Implementing measures to limit predator and human access along permanently deactivated linear features;
- Wildlife monitoring for a duration of ten years to understand use of wildlife habitat areas near the mine and in reclaimed areas, including for caribou; and
- Detailed engineering design of ditches, sediment ponds, embankments, and dams will consider need to reduce hazards to wildlife;

Conditions proposed by the EAO related to hunting and trapping include:

- Condition #14: Caribou Mitigation and Monitoring Plan: including caribou habitat mitigation measures and financial offsetting;
- Condition #6: Construction Environmental Management Plan: including mitigation measures for wildlife;
- Condition #16: End Land Use Plan: to describe end land use objectives and how these will be achieved.

The proposed conditions, which are intended to mitigate impacts to effects of the Amendment Activities, including impacts to Treaty rights, were developed collaboratively with the Consultation Indigenous Nations in an iterative and transparent process. The potential impact of the Amendment on SFN's and WMFN's Treaty 8 rights to hunt and trap is described in Section 7.4.3 of this Report. The potential impact of the Amendment on MLIB's Treaty 8 right to hunt and trap is described in Section 7.5.3 of this Report. The potential impact of the Amendment on HRFN's Treaty 8 right to hunt and trap is described in Section 7.6.3 of this Report.

7.3.3 GATHERING

The Consultation Indigenous Nations identified several traditionally important food and medicinal plants that may be impacted by the Amendment. These include, saskatoon berry, chokecherry, raspberry, crowberry, soapberry, blueberry, cranberry and huckleberry[70,71]. This list of plants, which are gathered for subsistence, to cure ailments, and to support general wellbeing, is not exhaustive as some community members prefer to protect the traditional knowledge associated with medicinal plants.

In the Application, Conuma indicated that the Amendment could adversely affect plants of value to Indigenous nations though direct loss of vegetation (i.e., removal due to land clearing), as well as through indirect changes that could adversely affect vegetation (e.g., changes to the availability of suitable substrate, water, light, and nutrient, changes to water quality, changes in forest succession stage, dust deposition on plants and soil, and increased prevalence of invasive plants). Changes in traffic, noise, and air quality in proximity to the mine sites and Coal Haul Road may also introduce contaminants to the vegetation, and negatively impact community members' ability to access gathering sites and have peaceful enjoyment while gathering. Competition from non-Indigenous gatherers could diminish community members' experience of exercising traditional gathering activities.

Conuma also acknowledged that these direct and indirect effects, or the perception that these effects have taken place, could result in community members' avoidance of specific gathering sites in the vicinity of the Amendment sites. The loss or reduction of the use of traditional gathering areas, whether through direct loss, reduced access or reduced preference for the area, would impact not only the ability to gather plants for food and/or medicine and the ability to have peaceful enjoyment while gathering, but also the

[70] Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited, 2019.
[71] McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts, 2020.

spiritual and cultural connection to the land and cultural learning practices associated with the traditional gathering activities.

The following key factors have informed the EAO's assessment of potential impacts of the Amendment on the Consultation Indigenous Nations' gathering practices:

- The biophysical assessment of impacts to vegetation (Section 6.4) and soils (Section 6.15), as well as discussions with, and information provided by the Consultation Indigenous Nations;
- The EAO assessed direct residual effects due to vegetation loss (including loss of habitat that supports vegetation (e.g., wetlands) and potential loss of species of cultural significance), as well as indirect effects to vegetation (including changes in hydrology and surface drainage, increase in dust, and change in abiotic conditions);
- Conuma expressed intent to close parts Coal Haul Road to public access, which could limit community members' access to gathering sites. Conuma noted that it may coordinate with Indigenous nations to provide access when requested. Conuma did not, however, assess inhalation or ingestion health risks due to coal dust emission and deposition in proximity to the closed portion of the Coal Haul Road because it was assumed that there would not be human receptors in the area;
- Conuma indicated that traffic along the Coal Haul Road would be such that a truck would pass any particular point roughly every 90 seconds. This could serve as a deterrent to some community members wishing to access gathering locations proximate to, or via the Coal Haul Road;
- The permitting process could require additional mitigation beyond that which is considered for the EAC, should it be is issued; and
- Mitigation measures, including proposed conditions, as discussed below.

MONITORING, MITIGATIONS AND ACCOMMODATIONS OF IMPACTS TO GATHERING

Conuma has proposed mitigation measures to avoid and minimize potential effects vegetation, and other concerns associated with gathering activities raised by the Consultation Indigenous Nations. Key monitoring and mitigation measures that address the issues described above included:

- Developing a Vegetation Management Plan, Fugitive Dust Management Plan, and Invasive Species Management Plan;
- Including black huckleberry shrubs, where suitable, in reclamation prescriptions, with a goal of creating a net gain of 71.9 ha of highly productive huckleberry habitat over the long-term (i.e., > 10 years beyond the life of the Project);
- Incorporating traditional use plants, where appropriate and technically feasible, in reclamation of temporary construction areas.

Conditions proposed by the EAO related to gathering include:

- Condition #6: Construction Environmental Management Plan, including mitigation measures to mitigate effects to wildlife and vegetation during construction;

- Condition #7: Operations Environmental Management Plan, including mitigation measures to mitigate effects to wildlife and vegetation during operations;
- Condition #16: End Land Use Plan, to require Conuma to develop a plan for vegetation and ecosystems following reclamation, in consultation with Indigenous nations; and
- Condition #10: Air Quality and Emissions Monitoring Plan, including mitigation measures to monitor and reduce CACs for non-threshold contaminants.

The proposed conditions, which are intended to mitigate impacts to effects of the Amendment Activities, including impacts to Treaty rights, were developed collaboratively with the Consultation Indigenous Nations in an iterative and transparent process. The potential impact of the Amendment on SFN's and WMFN's gathering practices is described in Section 7.4.4 of this Report. The potential impact of the Amendment on MLIB's gathering practices is described in Section 7.5.4 of this Report. The potential impact of the Amendment on HRFN's gathering practices is described in Section 7.6.4 of this Report.

7.4 Impacts to Saulteau First Nations and West Moberly First Nations' Treaty Rights and Interests

As part of the EAO's collaboration with WMFN and SFN, working jointly as the FNITR, the FNITR provided a report outlining the culturally-grounded assessment of the Amendment's impact on WMFN and SFN's Treaty rights and interests, entitled *Saulteau First Nations & West Moberly First Nations Preliminary Rights Impact Assessment for the Wolverine Hermann Mine* (2020, 'RIA')[72]. In providing the RIA, the FNITR specified that because of schedule and pandemic-related constraints, the RIA is preliminary and must be completed with community input during the permitting process. In recognition of the RIA, and in acknowledgement that additional information could be forthcoming at a later date, the EAO collaborated with the FNITR to propose Condition #18, which requires that Conuma describe how information provided in the RIA will be considered in the development of any plans, programs, or other documents required by the Amendment.

Although the RIA yet remains to be completed, it provides a rich understanding from SFN and WMFN, that includes:

- A background on SFN and WMFN communities and the territory encompassed by Treaty 8;
- A description of, and rationale for the FNITR's culturally-grounded approach to the RIA;
- Descriptions of key values related to Treaty rights and a community assessment of impacts to those each of those rights, including:
    - Water and fishing;
    - Hunting and trapping;
    - Food plants and medicines;

[72] Available online: https://www.projects.eao.gov.bc.ca/api/public/document/60188a8eab4f930020f76453/download/SFN_WMFN%20Rights%20IA_WH%20Project_FINAL_updated%2018Jan21.pdf

  - Cultural continuity; and
  - Independence and community wellness;
- In communicating the assessments of impacts to each of the rights, the RIA included consideration of:
  - Past and current conditions;
  - Community perceptions of impacts to Treaty rights and interests;
  - Western science information;
  - Degree of impact on the right;
- A discussion of the FNITR's proposed approach for optimizing the exercise of Treaty 8 rights while providing the Crown with the highest compatible opportunity for land and resource use on Crown lands. In discussing the concept of optimization, section 6.1 of RIA specifies that WMFN and SFN: "… are currently engaged in discussions with B.C, about these Treaty rights constituting a "beneficial interest" in Crown lands, and about "peaceful enjoyment", which refers to the degree which the Crown, and these others, in their use of Crown lands and resources, ought to show respect for the right of Treaty 8 peoples not to be unreasonably interfered with in their exercise of governance over their way-of-life, and their interactions with "all their relations". These discussions also prompted exploration of "optimization", as a respectful approach to balancing competing rights and interests which requires the highest level of protection for the exercise of Treaty rights, while providing the Crown with the highest compatible opportunity to support settlement and resource development within Treaty 8 lands which Treaty 8 peoples agreed to share with others."

In the RIA, WMFN and SFN undertook a territory-wide analysis to understand the current context of their ability to exercise their Treaty rights and interests. The analysis concluded that WMFN's and SFN's territories have been the subject of substantial historical development and alteration that have resulted in adverse environmental effects and impacts on Treaty rights and interests.

The RIA incorporates information that was previously provided to the EAO in February 2020 by the FNITR in the *Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited* (2019; 'SFN and WMFN Knowledge and Use Study'). In the RIA, the SFN and WMFN Knowledge and Use Study, as well as all other EA-related engagement on the Amendment, SFN and WMFN jointly provided traditional use information, technical analysis, comments and concerns that were raised in meetings, letters and Working Group comments. The EAO considered all of these sources in assessing the potential impacts of the Amendment on WMFN and SFN's Treaty rights, and because the information was provided jointly between SFN and WMFN, the EAO has assessed impacts to SFN and WMFN's Treaty rights jointly as well. In presenting the EAO's assessment of potential impacts to SFN and WMFN's Treaty rights and interests, the EAO sought to clearly and fairly articulate the views of the FNITR as a complement to, but not a replacement of, the information provided in the FNITR's RIA[73], which clearly sets out the FNITR's conclusions.

[73] Available online:

Regarding collaboration with the Province during permitting and life of mine, the EAO provided a letter to the FNITR dated February 1, 2021[74] that outlined a series of commitments made by EMLI and ENV, including a list of specific issues raised during the EA to be carried forward into a collaborative permitting process. The EAO notes that the RIA identified some issues raised by the FNITR that were most likely to be addressed during the technical permitting review, which would occur post-EA decision.

Overall, the EAO agrees that the EA process is just one step in the Crown's regulatory review of the Amendment, and that the FNITR may have additional requirements to be fulfilled by the Province or Conuma in order to conclude on whether SFN and WMFN support the Amendment. The EAO's conclusions on adequacy of consultation and accommodation pertain only to considerations related to the decision of whether or not to issue an EA with the proposed conditions.

The SFN and WMFN Knowledge and Use Study provided additional information that described the area within which the HDA is situated as linked to historic and contemporary use on the part of SFN and WMFN in the exercise of Treaty rights, as wells as gathering, water use and cultural continuity activities. The area within five km of the HDA was identified to encompass the following specific culturally important sites:

- Hunting, fishing, trapping, gathering (berries and medicinal plants) and camping sites, including specific large and small game kill locations, fish catch sites, and gathering sites;
- A site of spiritual significance;
- Valued habitat for food and medicine plants;
- A traditional place name;
- Valued wildlife habitat for grizzly bears, black bears, chicken, grouse and rabbits, and a mineral lick used by ungulates;
- Important fresh water sources;
- Permanent and temporary habitation sites; and
- Transportation routes, including trails frequently used by community members for hunting, and water routes used for fishing and travelling.[75]

7.4.1 ADDITIONAL KEY ISSUES RAISED BY THE FNITR

In addition to sharing each of the key concerns described in the Section 7.2 the FNITR expressed the following additional concerns:

- **Lack of trust in the current provincial regulatory structure**: The FNITR noted frustration with the inability to identify the requirements to protect Treaty rights during the EA process as some details

https://projects.eao.gov.bc.ca/api/public/document/60188a8eab4f930020f76453/download/SFN_WMFN%20Rights%20IA_WH%20Project_FINAL_updated%2018Jan21.pdf

[74] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019bdfe2090f10020b5315f/download/Wolverine%20Combined.pdf

[75] Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited, 2019.

(e.g. the current dynamics of selenium in M20 Creek, the influence of other selenium inputs to cumulative impacts, the operational performance capabilities of the water treatment system, appropriate discharge standards for fishery protection) are assessed during the permitting process which, will occur after the EA Amendment decision.

- **Impacts to individual and community wellness**: SFN and WMFN members describe any infringement on community members' ability to exercise their Treaty rights to hunt, trap, fish, and gather in accordance with their traditional seasonal rounds as a direct impact to many aspects of community wellness. For example, negative impacts on the right to hunt reduces opportunities for food sharing, which community members report is a core teaching that supports community cohesiveness and ensures that elders and other members who cannot hunt are able to access culturally important foods. Impacts to hunting can also reduce the ability to transmit cultural knowledge of the land, food preparation practices and other cultural protocols;
- **Reduced access to clean and safe drinking water**: Community members collect drinking water from a spring, located within 25 km of the Hermann site, as well as at other areas within the region. SFN and WMFN community members expressed concern that activities associated with the Amendment could damage or contaminate these springs. Community members may also opt to avoid the springs due to concerns that the springs may have become contaminated due to Project activities;
- **Food security:** Cumulative development pressures within SFN and WMFN's traditional territories has negatively impacted wild food resources and the ability to exercise Treaty rights to hunt, trap, fish and gather. As a result, community members' diets have increasingly shifted away from a culturally appropriate diet of wild foods to one more based on commercially available foods, which is commonly linked to negative health outcomes. WMFN noted, for example, that just 16 percent of its community members' nutritional needs are met through traditional harvesting practices. In its assessment, Conuma noted that the Amendment is expected to adversely change access to, and availability of country foods through changes in land use and reduced time to exercise Treaty rights for those community members who may gain employment at the Project sites. Conuma also acknowledged community members may opt to forego harvesting, gathering and consumption of country foods in some areas as a result of concerns related to safety, contamination, and sensory disturbances resulting from the Amendment;
- **Cultural, social and health importance of harvesting country foods:** The FNITR noted that wild meats including moose and elk are preferred over store-bought food because it is healthier, lower cost, and more culturally appropriate. Hunting, in addition to being an important activity to provide sustenance, plays a key role in supporting cultural transmission (e.g., sharing cultural protocols and sustainability practices), supporting community members (e.g., sharing the harvest with those who are unable to hunt), and supporting cultural practices (e.g., traditional foods are important in ceremonies). The FNITR indicated that hunting and sharing the harvest is an important and respected role for younger people to play in their communities and ensures that people who are unable to hunt can still have access to culturally important foods.
- **Traffic safety:** The high volume of traffic along Wolverine Road could pose a safety hazard and restrict the peaceful enjoyment of Treaty rights, thereby deterring community members from areas previously used for cultural practice;

- **Permanent loss of wetland habitat:** The FNITR asserted that estimated irreversible loss of 7.9 ha of wetland ecosystem should be offset. Conuma indicated that the Federal Policy on Wetland Conservation requires offsetting only for lands under federal jurisdiction or management, which is not the case for the HDA. As such, Conuma does not intend to offset wetland loss;
- **Economic effects:** The FNITR noted that community members who gain employment through guiding or outfitting could experience adverse effects to their livelihoods as a result of the Amendment; and
- **Reclamation plan:** The FNITR requested further engagement from Conuma in the development of the Reclamation Plan, as well as the Food, Plant & Medicine Values Work Plan.

The issues raised by the FNITR informed the EAO's assessment of potential adverse effects of the Amendment to a number of valued components; each of which are assessed in individual sections of this Report. Each section of the Report includes an assessment of the biophysical, social, economic, health or heritage effects, concerns raised by Indigenous Nations and working group members, Conuma's responses to those concerns, the EAO's assessment and conclusions, and conditions proposed by the EAO to address concerns. The following sections of the Report and conditions address the issues raised above:

- Concerns related to drinking water are addressed in surface water quality (Section 6.12) and groundwater quantity and quality (Section 6.10). Relevant conditions proposed by the EAO include:
    - Condition #9: Indigenous-Led Monitoring Program, which would include a requirement for Indigenous nations to be involved in the monitoring of groundwater quality and quantity;
    - Condition #11: Aquatic Resources Monitoring Plan, which would include a requirement for monitoring groundwater and surface water chemistry;
    - Condition #12: Water Treatment Technology, which requires Conuma to use a SeHAWK water treatment system; and
    - Condition #13: Water Quality Management Plan, which requires Conuma to use the water treatments system effectively and monitor water quality.
- Concerns related to food security and harvesting country foods are addressed in fish and fish habitat (Section 6.14), wildlife (Section 6.16), vegetation (Section 6.4) and human health (Section 6.17). Relevant conditions include:
    - Condition #9: Indigenous-Led Monitoring Program, which requires Conuma to fund Indigenous monitors to participate in monitoring effects to country foods, as well as effects to other media;
    - Condition #11: Aquatic Resources Monitoring Plan, including measures to address potential for bioaccumulation of selenium in fish;
    - Condition #14: Caribou Mitigation and Monitoring Plan, which includes provisions to mitigate and offset effects to caribou; and
    - Condition #15: Country Foods Monitoring Plan, including additional fish tissue sampling.
- Concerns related to wetland habitat are addressed in vegetation (Section 6.4). Relevant conditions include:
    - Condition #15: Country Foods Monitoring Plan, including mitigation measures to protect wetlands and plants of cultural significance; and

- Concerns related to reclamation are addressed in reclamation and closure (Section 6.20). The EAO proposes the following condition to clarify expectations related to reclamation:
    - Condition #9: End Land Use Plan, to require Conuma to develop a plan for vegetation and ecosystems following reclamation, in consultation with Indigenous nations.
- Additionally, the EAO proposes Condition #18: Rights Impact Assessment, which would require that Conuma describe how information provided in the RIA is considered in the development of any plans, programs, or other documents required by the Amendment.

In the course of discussions between the FNITR, the EAO and permitting agencies, the FNITR requested a letter from the EAO detailing the issues that would require further information, discussion or review during the upcoming joint *Mines Act/Environmental Management Act* permitting process, should the Amendment be granted. In response, the EAO provided a letter and an accompanying table to the FNITR[76] that outlined these issues, and included commitments made by EMLI and ENV to:

- Collaborate with the Treaty 8 First Nations (including FNITR) on the review of the following information (to be provided by Conuma) and the development of related draft permit conditions:
    - A selenium management plan, including the consideration of Treaty right's indicators as proposed by the Indigenous nations;
    - Site specific selenium bio-accumulation models for, but not limited to, M20 Creek, Perry Creek and Wolverine River, that include consideration of the influence of site-specific selenium speciation on the bioaccumulation;
    - A trigger response plan, including the consideration of Treaty Right's indicators as proposed by the First Nations; and
    - The regulation of the water treatment system (SeHAWK) operational effectiveness and efficiency.
- Collaborate with the FNITR to consider the outcomes of the forthcoming, final RIA in the review of the permit applications, the development of draft permit conditions, and in the review of any documents required by Conuma to comply with EA Certificate and permit conditions.

SFN provided a letter to the EAO on December 22, 2020 indicating that SFN is not opposed to the Amendment and looks forward to further discussions and collaboration as the project proceeds. WMFN provided a letter on January 22, 2021[77], indicating that Conuma's additional financial contribution for reclaiming, restoring and otherwise caribou habitat would, in WMFN's view, help offset some of the Amendment's impacts on caribou habitat. As such, WMFN indicated that it would not seek additional caribou offsetting funds but remains eager to work with Conuma and the Province to identify additional funds and commitments to restore and protect caribou habitat throughout the region.

[76] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019bdfe2090f10020b5315f/download/Wolverine%20Combined.pdf
[77] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019ba732090f10020b5303b/download/2021%2001%2022%20Ltr%20THT%20to%20EAO%20re%20Hermann%20Caribou%20Offsets.pdf

7.4.2 FISHING

Fishing is an historically important activity to SFN and WMFN and remains a core part of life for community members. Fishing in the traditionally important places where generations of SFN and WMFN have accumulated a deep body of knowledge over generations has importance that goes beyond food security, providing opportunities for knowledge transfer, social and cultural connectivity, which are integral to cultural continuity[78].

The biophysical assessments of impacts to fish and water resources are described in Sections 6.13 (Aquatic Resources), Section 6.14 (Fish and Fish Habitat), Section 6.11 (Surface Water Quantity) and Section 6.12 (Surface Water Quality) of this Report.

The FNITR stated that the Amendment would be estimated to result in a negative impact on WMFN and SFN's Treaty right to fish, noting that this impact would occur in the context of a baseline in which the Treaty right to fish is already negatively impacted. A comprehensive description of the FNITR's understanding of potential impacts to WFMN and SFN's Treaty right to fish is included in Section 5.1 of the RIA[79]. The community members have, through this RIA, identified a negative impact of this Amendment on already negatively-impacted existing conditions.

In assessing the Amendment's potential impact to WMFN and SFN's Treaty right to fish, the EAO considered the available information, including the discussion of the biophysical effects to fish and impacts to the Treaty right to fish, proposed mitigations, and accommodations as described in Section 7.3.1. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with the FNITR. On balance, the EAO concluded that the Amendment would be expected to result in a moderate impact on WMFN and SFN's Treaty right to fish.

7.4.3 HUNTING AND TRAPPING

During Application Review, the FNITR identified a number of issues and concerns related to the exercise of SFN and WMFN's Treaty right to hunt and trap, which are described in previous sections of this Report. The FNITR identified additional potential impacts to Treaty right to hunt and trap, which included:

- A potential increase of non-Indigenous hunting and recreation access;
- Diminished wildlife heath due to airborne and waterborne contaminants, including those contaminants that may bioaccumulate up the food chain; and
- Severely restricted wildlife movement patterns in the vicinity of the HDA and adjacent to the Coal

[78] Saulteau First Nations and West Moberly First Nations Knowledge and Use Study for the Hermann Mine Project Proposed by Conuma Coal Resources Limited, 2019.
[79] Available online: https://www.projects.eao.gov.bc.ca/api/public/document/60188a8eab4f930020f76453/download/SFN_WMFN%20Rights%20IA_WH%20Project_FINAL_updated%2018Jan21.pdf

Haul Road, where a coal haul truck would pass any given point along the road every 90 seconds.

The loss or reduction of the use area in the vicinity of the Wolverine-Hermann sites for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Treaty rights, but also the spiritual and cultural connection to the land and cultural learning practices associated with the exercise of these Treaty rights.

The biophysical assessments of impacts to wildlife are described in Section 6.16 of this Report.

The FNITR stated that the Amendment would be estimated to result in a negative impact on WMFN and SFN's Treaty right to hunt and trap, noting that this impact would occur in the context of a baseline in which the Treaty right to hunt and trap is already negatively impacted. A comprehensive description of the FNITR's understanding of potential impacts to WFMN and SFN's Treaty right to hunt and trap is included in Section 5.2 of the RIA[80]. The community members have, through this RIA, identified a negative impact of this Amendment on already negatively-impacted existing conditions.

In assessing the Amendment's potential impact to WMFN and SFN's Treaty right to hunt and trap, the EAO considered the available information, including the discussion of the biophysical effects to wildlife and impacts to the Treaty right to hunt and trap, proposed mitigations, and accommodations as described in Section 7.3.2. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with the FNITR. On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on WMFN and SFN's Treaty right to hunt and trap non-caribou wildlife and a serious impact on WMFN and SFN's Treaty right to hunt caribou.

SFN provided a letter to the EAO on December 22, 2020 indicating that SFN is not opposed to the Amendment and looks forward to further discussions and collaboration as the project proceeds. WMFN provided a letter on January 22, 2021 indicating that Conuma's additional financial contribution for reclaiming, restoring and otherwise caribou habitat would, in WMFN's view, help offset some of the Amendment's impacts on caribou habitat[81]. As such, WMFN indicated that it would not seek additional caribou offsetting funds from Conuma for the project but remains eager to work with Conuma and the Province to identify additional funds and commitments to restore and protect caribou habitat throughout the region.

7.4.4 GATHERING

[80] Available online: https://www.projects.eao.gov.bc.ca/api/public/document/60188a8eab4f930020f76453/download/SFN_WMFN%20Rights%20IA_WH%20Project_FINAL_updated%2018Jan21.pdf

[81] Available online: https://projects.eao.gov.bc.ca/api/public/document/6019ba732090f10020b5303b/download/2021%2001%2022%20Ltr%20THT%20to%20EAO%20re%20Hermann%20Caribou%20Offsets.pdf

The biophysical assessments of impacts to vegetation are described in Section 6.4 of this Report.

The FNITR stated that the Amendment would be estimated to result in a negative impact on WMFN and SFN's traditional gathering of food and medicine plants, noting that this impact would occur in the context of a baseline in which gathering practices are already negatively impacted. A comprehensive description of the FNITR's understanding of potential impacts to WFMN and SFN's traditional gathering of food and medicine plants is included in Section 5.2 of the RIA[82]. The community members have, through this RIA, identified a negative impact of this Amendment on already negatively-impacted existing conditions.

In assessing the Amendment's potential impact to WMFN and SFN's traditional gathering of food and medicine plants, the EAO considered the available information, including the discussion of the biophysical effects to vegetation and impacts to gathering, proposed mitigations, and accommodations as described in Section 7.3.3. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with the FNITR.

On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on WMFN and SFN's traditional gathering of food and medicine plants.

7.4.5 CULTURAL CONTINUITY

The RIA describes cultural continuity as being linked to cultural identity and the connection to the land stemming from the collective history inhabiting the land that ancestors inhabited and travelled for thousands of years. In this way, the ability to access and utilize the land in order to transmit knowledge and share experiences between generations is inextricably linked with the persistence of WMFN and SFN culture.

The RIA specifies that SFN and WMFN community members assess that cultural continuity has been negatively impacted by cumulative effects and notes that the Amendment would cause further negative impacts to WMFN and SFN cultural continuity.

7.4.6 INDEPENDENCE AND COMMUNITY WELLNESS

The RIA provides a rich description of independence and community wellness from an Indigenous worldview. The RIA notes that the cultural frameworks for WMFN and SFN are grounded in worldviews that differ from Euro-Canadian culture. These worldviews hold that community members' ability to experience wellness and "live the good life" depends upon their adherence to a set of principles (referred to as "Wahkotowin") in their relationship to the interconnected world of the individual, family, community, Nation, environment, and the cosmos/spirit world. This cultural framework informs and

[82]Available online: https://www.projects.eao.gov.bc.ca/api/public/document/60188a8eab4f930020f76453/download/SFN_WMFN%20Rights%20IA_WH%20Project_FINAL_updated%2018Jan21.pdf

guides both individual, and communal, decision-making about stewardship and use of Crown lands in accordance with their way-of-life, and the need for good relations with this interconnected world. SFN and WMFN elders advise that the path toward self-determination, sovereignty, and reconciliation with the Crown and others sharing the use of Treaty lands requires establishing "space" for asserting Wahkotowin.

The RIA specifies that cultural SFN and WMFN community members assess the independence and community wellness has been negatively impacted by cumulative effect and notes that the Amendment would cause further negative impacts to WMFN and SFN independence and community wellness.

The RIA notes that SFN and WMFN members expressed concern that the impacts from the Amendment would add to, and compound, the existing negative impacts to SFN and WMFN members' practice of culture and way of life.

7.5 Impacts to McLeod Lake Indian Band's Treaty Rights and Interests

This section was informed largely by information provided by MLIB in a knowledge and use study titled *McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts* (2020, 'MLIB Evaluation of Impacts Study'), which was provided to the EAO in November 2020.

MLIB is an adherent to Treaty 8 under the McLeod Lake Indian Band Treaty No. 8 Adhesion and Settlement Agreement (2000) and has Treaty 8 rights to hunt, fish and trap and the incidental activities associated with carrying out these rights within MLIB's Claimed Traditional Territory, and these rights are recognized and affirmed under Section 35 of the *Constitution Act*, 1982. During the EA, MLIB expressed their view that assessment of impacts to its rights should include impacts to both MLIB's Treaty rights and Aboriginal rights and interests within its territory, including MLIB's Aboriginal rights recognized under the United Nations Declaration on the Rights of Indigenous Peoples. MLIB indicated that it has approached consultation with the Crown on the Amendment on that basis.

The MLIB Evaluation of Impacts Study describes the area within which the HDA is situated as linked to MLIB's historic and contemporary exercise of Treaty rights, water use, gathering of food and medicine plants, and cultural continuity activities. The area within five km of the HDA was identified to encompass the following specific culturally important sites:

- Hunting, trapping, fishing, plant gathering, and camping sites, including specific large and small game kill locations, fish catch sites, and berry and medicine collection sites;
- A historic trail used by MLIB members to travel from McLeod Lake to Alberta;
- Fresh water sources, including a drinking water collection site;
- A trail used to access food gathering areas; and
- A burial site, traditional place name, and sites featuring archaeological resources[83].

From August 2019 through October 2020, the EAO and MMO worked with MLIB to develop a set of shared

[83] McLeod Lake Indian Band and the Proposed Hermann Mine Project: An Evaluation of Impacts, 2020.

principles and workplan to facilitate collaboration related to the EA and permitting processes. While *The Shared Principles and Collaborative Workplan for the Environmental Assessment and Permitting Review of the Wolverine-Hermann Project Collaboration Workplan* was not finalized until October 2020, the parties have worked to implement the spirit of the workplan throughout this regulatory review process.

7.5.1 ADDITIONAL KEY ISSUES RAISED BY MCLEOD LAKE INDIAN BAND

In addition to sharing each of the key concerns described in Section 7.2, MLIB expressed the following additional concerns.

- **Delayed contaminant attenuation at Wolverine**: Conuma's assessment of potential effects failed to account for the reclamation that would have taken place at the Wolverine site were it not for the addition of the Hermann pit. Processing coal from the HDA at the Wolverine mine would prolong operation at Wolverine for an estimated additional seven years, thereby delaying reclamation of the Wolverine mine during the period of continued operations. The reclamation activities at Wolverine that would have been completed were it not for the addition of the HDA would have been expected to result in a substantial reduction in contaminant loadings from the Wolverine mine. Conuma's assessment of potential effects at the Amendment failed to account for this loss of contaminant attenuation;
- **Unassessed effects to wildlife**: MLIB stated that the Wildlife Management Plan (WMP) provided for the purposes of the EA was inadequate to allow for the assessment of potential effects to wildlife, including habitat fragmentation. Conuma indicated that this would be updated at permitting. Conuma noted a number of Project-specific measures to directly and indirectly address local and larger scale habitat fragmentation effect, including adherence to riparian setbacks; creation of wildlife crossing points along open ditches; use of existing clearings, trails, and roads; consulting with the Province on amphibian dispersal routes; and limiting predator and human access along permanently deactivated linear features. Conuma's financial contribution for linear feature removal as part of the Provincial Caribou Recovery Program will reduce habitat fragmentation for caribou and other wildlife;
- **Permanent loss of wetland and riparian ecosystems:** MLIB noted additional mitigation is warranted to mitigate the projected permanent and irreversible loss of 160 ha of wetland and riparian ecosystems. Conuma indicated this would be updated at permitting as part of a Vegetation Management Plan;
- **Contamination from coal dust:** MLIB noted that the release of coal dust and chemicals in the surrounding environment may reduce the health of fish, plants, wildlife, and the people who exercise Treaty rights in the vicinity of the Project site or who use these resources for food and medicine;
- **Food security:** MLIB noted that continued development on a landscape already impacted by the cumulative impacts of previous industrial development presents a risk to the food security of future generations, and the environmental livelihood of current and future MLIB members;
- **Cultural continuity:** Reduced access to land and harvested resources would lead to a negative impact on the ability of MLIB members to transmit traditional knowledge and skills to future

generations. Further, transmitting this cultural knowledge provides an opportunity to share other important cultural knowledge such as ancestry, values, ways of conducting oneself, and a set of stewardship laws and principles; and

- **Loss of archaeological materials:** MLIB expressed concern that Amendment-related activities would cause the loss of valued archaeological materials which help link present day generations to their ancestors.

The issues raised by MLIB informed the EAO's assessment of potential adverse effects of the Amendment to a number of valued components; each of which are assessed in individual sections of this Report. Each section of the Report includes an assessment of the biophysical, social, economic, health or heritage effects, concerns raised by Indigenous Nations and working group members, Conuma's responses to those concerns, the EAO's assessment and conclusions, and conditions proposed by the EAO to address concerns. The following sections of the Report and conditions address the issues raised above:

- Concerns related to the assessment of effects to wildlife are addressed in wildlife (Section 6.16). Relevant conditions include:
    - Condition #9: Indigenous-Led Monitoring Program, which would require that Conuma fund Indigenous monitors to be involved in monitoring for wildlife effects (as well as other effects, including air quality, fish, country foods, water quality and vegetation);
- Concerns related to wetland and riparian ecosystems are addressed in vegetation (Section 6.4). Relevant conditions include:
    - Condition #6: Construction Environmental Management Plan, including mitigation measures to protect vegetation during construction;
    - Condition #7: Operations Environmental Management Plan, including mitigation measures to protect vegetation during operations;
- Concerns related to coal dust contamination and food security are addressed in air quality (Section 6.9), vegetation (Section 6.4), wildlife (Section 6.16), and human health (Section 6.17). Relevant conditions include:
    - Condition #9: Indigenous-Led Monitoring Program, which would require that Conuma fund Indigenous monitors to be involved in monitoring for effects to air quality, wildlife, fish, country foods, water quality and vegetation;
    - Condition #10: Air Quality and Emissions Management Plan, which would require that Conuma develop a mitigation and management plan for air quality and emissions in consultation with Indigenous nations; and
    - Condition #15: Country Foods Monitoring Plan, which would require that Conuma monitor and sample air, soil, vegetation, fish tissue and small mammal tissue.
- Concerns related to archaeological materials are addressed in cultural heritage (Section 6.5). Relevant mitigations include:
    - Implementing the Archaeological Chance Finds Protocol (provided in Appendix 4.10-E of the Amendment Application) to protect any cultural features or sites found during construction;
    - Protecting any cultural heritage sites identified using flagging or fencing; and
    - Educating staff and contractors about the importance of cultural heritages sites.

7.5.2 FISHING

The biophysical assessments of impacts to fish and water resources are described in Sections 6.13 (Aquatic Resources), Section 6.14 (Fish and Fish Habitat), Section 6.11 (Surface Water Quantity) and Section 6.12 (Surface Water Quality) of this Report.

MLIB has stated that the Amendment would have a potentially significant adverse impact on MLIB's Treaty right to fish. In assessing the Amendment's potential impact to MLIB's Treaty right to fish, the EAO considered the available information, including the discussion of the biophysical effects to fish and impacts to the Treaty 8 right to fish, proposed mitigations, and accommodations as described in Section 7.3.1. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with MLIB. On balance, the EAO concluded that the Amendment would be expected to result in a moderate impact on MLIB's Treaty right to fish.

7.5.3 HUNTING AND TRAPPING

During Application Review, MLIB identified a number of issues and concerns related to the exercise of MLIB's Treaty 8 right to hunt and trap, which are described in previous sections of this Report. MLIB identified additional potential impacts to MLIB's Treaty 8 right to hunt and trap, which included:

- Diminished wildlife heath due to airborne and waterborne contaminants, including those contaminants that may bioaccumulate up the food chain;
- Severely restricted wildlife movement patterns in the vicinity of the HDA and adjacent to the Coal Haul Road. MLIB specified that Conuma's expectation that a coal haul truck would pass any given point along the road every 90 seconds would serve as a barrier to wildlife crossing and a potential mortality risk to wildlife that risk crossing the road;
- Project-related traffic along the Coal Haul Road presenting a safety risk to individuals seeking to use portions of the Coal Haul Road to access hunting sites;
- Displacement of wildlife due to noise from Amendment activities; and Reclamation efforts may not be sufficient to ensure that habitat sufficient for sustaining caribou is restored. For example, MLIB notes that lichen, which is a vital food source for caribou, grows very slowly and has been very slow to re-establish at a nearby reclaimed mine; and
- The loss or reduction of the use area in the vicinity of the Wolverine-Hermann sites for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Treaty rights, but also spiritual and cultural values, cultural learning practices associated with the exercise of these Treaty rights.

The biophysical assessments of impacts to wildlife are described in Section 6.16 of this Report.

MLIB has stated that the Amendment would have a potentially significant adverse impact on MLIB's Treaty

right to hunt and trap. In assessing the Amendment's potential impact to these rights, the EAO considered the available information, including the discussion of the biophysical effects to wildlife and impacts to the Treaty 8 right to hunt and trap, proposed mitigations, and accommodations as described in Section 7.3.2. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with MLIB. On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on MLIB's Treaty right to hunt and trap non-caribou wildlife and a serious impact on MLIB's Treaty right to hunt caribou.

7.5.4 GATHERING

During Application Review, MLIB identified a number of issues and concerns related to the exercise of MLIB's gathering of food and medicine plants, which are described in previous sections of this Report. MLIB identified additional potential impacts to gathering, which included:

- Concern that the potency of medicines harvested in the vicinity of the Amendment sites would have reduced potency due to contamination from Amendment activities;
- The Amendment area features medicinal plants that grow exclusively in wetland environments. Conuma noted that 7.9 ha of wetland ecosystem would be permanently lost as a result of the Amendment; and
- Potential for the introduction of invasive species that would displace food and medicine plants.

The biophysical assessments of impacts to vegetation are described in Section 6.4 of this Report. Impacts to MLIB's traditional gathering of food and medicine plants, proposed mitigations, conditions, and accommodations are described in Section 7.3.3.

MLIB has stated that the Amendment would have a potentially significant adverse impact on MLIB's traditional gathering activities. In assessing the Amendment's potential impact to MLIB's traditional gathering of food and medicine plants, the EAO considered the available information, including the discussion of the biophysical effects to vegetation and impacts to gathering, proposed mitigations, and accommodations as described in Section 7.3.3. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with MLIB. On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on MLIB's traditional gathering of food and medicine plants.

7.6 Impacts to Halfway River First Nation's Treaty Rights and Interests

The Amendment lies within the geographic area defined in the Regional Coal Agreement established between HRFN and the Province.

7.6.1 ADDITIONAL KEY ISSUES RAISED BY HALFWAY RIVER FIRST NATIONS

In addition to sharing each of the key concerns described in the Section 7.2, HRFN expressed the following additional concerns.

- **Potential effects to moose:** The data used by Conuma to assess potential impacts to moose overstates the strength of moose populations by inappropriately incorporating data from agricultural zones. HRFN notes that moose populations are declining outside of agricultural zones. By including data from agricultural zones in the assessment, Conuma's application underestimated potential effects to moose, which has implications to Treaty 8 Nations' right to hunt this culturally preferred game;
- **Effects to wildlife and fish health:** HRFN questioned Conuma's methodology for assessing effects to wildlife health by drawing from the assessment of effects on human health, and took issue with Conuma's failure to account for the time needed to restore site conditions to those that would be suitable for wildlife. Similarly, HRFN suggested that Conuma's data collection in assessing effects to fish failed to collect a representative sample;
- **End land use objectives:** HRFN noted that Conuma has not been entirely consistent in expressing end land use objectives for reclamation, noting that different sources cite objectives for achieving exiting, pre-development conditions, suitability for a diversity of wildlife, and long-term commercial forestry. In cases where Conuma intends to achieve more than one end land use in a specific area, HRFN asked that Conuma indicate how the land uses are compatible and connect to reclamation plans. An End Land Use Plan is proposed as an EAO condition, to be developed in consultation with Indigenous nations;
- **Progressive reclamation:** HRFN requested that Conuma commit to yearly progressive reclamation and provided suggestions to assist Conuma with managing the reclamation plans to better ensure successful reclamation and return of habitat suitable for wildlife. Noting that some features in the landscape would not be reclaimed, HRFN indicated that Conuma should provide offsets commensurate to the loss to those vegetation communities. Conuma disagreed with HRFN's proposal that the loss be offset but indicated that it would be willing to discuss ideas for mitigation with HRFN; and
- **Effects to traditional societal practice**: HRFN expressed concern about Conuma's failure to assess potential effects to traditional societal practice in its assessment of effects to Cultural Heritage.

The issues raised by HRFN informed the EAO's assessment of potential adverse effects of the Amendment to a number of valued components; each of which are assessed in individual sections of this Report. Each section of the Report includes an assessment of the biophysical, social, economic, health or heritage effects, concerns raised by Indigenous nations and working group members, Conuma's responses to those concerns, the EAO's assessment and conclusions, and conditions proposed by the EAO to address concerns. The following sections of the Report and conditions address the issues raised above:

- Concerns related to the assessment of effects to wildlife and fish are addressed in wildlife (Section 6.16) and fish and fish habitat (Section 6.14). Relevant conditions include:
    - Condition #9: Indigenous-Led Monitoring Program, which would require that Conuma fund Indigenous monitors to be involved in monitoring for wildlife and fish effects (as well as

other effects, including air quality, country foods, water quality and vegetation); and
    - Condition #15: Country Foods Monitoring Plan, which would require that Conuma monitor and sample air, soil, vegetation, fish tissue and small mammal tissue.
- Concerns related to end land use objectives and reclamation are addressed in reclamation and closure (Section 6.20). The EAO proposes the following condition to clarify expectations related to reclamation:
    - Condition #16: End Land Use Plan, to require Conuma to develop a plan for vegetation and ecosystems following reclamation, in consultation with Indigenous nations; and
    - Condition #9: Indigenous-Led Monitoring Program, which would require that Conuma fund Indigenous monitors to be involved in monitoring from Construction through to Reclamation and Closure.

7.6.2 FISHING

The biophysical assessments of impacts to fish and water resources are described in Sections 6.13 (Aquatic Resources), Section 6.14 (Fish and Fish Habitat), Section 6.11 (Surface Water Quantity) and Section 6.12 (Surface Water Quality) of this Report.

HRFN has stated that it was unknown what the impact of the Amendment would be on HRFN's Treaty right to fish, given unknowns with respect to selenium and permitting levels, among other concerns noted. In assessing the Amendment's potential impact to HRFN's Treaty right to fish, the EAO considered the available information, including the discussion of the biophysical effects to fish and impacts to the Treaty right to fish, proposed mitigations, and accommodations as described in Section 7.3.1. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with HRFN. On balance, the EAO concluded that the Amendment would be expected to result in a moderate impact on HRFN's Treaty right to fish.

7.6.3 HUNTING AND TRAPPING

During Application Review, HRFN identified a number of issues and concerns related to the exercise of HRFN's Treaty right to hunt and trap, which are described in previous sections of this Report. HRFN identified additional potential impacts to Treaty 8 right to hunt and trap, which included concerns related to diminished wildlife heath due to airborne and waterborne contaminants.

The loss or reduction of the use area in the vicinity of the Wolverine-Hermann sites for hunting and trapping, whether through reduced access or reduced preference for the area, would impact not only the ability to hunt/trap or the ability to have peaceful enjoyment of those Treaty rights, but also the spiritual and cultural connection to the land, cultural learning practices associated with the exercise of these Treaty rights.

The biophysical assessments of impacts to wildlife are described in Section 6.16 of this Report.

HRFN has stated that the Amendment would have a moderate impact on HRFN's Treaty right to hunt and trap non-caribou wildlife, given access constraints, habitat loss and alteration, and loss of connectivity. HRFN stated that the Amendment would have a serious and irreversible impact on HRFN's Treaty right to hunt caribou. In assessing the Amendment's potential impact to HRFN's Treaty right to hunt and trap, the EAO considered the available information, including the discussion of the biophysical effects to wildlife and impacts to the Treaty right to hunt and trap, proposed mitigations, and accommodations as described in Section 7.3.2. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with HRFN.

On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on HRFN's Treaty right to hunt and trap non-caribou wildlife and a serious impact on HRFN's Treaty right to hunt caribou.

7.6.4 GATHERING

The biophysical assessments of impacts to vegetation are described in Section 6.4 of this Report. Impacts to the HRFN's gathering of food and medicine plants, proposed mitigations, conditions, and accommodations are described in Section 7.3.3.

HRFN has stated that the Amendment would have a moderate impact on HRFN's traditional gathering practices, given access restraints, habitat alternation and loss, and loss of connectivity. In assessing the Amendment's potential impact to HRFN's traditional gathering of food and medicine plants, the EAO considered the available information, including the discussion of the biophysical effects to vegetation and impacts to gathering, proposed mitigations, and accommodations as described in Section 7.3.3. The EAO also considered Conuma's commitments, the regional context, additional requirements expected to be imposed through permitting, the EAO's proposed conditions should the amendment be granted, and consultation with HRFN. On balance, the EAO concluded that the Amendment would be expected to result in a minor impact on HRFN's traditional gathering of food and medicine plants.

In consideration of the information available to the EAO, consultation with the HRFN, the regional context, additional requirements under permitting, Conuma's commitments and the EAO's proposed conditions of any EAC issued, the Amendment would be expected to result in a minor impact on HRFN's traditional gathering of food and medicine plants.

7.7 Notification Indigenous Nations

The EAO formally notified DRFN, BRFN, and HLFN of the Amendment on December 5, 2018, by providing a letter that included a short project description, maps depicting the site locations, and the EAO's contact information for any inquiries. On December 12, 2018, the EAO followed up with a notice that the original EAC for the Hermann Mine Project (#M08-01) had expired, which would allow for the EAO to consider the inclusion of part of the Hermann site for inclusion in the Amendment.

On July 5, 2019, the EAO wrote to DRFN, BRFN, and HLFN to advise that the AAIR document had been finalized. The letter provided a link to AAIR and supplemental documents.

On December 19, 2020, the EAO advised DRFN, BRFN and HLFN that the EAO had accepted Conuma's Amendment Application and provided a link to the Application and supplemental documents. The EAO invited each of these Indigenous nations to provide comments on the Amendment Application during the Public Comment Period. No comments were received from DRFN, BRFN or HLFN on the Amendment Application.

DRFN participated in a Working Group meeting aimed at providing an overview of the Environmental Assessment Process on November 13, 2018. DRFN subsequently indicated a preference to be included in the Amendment at the notification level. Since that date, DRFN has not participated in the Amendment process or corresponded with the EAO regarding the Amendment.

BRFN and HLFN have not participated in the Amendment process or corresponded with the EAO regarding the Amendment. No issues or concerns have been raised by DRFN, BRFN, or HLFN regarding the Amendment.

The EAO concludes that the Amendment would have negligible impacts to the Treaty rights of DRFN, BRFN and HLFN to hunt, trap and fish, and would have negligible impacts on traditional gathering activities and access culturally important areas. This conclusion is based on the following considerations: 1) information available to the EAO through public sources and those shared with the Province, 2) Conuma's proposed mitigation measures, 3) the proposed conditions, should the Amendment be issued, 4) the EAO's analysis of residual and cumulative effects from the Amendment, 5) potential impacts of the Amendment identified by DRFN, and 6) BRFN and HLFN's known areas of traditional use.

8 CONCLUSIONS

Based on:

- The information contained in the Amendment Application and supplemental information provided during the Amendment application review;
- Comments on the Amendment Application by Halfway River First Nation, McLeod Lake Indian Band, Saulteau First Nations, West Moberly First Nations and provincial government agencies as members of the Working Group, and Conuma's responses to these comments;
- Public engagement conducted by the EAO and Conuma on the Amendment Application;
- The proposed Table of Conditions and the Certified Project Description;
- The engagement of Halfway River First Nation, McLeod Lake Indian Band, Saulteau First Nations, West Moberly First Nations, including a Collaboration Plan with McLeod Lake Indian Band, by Conuma and the EAO;
- The letter from Saulteau First Nations indicating that it does not oppose the Amendment;

- The letter from West Moberly First Nations indicating that it is not seeking additional caribou offset funds and remains eager to work with Conuma and the Province to restore and protect caribou habitat in the region; and
- The additional measures proposed by the Province regarding impacts to caribou.

the EAO is satisfied that:

- The Amendment assessment has adequately identified and assessed the potential adverse changes to the environmental, economic, social, heritage and health effects of the Wolverine Mine resulting from the proposed Amendment;
- Issues identified during review of the Amendment Application, which were within the scope of the assessment of the proposed EA Amendment, were adequately and reasonably addressed by Conuma or the EAO's proposed conditions;
- Practical means have been identified to prevent or reduce any potential adverse environmental, economic, social, heritage and health effects of the proposed Amendment such that no significant adverse effect is predicted or expected as a result of this proposed Amendment, with the exception of impacts to caribou;
- The potential for adverse effects on Treaty rights and interests has been avoided, minimized or otherwise accommodated to an acceptable level, with the exception of the Treaty right to hunt caribou;
- The provincial Crown has fulfilled its obligations for consultation and accommodation of Halfway River First Nation, McLeod Lake Indian Band, Saulteau First Nations, and West Moberly First Nations, and Doig River First Nation relating to the issuance of this Amendment; and
- Notification of Blueberry River First Nations, Doig River First Nation, and Horse Lake First Nation about the proposed Amendment has been carried out adequately by the EAO and fulfills the Provincial Crown's obligations for consultation and accommodation.

The EAO recommends that Certificate #M04-01 for the Wolverine Mine be amended under Section 19 of the *Environmental Assessment Act* (2002), to authorize Conuma to build a new pit (the Hermann Pit) and associated new infrastructure, to extend the life of the Wolverine Mine for processing the coal from the Hermann Pit, and to update the company name to 'Conuma Resources Ltd.', as described in this Amendment Report.