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Project name: Pointed Mountain Pipeline Abandonment Project
Project no: CE862600

Subject: Pointed Mountain Pipeline Abandonment Project Environmental Technical Memorandum for Northwest Territories

Westcoast Energy Inc. (Westcoast) applied in 2022 under Section 241 of the *Canadian Energy Regulator Act* for the Pointed Mountain Pipeline Abandonment Project (the Project). The Nominal Pipe Size 20 natural gas gathering pipeline is situated in the southwest corner of the Northwest Territories (NWT), southeast corner of the Yukon Territory (Yukon), and northeast corner of British Columbia (BC) and is regulated by the Canada Energy Regulator (CER).

The pipeline has been deactivated for several years with no prospective future use. As such, Westcoast is planning to take the Pointed Mountain Pipeline permanently out of service by moving on to the abandonment phase.

To address the request from the Mackenzie Valley Land and Water Board to provide further detail on the studies undertaken to date, this report describes the desktop review and field data collection methods, and the results of the biophysical surveys for vegetation, wetlands, aquatics, and wildlife for the NWT components of the Project.

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1. Project Description

Westcoast is proposing to abandon the approximately 56 kilometres (km) of the Pointed Mountain Pipeline. This pipeline is located in southwest NWT, southeast Yukon, and northeast BC (Figure 1-1) and has previously been deactivated. In 2008, kilometre post (KP) 0 to KP 34.92 was deactivated pursuant to National Energy Board Order MO-11-2008. The remainder of the Pointed Mountain Pipeline (KP 34.92 to KP 55.64) was deactivated in 2016. This included being purged, cleaned of residual product, internally coated with corrosion inhibitor, and physically isolated from sources of upstream pressure. The pipeline has been filled with nitrogen gas to a minimum pressure of 70 kilopascals.

The Project will include:

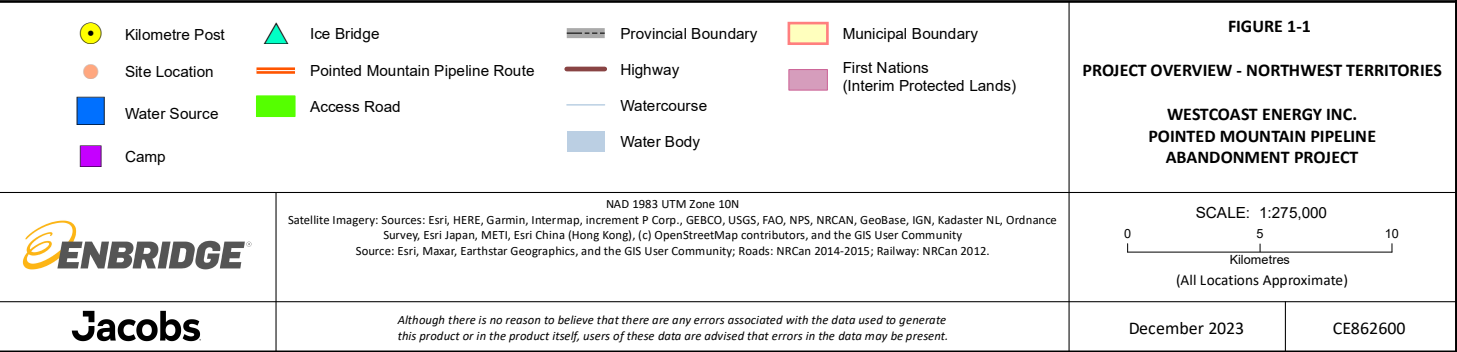
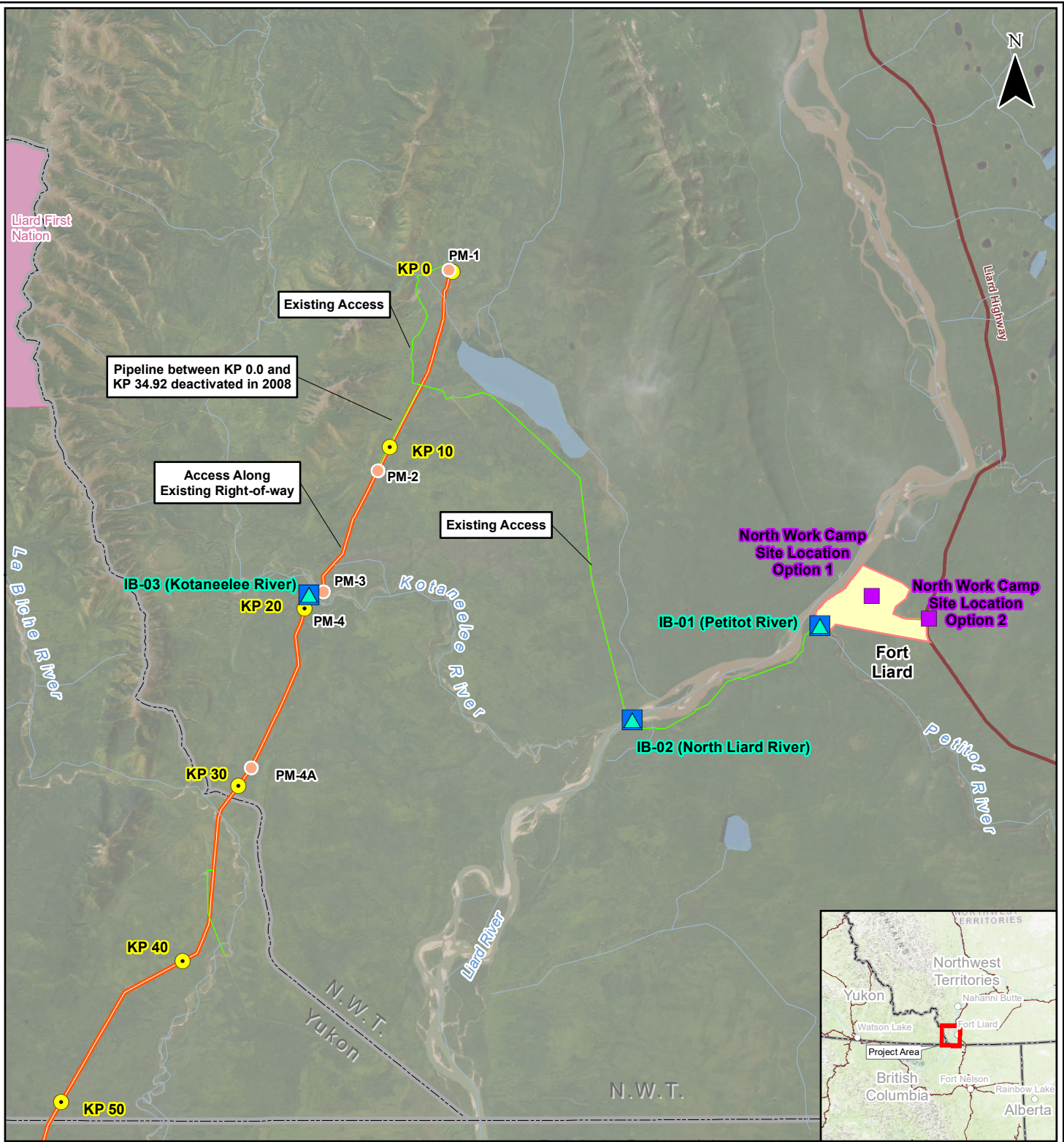
- abandonment in-place of approximately 56 km of buried pipeline;
- removal of aboveground facilities associated with the Pointed Mountain Pipeline; and
- disconnecting cathodic protection systems.

Since preparing and submitting the Environmental and Socio-economic Assessment (ESA) as part of the original application (Original Application) (CER filing A8A6U1), Project details were refined, and further planning and design have taken place in 2023 as outlined in the supplemental ESA (Supplemental ESA) filed in 2023 with the CER Project Update (CER filing A8T1K3) including:

- the addition of two new sites where physical abandonment activities will occur
- change in season for physical abandonment activities in the NWT
- new access plans for execution of the Project
- additional details about the construction camp locations

The buried pipeline will be abandoned in-place. Physical abandonment activities (e.g., cutting, capping) will be confined to the existing right-of-way and previously disturbed areas where aboveground infrastructure is located. Physical abandonment activities in the NWT were planned to occur during summer in the original Application but are now scheduled during winter.

The Pointed Mountain Pipeline right-of-way and existing access roads will be used to access the physical abandonment sites, which will require vegetation brushing. Access to sites in the NWT will include brushing along an existing 12 km long temporary access route near Fort Liard and installation of ice bridges (IB). Two options for a construction camp location have been proposed near Fort Liard, though only one camp will be required for the Project.



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2. Objectives

The objective of the vegetation, wetlands, aquatics, and wildlife and wildlife habitat desktop reviews and field surveys was to inform the ESA and Supplemental ESA prepared for the Project, as follows:

- collect information on vegetation, wetlands, aquatics, and wildlife and wildlife habitat encountered by the Project.
- characterize the existing conditions to inform the effects assessment for vegetation, wetlands, aquatics, and wildlife and wildlife habitat.
- inform the development of technically and economically feasible site-specific mitigation measures to avoid or reduce potential Project effects.
- determine provincial and territorial permitting requirements for various biophysical elements encountered by the Project.

The ESA and Supplemental ESA submitted to the CER present the potential residual and cumulative effects of the Project on vegetation, wetlands, aquatics, and wildlife and wildlife habitat, including an evaluation of significance.

The specific objectives of data collection for vegetation, wetlands, aquatics, and wildlife and wildlife habitat in the NWT are summarized below.

2.1 Vegetation

Desktop and field assessments were conducted to:

- provide information on pre-Project diversity, relative abundance, and distribution of vegetation communities
- confirm the presence of federally listed rare species in accordance with the federal *Species at Risk Act* (SARA) and the Committee on the Status of Endangered Wildlife in Canada (COSEWIC)
- confirm the presence of provincially and territorially listed rare species in accordance with the *Species at Risk (NWT) Act*
- confirm the presence of provincially and territorially rare species and ecological communities ranked as May Be At Risk in accordance with the Northwest Territories Conservation Data Centre (NWT CDC) Species General Ranking (GNWT 2023a, b)
- verify the presence of invasive plant species in accordance with the Northwest Territories Environment and Climate Change (NWT ECC) list of Invasive Species of Most Concern (NWT ECC 2020; NWT CISPP 2023) and support best practices for control mitigation
- provide information on the current (pre-abandonment) forest condition, including forest maturity and forest pests

2.2 Wetlands

Desktop and field assessments were conducted to:

- confirm classifications and refine wetlands delineated during desktop review that are encountered by the Project.

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- support regulatory requirements related to wetlands in the NWT that adhere to the *Waters Act* and the *Waters Regulation* (GNWT 2014a, b)
- obtain pre-abandonment information on wetlands encountered by the Project at infrastructure sites.

2.3 Aquatics

Desktop and field fish and fish habitat assessments were conducted to:

- provide information on pre-abandonment conditions, accessibility, and fish presence.
- confirm the presence of federally listed aquatic species, in accordance with the federal SARA and COSEWIC.
- confirm the presence of territorially listed species with the Species General Ranking (GNWT 2023a)
- verify the presence of invasive aquatic species in accordance with the Northwest Territories Environment and Natural Resources (NWT ENR) list of Invasive Species of Most Concern (GNWT 2022)

2.4 Wildlife and Wildlife Habitat

Desktop and field reconnaissance assessments were conducted to:

- assess and describe the existing conditions for wildlife by identifying wildlife and wildlife habitat based on visual sightings and signs (e.g., tracks, scat, markings) and identifying wildlife features (e.g., dens, mineral licks, stick nests) that could potentially be affected by the Project.
- confirm wildlife habitat and refine wildlife species potential and wildlife habitats during the desktop review that are encountered by the Project in the NWT.
- support regulatory requirements related to wildlife in NWT including the NWT *Wildlife Act*, the *Species at Risk (NWT) Act*, the federal SARA and COSEWIC
- obtain pre-abandonment information on wildlife and wildlife habitat encountered by the Project at infrastructure sites in the NWT.

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3. Study Area Boundaries

Spatial assessment boundaries were used to set a frame of reference for the ESA and Supplemental ESA to encompass the geographic extent of measurable potential environmental effects of the Project.

The spatial boundaries for the Project residual and cumulative effects assessment encompass the areas potentially affected by the Project, the areas within which a biophysical or socio-economic element occurs or functions, and the areas within which Project effects might occur. Four categories of study areas are defined for the ESA and Supplemental ESA.

- **Project Footprint:** the land area directly disturbed by the physical abandonment activities, including associated physical works and activities for the right-of-way, associated facilities, and temporary workspace. The Project Footprint is the same for all elements. Physical abandonment activities will generally be conducted on the existing pipeline right-of-way.
- **Local Study Area (LSA):** varies with the environmental and socio-economic element being considered. The LSA includes the Project Footprint and extends beyond it to incorporate the area within which the element is most likely to be affected by the Project.
- **Regional Study Area (RSA):** varies with the environmental and socio-economic element being considered. The RSA includes the Project Footprint and LSA, and the area beyond the LSA boundaries where the predicted likely residual effects from the Project may act in combination with those of existing and reasonably foreseeable developments and activities to cause cumulative effects.
- **Beyond RSA:** the area extending beyond the RSA identified for each element.

The LSA and RSA boundaries reflect a balance between choosing an area that is large enough for potential effects to be measurable and meaningful, but not so large as to mask or dilute the effects.

The following spatial boundaries were used in the desktop review and field planning for each discipline:

- **vegetation LSA:** 100-metre (m) buffer extending from the edges of the Project Footprint and on both sides of the pipeline centreline.
- **vegetation RSA:** 1 km buffer extending from the edges of the Project Footprint. A rare plants search was used at RSA level due to low survey intensity on the Project Footprint.
- **wetlands LSA:** 100-m buffer extending from the Project Footprint. It incorporates the area in which wetlands are most likely to be affected by temporary disturbances due to all phases of the Project. It encompasses the distance at which wetland vegetation is predicted to be directly affected by the Project and includes wetlands adjacent to the Project Footprint, which may be susceptible to hydrological, habitat, and biogeochemical alteration.
- **aquatics LSA:** A 100-m buffer extending from the Project Footprint and extended to a minimum of 300 m downstream at all defined watercourse crossings. At drainages, the Aquatics LSA consists of the area extending 100 m upstream at each crossing location to a minimum of 100 m downstream.
- **wildlife and wildlife habitat LSA:** a 1 km buffer extending from the edges of the Project Footprint and on both sides of the pipeline centerline in consideration of potential setbacks or buffers for certain sensitive wildlife species with potential to occur in the area.

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4. Vegetation

This section summarizes the vegetation desktop review and field surveys that occurred in the NWT in 2021 to inform the ESA and in 2023 to inform the Supplemental ESA.

4.1 Methods

The following subsections describe the methods used during the vegetation desktop review and field surveys.

4.1.1 Desktop Review

The Vegetation LSA was used during the initial desktop review. Records of known rare vegetation and rare ecological community occurrences from within the Vegetation RSA were also reviewed to inform and plan field surveys.

4.1.1.1 Ecological Classification

A desktop review was conducted using satellite imagery, publicly available land cover mapping (NRCan 2009), historical fire (GNWT 2012), and human footprint (GNWT 2010) to delineate upland vegetation community distribution along the Project, within a 100 m corridor centred on the Project centreline. Refer to subsection 8.2.1 of the ESA for the desktop review methods for wetland mapping. Satellite imagery was reviewed at varying scales of approximately 1:2,000 to 1:15,000. Vegetation community categories followed the CER (2023) *Filing Manual* Checklist for Guide B – B.2, Table 1 land use categories.

4.1.1.2 Rare Vegetation and Rare Ecological Communities

A literature review was conducted to identify rare vegetation and rare ecological communities with the potential to occur in the NWT. Using data available from the NWT CDC, COSEWIC, and the Government of Canada, tables of potential rare vascular plants and rare ecological communities in the NWT were compiled (Appendix D).

A search of the NWT CDC (GNWT 2023a, b) dataset was completed to determine if existing records of rare plant populations or rare ecological communities exist within 5 km of the Project Footprint. The search was extended beyond the Vegetation RSA because of low survey effort in this region of the NWT.

4.1.1.3 Invasive Weed Species

Weeds of management concern identified in the NWT ECC list of Invasive Species of Most Concern (NWT ECC 2020) was reviewed before commencement of the vegetation survey.

4.1.1.4 Forest Condition

A literature review of the current forest condition was conducted to identify likely locations of late-successional forest and recent forest health concerns.

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4.1.2 Field Data Collection

The vegetation survey focused on the area directly disturbed by the physical abandonment activities. Information regarding general species composition and potential to support rare vegetation species may be inferred for habitats adjacent to or contiguous with the surveyed area boundaries as vegetation communities within the Project Footprint may extend outside of the surveyed area.

Vegetation surveys were completed from August 4 to 5 in 2021 and July 28 to August 1 in 2023, focusing on areas where physical abandonment activities will occur.

The vegetation survey included confirmation of land use categories, rare vegetation observations, incidental weed observations, and incidental forest condition observations. A list of culturally important plant species for the Acho Dene Koe First Nation (subsection 13.2.2 of the ESA) was also made available to the vegetation specialist.

4.1.2.1 Ecological Classification

A vegetation specialist traversed each selected survey location; noted the land uses on the physical abandonment activity areas; and took representative photos.

4.1.2.2 Rare Vegetation and Rare Ecological Communities

The Jacobs vegetation survey methodology is based on the Alberta Native Plant Council Guidelines for Rare Vascular Plant Surveys in Alberta (ANPC 2012) and the BC CDC's and E-Flora BC's Protocols for Rare Plant Surveys (Penny and Klinkenberg 2021).

A vegetation specialist noted the dominant ecological communities, recorded all identifiable species, and searched for rare species and uncommon habitats. A purposeful meander technique was used to survey the proposed physical abandonment activities area. At locations where potentially important microsites were observed, more detailed searches were performed. All vegetation surveys were conducted during biologically appropriate timing for the region and species being surveyed.

4.1.2.3 Invasive Weed Species

Listed weeds and non-listed, non-native species were recorded at the locations where they were observed during the surveys. Numerical density distribution classes were assigned for each listed weed species at each physical abandonment activities area where they were observed during the survey, following the density distribution guide established by the BC Ministry of Forests (Luttmerding et al. 1990; refer to Appendix A). Numerical density codes were assigned for Noxious weed species observed during the survey, following the *Range Invasive Alien Plant Program Reference Guide* (BC MFR 2010; refer to Appendix A).

4.1.2.4 Forest Condition

During overflights along the Project Footprint, vegetation specialists identified trees with discoloured needles, and documented observations on field sheets and field maps. During the vegetation survey, trees that were discoloured were further inspected for pitch tubes. Notes, photos, and locations of these documented observations were compiled with overflight observations. Forest stands with the potential to be late-successional forest were identified during the overflight and visited during the vegetation survey.

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Observations were recorded with photographs and documented on field sheets including notes of composition class, the height and size of the trees, and the structural diversity of the canopy.

4.2 Results

This section summarizes the results of the vegetation desktop reviews and field surveys.

4.2.1 Results of Desktop Review

The vegetation desktop review results are provided for ecological classification, rare vegetation and rare ecological communities, invasive weed species, and forest condition.

4.2.1.1 Ecological Classification

The Project crosses the Liard Range Mid-Boreal boreal-subalpine Ecoregion in the Cordillera Ecological Region of the NWT (Ecosystem Classification Group 2010) and the Liard Upland Mid-Boreal Ecoregion in the Taiga Ecological Region (Ecosystem Classification Group 2007). The Liard Range Mid-Boreal boreal-subalpine Ecoregion are typically dominated by a complex of pure and mixed white spruce, aspen, paper birch, and lodgepole pine forests within the valleys and lower slopes. Dry, open spruce-lichen woodlands are common on gravelly to bouldery colluvium in the northwest; the thick lichen cover might reflect a higher precipitation regime that promotes its development and growth on coarser materials. The middle to upper slopes of the ridges are mantled by subalpine spruce and lodgepole pine forests. Krummholz alpine fir and white spruce communities and stunted lodgepole pine grow on upper slopes and across lower elevation ridges. Shrub and sedge tundra communities occupy high elevation ridgetops and slopes where soils are fine enough or where there is enough seepage to permit growth (Ecosystem Classification Group 2010).

The Liard Upland Mid-Boreal Ecoregion is dominated by highly productive deciduous and mixed-wood stands. Trembling aspen, balsam poplar, and white spruce may grow to 30 m or more in less than 100 years, and understories are usually lush and diverse, with low-bush cranberry, prickly rose, red osier dogwood, dwarf red raspberry, meadow-horsetail, and other herbs. Wetlands are less common in this Ecoregion than in the adjacent Liard Plain Mid-Boreal Ecoregion, and are typically rich, wet horizontal fens vegetated by sparse trees, willows, and sedges (Ecosystem Classification Group 2007).

Areas of each land cover class along the existing pipeline right-of-way are provided in Table 4-1. The land cover areas exclude additional access roads, camps and water withdrawal sites that were part of the Project refinements.

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Table 4-1. Land Cover Classification on the Project Footprint, Existing Pipeline Right-of-Way, and Local Study Area

Land Cover Classification	Project Footprint (ha) ^a	Area on Existing Pipeline Right-of-Way(ha) ^b	Area on Vegetation Local Study Area (ha) ^c
NWT – Native			
Forested	0.4 (0.9% of area on Project Footprint)	8.5 (7.5% of area on pipeline right-of-way)	429.1 (34.6% of area on Vegetation LSA)
Wetlands	0.0 (0.0% of area on Project Footprint)	20.5 (18.0% of area on pipeline right-of-way)	196.3 (15.8% of area on Vegetation LSA)
Water	0.0 (0.0% of area on Project Footprint)	0.6 (0.5% of area on pipeline right-of-way)	5.8 (0.5% of area on Vegetation LSA)
Shrubs	0.5 (1.3% of area on Project Footprint)	32.5 (28.5% of area on pipeline right-of-way)	40.1 (3.2% of area on Vegetation LSA)
Regenerating Burn	0.0 (0.0% of area on Project Footprint)	0.0 (0.0% of area on pipeline right-of-way)	0.2 (<0.1% of area on Vegetation LSA)
Native subtotal	0.9 (2.2% of area on Project Footprint)	62.1 (54.4% of area on pipeline right-of-way)	671.6 (54.2% of area on Vegetation LSA)
NWT – Anthropogenic			
Cleared	0.8 (1.9% of area on Project Footprint)	0.8 (0.7% of area on pipeline right-of-way)	16.2 (1.3% of area on Vegetation LSA)
Disturbed	0.1 (0.1% of area on Project Footprint)	0.1 (0.1% of area on pipeline right-of-way)	0.8 (0.1% of area on Vegetation LSA)
Anthropogenic subtotal	0.8 (2.1% of area on Project Footprint)	1.0 (0.8% of area on pipeline right-of-way)	17.0 (1.4% of area on Vegetation LSA)
NWT total	1.7 (4.3% of area on Project Footprint)	63.0 (55.3% of area on pipeline right-of-way)	688.6 (55.5% of area on Vegetation LSA)

^a PM-1 through PM-4 (ha). Areas are approximate.

^b Includes Physical Abandonment Activities Sites located within the existing pipeline right-of-way (ha) in the Northwest Territories. Areas are approximate.

^c Areas are approximate.

Notes:

% = percent

< = less than

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4.2.1.2 Rare Vegetation and Rare Ecological Communities

There are three species with federal conservation status known to occur in the NWT (Government of Canada 2023e):

- hairy braya (*Braya pilosa*, listed as Endangered by COSEWIC and SARA, and listed as Threatened by the Species at Risk (NWT) Act)
- Mackenzie hairgrass (*Deschampsia mackenzieana*, listed as Special Concern by COSEWIC and SARA)
- Nahanni aster (*Symphyotrichum nahanniense*, listed as Special Concern by COSEWIC and SARA)

None of these species at risk are known to occur in the range of the Project (GNWT 2020b).

In the NWT, there is an occurrence of a territorially listed species, Raup's willow (*Salix raupii*, May Be At Risk), within 5 km of the Pointed Mountain Pipeline (GNWT 2013), located approximately 3.1 km east of the Project Footprint between PM-1 and PM-2. This species can occur in disturbed areas and may be present in the Vegetation RSA.

4.2.1.3 Invasive Weed Species

The NWT ENR lists white and yellow sweet-clover, creeping thistle, and smooth (awnless) brome as the Invasive Species of Most Concern (NWT ENR 2020). Some of these species have previously been included in reclamation seed mixes and may be present on the Project Footprint. NWT ENR requests that observations of invasive species be reported.

4.2.1.4 Forest Condition

The Project is within the Dehcho administrative region of the NWT, which has reported the following forest pests: aspen serpentine leafminer, spruce budworm, willow blotch leafminer, and white-spotted sawyer beetle (GNWT 2020a).

4.2.2 Results of Field Data Collection

A total of eight vegetation plots were completed on August 4 and 5, 2021 and July 29 to August 1, 2023 on the Project Footprint in the NWT. Field surveys focused on sites where physical abandonment activities will take place. A total of fourteen plant species included on the list of culturally important plant species for the Acho Dene Koe First Nation (subsection 13.2.2 of the ESA) were observed (Appendix B).

A vegetation survey was conducted from July 28 to August 1, 2023, focusing on areas where Project details have been refined. A total of eight locations were surveyed in the field.

4.2.2.1 Ecological Classification

2021 Field Survey

Three of the four 2021 surveyed plots within the NWT were located on the Project Footprint within forest. One plot within the NWT was located on the Project Footprint within a graminoid fen.

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2023 Field Survey

Exposed Pipe Removal Site

PM-4A is located on the regenerating pipeline right-of-way, dominated by shrubs within a wetland complex. Shrub cover includes river alder and fewer red-osier dogwood and balsam willow, which are present throughout most of the Vegetation LSA. There are some mature trees at the edges of the site, which are mostly black spruce and tamarack, with fewer balsam poplar and aspen. Herb cover is low in this area. Grasses and sedges become more common close to the open water portion of the wetland. The wetland to the southeast of the site becomes bog dominated by black spruce and common Labrador tea. The site is heavily influenced by beaver activity.

Physical Abandonment Sites

PM-3 is generally shrub-dominated with mountain alder.

PM-4 is mostly shrub-dominated with standing water throughout the right-of-way. Shrub species include mountain alder, red-osier dogwood, and young balsam poplar, with a dense graminoid understory consisting of fowl bluegrass and bluejoint reedgrass.

Temporary Access Routes and Ice Bridges

The vegetation surveys carried out between July 28 to August 1, 2023 covered access routes and ice bridges that will be constructed for the Project. This section describes the vegetation communities located in these areas.

Fort Liard to North Liard River Crossing (IB-01 to IB-02)

A flyover was conducted of the access road between Fort Liard and the North Liard River Crossing (IB-01 to IB-02) in July 2023. Jacobs confirmed that this route is dominated by shrubs and pole sapling trees. Brushing of trees and shrubs along this access road includes upland vegetation and wetland vegetation.

Pipeline Right-of-Way

A flyover was conducted for the pipeline right-of-way from PM-2 south to the border of the Yukon and NWT in July 2023, and Jacobs confirmed that it is dominated by shrubs and pole sapling trees. Brushing of regenerating shrubs along the existing right-of-way includes upland, wetland, and riparian vegetation.

A rare plant survey was conducted from KP 16.5 to KP 18.5 (north of PM-3) because of the potential for Raup's willow in the area; however, no rare vegetation was observed. The existing right-of-way was observed to be dominated by trembling aspen at pole sapling height, white spruce, and balsam poplar trees.

North Work Camp Site

Both site options for the North Work Camp are located on previously disturbed lots in or near the Hamlet of Fort Liard. These sites were not included in the 2023 survey, as they have low to no potential to support rare vegetation due to the existing disturbance.

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Summary of Ecological Classification

Table 4-2 provides a list of the plot locations, land cover types as well as the presence of invasive weed species from both the 2021 and 2023 field surveys. Species nomenclature is according to the BC Species and Ecosystems Explorer (BC CDC 2023a) and a complete list of species observed is provided in Appendix B.

Native land covers include forested, wetlands, water, and shrubs. Forested land cover was dominated by a combination of trembling aspen, white spruce, balsam poplar and black spruce (Appendix C, Photo 5, Photo 8). Wetlands observed included a graminoid fen and graminoid marshes (Appendix C, Photo 2). Rivers were classified as water land cover, but were not included in the field survey. Shrub land cover was dominated by various willow species, green alder, red-osier dogwood, and red raspberry (Appendix C, Photo 1, Photo 4, Photo 6).

Anthropogenic land covers include cleared and disturbed. Cleared land cover was dominated by a combination of native and tame/agronomic plant species with scattered native shrubs. Disturbed land cover was maintained to be free of vegetation and included disturbances such as roads and aboveground infrastructure (Appendix C, Photo 7).

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Table 4-2. Summary of Vegetation Survey Plots, Locations, Land Cover, and Invasive Weed Species Observed During the Vegetation Field Surveys in the NWT

Survey Area	UTM Zone	UTM Easting	UTM Northing	Land Cover	Invasive Weed Species ^a	Weed Designation ^a	Distribution ^b	Density ^c
PM-1	10	454487	6695914	Forest (including regenerating pole/sapling forest)	perennial sow-thistle	Not designated	4	1
				Shrub	annual hawksbeard	Not designated	2	1
				Cleared	oxeye daisy	Not designated	3	1
				Disturbed	white sweet-clover	Most Concern	2	1
					yellow sweet-clover	Most Concern	4	1
PM-2	10	450687	6685737	Forest (including regenerating pole/sapling forest)	--	N/A	N/A	N/A
				Cleared				
PM-3	10	447708	6679486	Shrub regeneration (clearing)	3b: Tall shrub (2-10 m tall)	None	N/A	N/A
KP 16.5 to KP18.5d	10	447201 448391	6679256 6680931	Mixedwood forest (regenerating on existing right-of-way)	4: Pole sapling	None	N/A	N/A
				Deciduous forest (regenerating on existing right-of-way)				
				Coniferous forest (regenerating on existing right-of-way)				
PM-4	10	446729	6679167	Wetland	3b: Tall shrub (2-10 m tall)	None	N/A	N/A



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Survey Area	UTM Zone	UTM Easting	UTM Northing	Land Cover	Invasive Weed Species ^a	Weed Designation ^a	Distribution ^b	Density ^c
PM-4A	10	443861	6670423	Wetland	3b: Tall shrub (2-10 m tall)	None	N/A	N/A

^a Species nomenclature is according to the BC Species and Ecosystems Explorer (BC CDC 2023a), and weed designation is according to the BC Weed Control Regulation.

^b Luttmerding et al. (1990); refer to Appendix A

^c BC MFR (2010); refer to Appendix A

Notes:

N/A = not applicable

UTM = Universal Transverse Mercator

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4.2.2.2 Rare Vegetation and Rare Ecological Communities

The desktop survey identified the potential for Raup's willow to be present on the Project Footprint, as it was recorded on the Species at Risk (NWT) plant layer approximately 3 km east of the Pointed Mountain Pipeline. The Project Footprint within this vicinity with potential to support Raup's willow was therefore surveyed on foot; however, no occurrences were observed during field surveys. There were no species at risk or rare ecological communities observed in the NWT survey areas.

4.2.2.3 Invasive Weed Species

Two invasive weed species designated as Most Concern were observed at PM-1: white sweet-clover and yellow sweet-clover. Additional invasive weed species were observed at this site that are not designated species in the NWT, but are designated as Highly Invasive in the adjacent Yukon: perennial sow-thistle; annual hawksbeard; and oxeye daisy. Invasive weed species were associated with existing disturbance and infrastructure. No invasive weed species were observed at PM-2, PM-3, PM-4, PM-4A or along the access route between KP 16.5 and KP 18.5.

4.2.2.4 Forest Condition

No evidence of forest pests or pathogens was observed. No late-successional forests were observed.

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5. Wetlands

This section summarizes the wetland desktop review and field surveys that occurred in the NWT in 2021 to inform the ESA and in 2023 to inform the Supplemental ESA.

5.1 Methods

The following subsections describe the methods used during the wetland desktop review and field surveys. The Wetland LSA was considered during desktop review. For the reconnaissance-level field study, the area considered included the Project Footprint.

5.1.1 Desktop Review

The desktop review used satellite imagery and the preliminary Canadian Wetland Inventory map (Amani et al. 2019) to determine wetland class and distribution within a 100 m corridor centred on the Project Footprint.

Satellite imagery was reviewed at varying scales of approximately 1:2,000 to 1:15,000 and was interpreted using key indicators (geomorphology, surficial hydrology, and vegetation type and cover). Each wetland encountered by the Project Footprint was delineated independently and assigned a unique crossing identification (ID). This approach was taken because many of wetland systems crossed by the study area are expansive regional complexes, and the intent was to indicate wetland habitat types within complexes crossed by the Project Footprint.

5.1.2 Field Data Collection

During the field surveys, wetland classes and delineations identified during the desktop review were confirmed or refined, as warranted, and the following information was collected about the wetlands:

- Existing disturbance
- Habitat
- Hydrology
- Location
- Substrate (peat or mineral)
- Vegetation

Wetlands were classified according to the Canadian Wetlands Classification System (CWCS) (NWWG 1997).

5.1.2.1 2021 Wetland Surveys

A helicopter overflight was conducted along the pipeline right-of-way. Helicopter reconnaissance and helicopter-assisted ground-based wetland assessments were conducted from August 4 to 5, 2021 at the aboveground infrastructure sites where physical abandonment activities will occur in the NWT (i.e., PM-1, PM-2, PM-3 and PM-4). Ground-based surveys were conducted where safe helicopter landing was feasible and practical, and where it was not, sites were observed aerially.

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5.1.2.2 2023 Wetland Surveys

Helicopter reconnaissance and helicopter-assisted ground-based wetland surveys were completed from July 28 to August 1, 2023. Wetland survey locations were based on potential wetland interactions with updated Project Footprint components observed during desktop review, using methods described in Section 8 of the ESA. Wetland surveys were conducted at the following locations in NWT:

- PM-4A
- The additional temporary access road from Petitot ice bridge (IB-01) to North Liard ice bridge (IB-02)
- Select locations along the right-of-way where brushing will be required for access between PM2 and PM-4

Ground-based surveys were conducted where safe helicopter landing was feasible and practical, and where it was not, wetlands were observed aurally.

5.2 Results

This section summarizes the results of the wetland desktop reviews and field surveys.

5.2.1 Results of Desktop Review

Wetland regions in Canada are defined by wetland ecosystems that develop in locations with similar topography, hydrology, and nutrient regimes. Within the NWT, the Project is located within the Continental High Boreal Subregion of the Boreal Wetland Region and the Central Rocky Mountain Wetland Region of the Mountain Wetland Region. Characteristic Continental High Boreal wetlands consist of treed bogs and fens on broad flats and in confined basins. Swamp and marsh wetlands can be found in agricultural areas as well as along edges of some streams and lakes. Peat depth for Continental High Boreal wetlands averages 2 to 3 m. Characteristic Central Rocky Mountain wetlands include bogs and fens. Peat accumulation is typically less than 1 m (Natural Resources Canada 1986).

The Project crosses the Liard Upland Mid-Boreal Ecoregion in the Taiga Ecological Region (Ecosystem Classification Group 2007) and the Liard Range Ecoregion in the Cordillera Ecological Region of the NWT (Ecosystem Classification Group 2010). Less than 5% of the total area of the Liard Upland Mid-Boreal Ecoregion is covered by water. The undulating terrain limits wetlands in area. In the Liard Range Ecoregion, there are few lakes and wetlands, common in broad valley bottoms, include shore and floating sedge fens and black spruce fens (Ecosystem Classification Group 2007, 2010).

5.2.2 Results of Field Surveys

A total of 35 wetlands were identified along the Project Footprint in the NWT in 2021 and 2023. Table 5-1 summarizes wetland interactions with project components in the NWT.

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Table 5-1. Wetlands Crossed by the Pointed Mountain Pipeline in the NWT

ID	Wetland Class ^a	Start KP ^b	End KP ^b	UTM Zone 10U				Length Crossed by Project Footprint (km)	Area Crossed by Project Footprint (ha)	Total Wetland Area (ha)	Project Component
				Start Easting	Start Northing	End Easting	End Northing				
WET-002	Swamp	0.49	0.56	454450	6695594	454446	6695524	0.07	0.11	1.40	Access along Right-of-Way
WET-010	Shallow Water	0.55	1.51	454464	6695530	454207	6694619	0.96	1.88	50.71	Access along Right-of-Way
WET-004	Swamp	0.96	1.08	454374	6695128	454346	6695010	0.12	0.03	0.59	Access along Right-of-Way
WET-005	Swamp	1.50	1.54	454191	6694638	454189	6694591	0.05	0.07	6.40	Access along Right-of-Way
WET-011	Shallow Water	1.54	2.65	454201	6694597	454153	6693482	1.12	2.21	104.08	Access along Right-of-Way
WET-007	Swamp	2.64	2.81	454134	6693499	454118	6693326	0.17	0.33	2.91	Access along Right-of-Way
WET-009	Shallow Water	2.81	2.88	454128	6693327	454094	6693259	0.07	0.14	0.22	Access along Right-of-Way
WET-008	Fen	2.87	4.86	454090	6693269	453515	6691373	1.98	3.95	120.44	Access along Right-of-Way
WET-012	Fen	4.89	5.22	453502	6691339	453405	6691022	0.33	0.64	6.35	Access along Right-of-Way
WET-013	Fen	5.72	5.92	453255	6690544	453157	6690374	0.20	0.38	4.02	Access along Right-of-Way
WET-016 ^e	Fen	7.071	7.234	452567	6689384	452491	6689240	0.16	0.16	2.54	Access Road (Prairie Provident Resources Road)
		7.07	7.24	452601	6689363	452542	6689210	0.16	0.32		Access along Right-of-Way
WET-018	Fen	9.12	9.23	451657	6687545	451591	6687463	0.10	0.17	0.66	Access along Right-of-Way
WET-019 ^c	Fen	9.60	9.68	451416	6687134	451378	6687062	0.08	0.15	1.05	Access along Right-of-Way
		9.613	9.669	451350	6687151	451324	6687102	0.06	0.05		Access Road (Prairie Provident Resources Road)
WET-020	Fen	10.24	10.32	451119	6686564	451094	6686487	0.08	0.15	0.62	Access along Right-of-Way
WET-021	Fen	10.44	10.57	451041	6686382	450964	6686279	0.13	0.23	1.48	Access along Right-of-Way
WET-022 ^c	Mixed Treed Swamp	10.91	10.99	450730	6686018	450695	6685937	0.09	0.08	5.65	Access Road (Prairie Provident Resources Road)
		10.96	10.99	450781	6685933	450763	6685900	0.04	0.05		Access along Right-of-Way
		11.03	11.06	450669	6685910	450653	6685880	0.03	0.03		Access Road (Prairie Provident Resources Road)
		11.21	11.28	450665	6685712	450631	6685649	0.07	0.13		Access along Right-of-Way
WET-023	Mixed Treed Swamp	11.45	11.85	450570	6685490	450372	6685142	0.40	0.80	5.39	Access along Right-of-Way
WET-025	Mixed Treed Swamp	12.83	12.90	449925	6684271	449890	6684204	0.08	0.08	1.33	Access along Right-of-Way
WET-029	Mixed Treed Swamp	14.04	14.29	449354	6683192	449229	6682987	0.24	0.48	17.67	Access along Right-of-Way
WET-028	Mixed Treed Swamp	14.74	15.09	449094	6682552	449010	6682211	0.35	0.65	49.44	Access along Right-of-Way
WET-030	Treed Bog	15.69	16.05	448833	6681642	448727	6681301	0.36	0.68	59.88	Access along Right-of-Way
WET-031	Shrub Bog	16.04	16.60	448716	6681313	448346	6680901	0.56	1.10	46.07	Access along Right-of-Way
WET-102	Mixed Treed Swamp	16.067	16.067	465744	6672227	465483	6672077	0.00	0.30	55.34	Access Road (Connector Road)

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ID	Wetland Class ^a	Start KP ^b	End KP ^b	UTM Zone 10U				Length Crossed by Project Footprint (km)	Area Crossed by Project Footprint (ha)	Total Wetland Area (ha)	Project Component
				Start Easting	Start Northing	End Easting	End Northing				
WET-032	Treed Bog	16.57	16.96	448375	6680910	448108	6680625	0.39	0.73	51.12	Access along Right-of-Way
WET-103	Shrub Swamp	17.65	17.69	447665	6680121	447663	6680082	0.04	0.07	0.13	Access along Right-of-Way
WET-083	Shrub Swamp	18.25	18.29	447698	6679518	447717	6679479	0.04	0.07	0.39	Access along Right-of-Way
WET-095 ^c	Shrub Swamp	19.28	19.29	446894	6679164	446885	6679158	0.01	0.01	10.21	Access along Right-of-Way
		19.29	19.38	446893	6679150	446851	6679069	0.09	0.19		Workspace (PM-4)
		19.38	19.46	446831	6679075	446832	6678997	0.08	0.15		Access along Right-of-Way
WET-034	Shrub Swamp	19.98	20.09	446704	6678493	446658	6678387	0.11	0.20	0.52	Access along Right-of-Way
WET-035	Mixed Treed Swamp	20.98	21.01	446392	6677541	446384	6677508	0.03	0.06	0.15	Access along Right-of-Way
WET-036	Treed Bog	21.24	21.60	446276	6677316	446193	6676968	0.36	0.72	27.61	Access along Right-of-Way
WET-038	Treed Bog	21.94	22.05	446243	6676632	446247	6676517	0.11	0.21	11.48	Access along Right-of-Way
WET-039	Shrub Swamp	23.05	23.19	446313	6675528	446256	6675405	0.14	0.25	2.20	Access along Right-of-Way
WET-041	Shrub Swamp	28.57	28.77	443936	6670551	443831	6670382	0.20	0.37	1.53	Access along Right-of-Way
WET-042 ^c	Mixed Treed Swamp	28.57	28.81	443936	6670551	443809	6670338	0.07	0.49	28.88	Access along Right-of-Way
		28.81	28.84	443826	6670330	443797	6670314	0.03	0.04		Workspace (PM-4A)
		28.91	28.93	443761	6670263	443750	6670247	0.02	0.01		

^aWetlands were classified according to the CWCS (NWWG 1997).

^bStart and end KPs and UTM's are approximate and indicate where the wetland intersects the Project Footprint (access along right-of-way or additional temporary access).

^cWetland is part of a complex and crosses footprint more than once.

Notes:

ha = hectare(s)

UTM = Universal Transverse Mercator

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6. Aquatics

This section summarizes the aquatics desktop review that occurred in the NWT in 2021 to inform the ESA and desktop review and field surveys in 2023 to inform the Supplemental ESA.

6.1 Methods

The following subsections describe the methods used during the aquatics desktop review and field surveys.

6.1.1 Desktop Review

The aquatics LSA was used during the 2021 desktop review. Jacobs reviewed the following data and reports:

- Fisheries and Oceans Canada (DFO) Aquatic Species at Risk Map to identify potential species at risk and the presence of critical habitat (DFO 2022)
- BC Habitat Wizard database to identify potential stream crossing locations and historical fish capture information, as well as the presence of critical habitats (Government of BC 2023b)
- EcoCat Ecological Reports Catalogue to review reports relating to previous fish captures for additional information (Government of BC 2023a)
- History of the Liard River (McLeod and O'Neil 1983)
- The Freshwater Fishes of BC (McPhail 2007)

The results of the desktop review were used to focus and inform field data collection. Historical fish and fish habitat information within the watershed were also reviewed to inform and plan field surveys.

6.1.2 Field Data Collection

The field assessments focused on the area directly disturbed by the physical abandonment activities or ice bridge locations and their zone of influence. Jacobs visited the Project Footprint on May 2 to 8, 2023, and completed the aquatic assessments August 23 to 26, 2023, which consisted of watercourse assessments and fish sampling. Assessments were completed within the NWT at IB-01, IB-02, and IB-03, and at PM-4A where exposed pipe will be removed (WC-27a). Crews assessed watercourse features and areas where the temporary disturbance may affect fish and fish habitat. Figure 6-1 shows the fish habitat assessment locations. The field data support the development of site-specific mitigation and recommendations that comply with environmental permitting requirements.

The following tasks took place as part of the aquatic field assessments:

- Areas upstream, within the boundaries of, and downstream of the proposed Project Footprint were traversed.
- Aquatics features, such as beaver dams and fish barriers, were identified within the assessment area, described, and photo-documented. Global positioning system coordinates of these features were acquired using a handheld device.

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- Morphometric data were collected at transects within the assessment area and included:
 - Channel (bankfull) width (recorded to the nearest 0.1 m)
 - Wetted width (recorded to the nearest 0.1 m)
 - Water depth (recorded to the nearest 0.01 m)
- Substrates were visually assessed as a general composition at each transect location, based on substrate size listed in Bain and Stevenson (1999). Channel geomorphic units according to Bisson et al. (1981) were identified, but not mapped at the physical removal locations.
- Bank shape and stability were assessed qualitatively.

At WC-27a, fish inventory sampling consisted of a crew of two aquatic biologists using gee-style minnow traps and a Smith-Root 24R backpack electrofishing. Fish specimens that were captured were not retained and released back into the same watercourse.

The following water quality parameters were measured using an Aqua TROLL 600 multiparameter sonde:

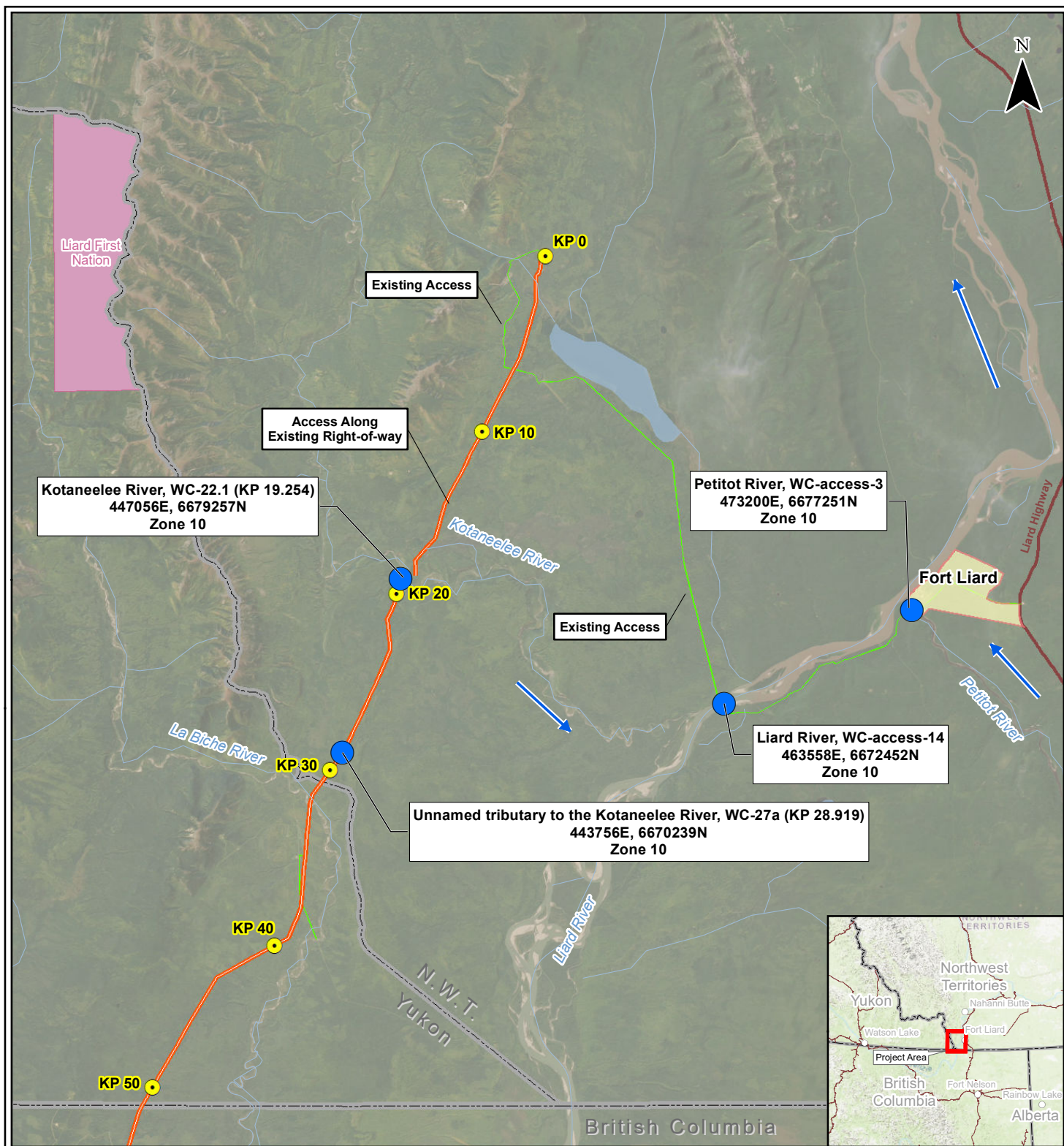
- Conductivity
- Dissolved oxygen
- pH
- Turbidity
- Water temperature

Discharge was measured within the proposed Project Footprint using a Swoffer velocity meter.

6.1.3 Fish Habitat Potential Ratings

Ratings for habitat potential were assigned for representative species that would likely be present near the Project based on results from the available desktop information. Jacobs considered sportfish species and species at risk, as well as unique habitat types and different seasons of habitat use. Habitat ratings were assigned to categorize the potential for the stream to support a species spawning, rearing, adult suitability, wintering, and migration life stages. Fish habitat potential was rated as Essential, Important, Marginal, or Unsuitable, as adapted from BC OGC (2021). General descriptions of the habitat ratings adapted from the BC OGC and DFO (1998) are as follows:

- **Essential:** Habitat that is rare or uncommon and exceptionally productive, and that has very high habitat values. This category of habitat is vital in sustaining sportfish or a species of management concern. Essential habitat is rare and is not encountered often.
- **Important:** Habitat that is used by fish for spawning, feeding, rearing, wintering, or migration that is important to the fish population but is not deemed to be essential. This category of habitat usually contains a large amount of similar habitat that is readily available to fish. Important habitat provides the necessary physical and biological requirements for a fish species and life history stage. Habitat with optimal or suboptimal habitat potential may be rated as important.
- **Marginal:** Habitat that has low productive capacity that contributes marginally to fish production. Marginal habitat provides limited habitat potential for fish life history requirements and includes habitat that is not available to fish because of natural permanent barriers, as well as habitat that is available to fish, but that supports limited fish use.
- **Unsuitable:** No suitable habitat is present for a specific fish species or a life history stage.



- | | | |
|----------------------------------|---------------------|---|
| Fish Habitat Assessment Location | Provincial Boundary | Municipal Boundary |
| Kilometre Post | Highway | First Nations (Interim Protected Lands) |
| Pointed Mountain Pipeline Route | Flow Direction | |
| Access Road | Watercourse | |
| | Water Body | |

FIGURE 6-1
PROJECT OVERVIEW - NORTHWEST TERRITORIES
WESTCOAST ENERGY INC.
POINTED MOUNTAIN PIPELINE
ABANDONMENT PROJECT



NAD 1983 UTM Zone 10N
Satellite Imagery: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community; Roads: NRCAN 2014-2015; Railway: NRCAN 2012.

SCALE: 1:275,000
0 5 10
Kilometres
(All Locations Approximate)

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

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6.2 Results

This section summarizes the results of the aquatics desktop reviews and field surveys.

6.2.1 Desktop Assessment Results

Jacobs reviewed the Project information to identify existing fish and fish habitat data. Documented fish presence near the Project was gathered from the BC Habitat Wizard database (Government of BC 2023b). The restricted activity periods (RAPs) of the watercourses were gathered via DFO's Timing Windows (DFO 2013, 2014).

6.2.1.1 Hydrology and Watershed

The Project is within the Liard River sub-basin of the Mackenzie River basin. The Liard River sub-basin is a transboundary watershed with headwaters in the southern portion of the Yukon. The Liard River sub-basin area is approximately 275,000 square kilometres (km²) and is the ninth largest in Canada (Mackenzie River Water Board 2003). The Liard River is 1,115 km long and flows southeast across the BC border, then north across the NWT border, where it eventually meets the confluence with the Mackenzie River, which eventually drains into the Arctic Ocean. The river is located in an area of discontinuous permafrost, and the region is characterized by short, dry summers and long, cold winters. Due to the amount of ice that can last for nearly six months of the year, there is dramatic spring breakups that cause flooding in downstream communities (Newton 2016). The Kotaneelee River and Petitot River are direct tributaries to the Liard River.

The Kotaneelee River originates in the Yukon and flows southeast into the NWT, where it empties into the Liard River. The Petitot River originates in northern Alberta and flows northwest through BC, into the NWT, where it empties into the Liard River near Ford Liard, NWT.

Data for the Liard River at Fort Liard hydrometric station (Station Number 10ED001) are available from 1942 to 2023 (ECCC 2023). The hydrometric station is approximately 60 km downstream from the Liard River ice bridge crossing. Highest mean monthly flows typically occur April to May and decline throughout the summer and fall (ECCC 2023).

6.2.1.2 Fish Presence

There are no previously documented fish species for the unnamed tributary to the Kotaneelee River (WC-27a). Previously documented fish species for the Kotaneelee River (WC-22.1), Petitot River (WC-access-3), and Liard River (WC-access-14), are included in Table 6-1, Table 6-2, and Table 6-3 respectively.

Table 6-1. Documented Fish Species Presence at Kotaneelee River (WC-22.1)

Common Name	Scientific Name ^a	Spawning Season	SARA Status ^b	COSEWIC Status ^b
Bull Trout	<i>Salvelinus confluentus</i>	Fall	Special Concern	Special Concern

Notes:

^a McPhail and Carveth 1993; McPhail 2007

^b Species at Risk Public Registry (Government of Canada 2023e)

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Table 6-2. Documented Fish Species Presence at Petitot River (WC-access-3)

Common Name	Scientific Name ^a	Spawning Season	SARA Status ^b	COSEWIC Status ^b
Arctic Grayling	<i>Thymallus arcticus</i>	Spring/Summer	--	--
Brook Stickleback	<i>Culaea inconstans</i>	Spring/Summer	--	--
Burbot	<i>Lota lota</i>	Winter	--	--
Finescale Dace	<i>Chrosomus neogaeus</i>	Spring/Summer	--	--
Goldeye	<i>Hiodon alosoides</i>	Spring	--	--
Lake Chub	<i>Couesius plumbeus</i>	Spring/Summer	--	--
Leopard Dace	<i>Rhinichthys falcatus</i>	Summer	--	Not at Risk
Longnose Dace	<i>Rhinichthys cartaractae</i>	Spring/Summer	--	--
Longnose Sucker	<i>Catostomus catostomus</i>	Spring/Summer	--	--
Ninespine Stickleback	<i>Gasterosteus aculeatus</i>	Summer	--	--
Northern Pike	<i>Esox lucius</i>	Spring	--	--
Slimy Sculpin	<i>Cottus cognatus</i>	Spring	--	--
Trout-perch	<i>Percopsis omiscomaycus</i>	Spring/Summer	--	--
Umatilla Dace	<i>Rhinichthys umatilla</i>	Spring	--	Threatened
Walleye	<i>Sander vitreus</i>	Spring	--	--
White Sucker	<i>Catostomus commersonii</i>	Spring	--	--

Notes:

^a McPhail and Carveth 1993; McPhail 2007

^b Species at Risk Public Registry (Government of Canada 2023e)

Table 6-3. Documented Fish Species Presence at Liard River (WC-access-14)

Common Name	Scientific Name ^a	Spawning Season	SARA Status ^b	COSEWIC Status ^b
Arctic Cisco	<i>Coregonus autumnalis</i>	Summer/Fall	Sensitive	Special Concern
Arctic Grayling	<i>Thymallus arcticus</i>	Spring/Summer	--	--
Bull Trout	<i>Salvelinus confluentus</i>	Fall	Special Concern	Special Concern
Brook Stickleback	<i>Culaea inconstans</i>	Spring/Summer	--	--
Burbot	<i>Lota lota</i>	Winter	--	--
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Fall/Winter	--	Endangered
Chum Salmon	<i>Oncorhynchus keta</i>	Summer/Fall	--	--
Dolly Varden	<i>Salvelinus malma</i>	Fall	--	--

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Common Name	Scientific Name ^a	Spawning Season	SARA Status ^b	COSEWIC Status ^b
Emerald Shiner	<i>Notropis atherinoides</i>	Summer	--	--
Finescale Dace	<i>Chrosomus neogaeus</i>	Spring/Summer	--	--
Flathead Chub	<i>Platygobio gracilis</i>	Summer	--	--
Goldeye	<i>Hiodon alosoides</i>	Spring	--	--
Inconnu	<i>Stenodus leucichthys</i>	Summer/Fall	--	--
Lake Chub	<i>Couesius plumbeus</i>	Spring/Summer	--	--
Lake Trout	<i>Salvelinus namaycush</i>	Fall	--	--
Lake Whitefish	<i>Coregonus clupeaformis</i>	Fall/Winter	--	--
Longnose Dace	<i>Rhinichthys cartaractae</i>	Spring/Summer	--	--
Longnose Sucker	<i>Catostomus catostomus</i>	Spring/Summer	--	--
Mountain Whitefish	<i>Prosopium williamsoni</i>	Fall	--	--
Northern Pearl Dace	<i>Margariscus nachtriebi</i>	Spring	--	--
Northern Redbelly Dace	<i>Chrosomus eos</i>	Spring/Summer	--	--
Northern Pike	<i>Esox lucius</i>	Spring	--	--
Pygmy Whitefish	<i>Prosopium coulterii</i>	Winter	Secure	Not at Risk
Rainbow Trout	<i>Oncorhynchus mykiss</i>	Spring	--	--
Round Whitefish	<i>Prosopium cylindraceum</i>	Fall	--	--
Slimy Sculpin	<i>Cottus cognatus</i>	Spring	--	--
Spoonhead Sculpin	<i>Cottus ricei</i>	Summer/Fall	--	Not at Risk
Spottail Shiner	<i>Notropis hudsonius</i>	Spring/Summer	--	--
Trout-perch	<i>Percopsis omiscomaycus</i>	Spring/Summer	--	--
Walleye	<i>Sander vitreus</i>	Spring	--	--
White Sucker	<i>Catostomus commersonii</i>	Spring	--	--

Notes:

^a McPhail and Carveth 1993; McPhail 2007

^b Species at Risk Public Registry (Government of Canada 2023e)

6.2.1.3 Restricted Activity Timing Window

The RAPs for the Project represent a period when there is a greater risk to fish and fish habitat from instream work activities. During the RAP, spawning fish, incubating eggs, and fry are vulnerable to direct disturbance or increases in suspended sediment in the water column. The recommended Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat in the NWT are outlined on DFO's Projects Near Water website (DFO 2014).

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Due to the presence of species that spawn during spring/summer, fall, and winter, watercourses within the NWT have a RAP of August 15 to July 15. Whitefish species, Arctic Grayling, and Bull Trout are present in the watercourse within the Yukon, so the watercourses within the Liard River Basin have RAPs of September 2 to June 14.

RAPs may be modified based on the recommendation of an aquatic specialist based on the result of data collected during field assessments, but these modifications may be subject to regulatory approval. For this Project, the RAP was determined based on the recommended provincial window, the aquatic field assessment results, existing fish distribution information, and species-specific recommendations.

6.2.2 Field Assessment Results

The following sections outline the results of Jacobs' August 23 to 26, 2023, site assessment. Appendix E provides additional information about each site.

6.2.2.1 Kotaneelee River (WC-22.1)

The proposed activity at this watercourse is to build IB-03. No fish sampling was conducted.

The Kotaneelee River at WC-22.1 is sinuous, with an occasionally confined channel. Within the assessed reach, the mean channel width and wetted width were 73.7 m and 32.3 m, respectively, with a 2.7% stream gradient. The substrate was dominated by cobble and large gravels, with some small gravels, boulders, rock, and fines. During the assessment, the stream was not wadable, so an accurate discharge could not be collected. Water depths ranged from 0.37 m to 1.10 m.

At the proposed ice bridge location, a sloping, stable, left bank composed of cobble and large gravel and a vertical, moderately unstable, right bank composed of fines and cobble were observed. Within the --right-of-way, the riparian area was a flood plain dominated by grasses and shrubs along the left bank, and a young deciduous forest along the right bank.

A full fish habitat assessment was not conducted at this site, because the primary proposed work type is an ice bridge. Fish habitat potential ratings were collected for the following species of interest:

- Arctic Grayling
- Bull Trout
- Mountain Whitefish
- White Sucker

Large, coarse substrates (i.e., cobble and large gravel) are available and provide important spawning habitat potential for fall spawning salmonids. However, substrate size will limit spawning potential for Arctic Grayling and White Sucker and are rated as marginal. Rearing habitat potential is rated as important for Arctic Grayling, Bull Trout, and Mountain Whitefish and marginal for White Sucker and is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows provide important wintering habitat potential for all species. No barriers to fish migration were identified within the assessed reach.

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6.2.2.2 Unnamed Tributary to the Kotaneelee River (WC-27a)

The proposed activity at this watercourse is to remove exposed pipe.

The unnamed tributary to the Kotaneelee River at WC-27a is irregular wandering, with an occasionally confined channel. Within the assessed reach, the mean channel width and wetted width was 2.4 m with a 2% stream gradient. The substrate was dominated by fines with small gravel and organics. The riparian area is intact and dominated by deciduous trees and shrubs. During the August site assessment, flows were very low, and the average wetted width and water depth were 0.7 m and 0.07 m, respectively. Sloping, moderately unstable banks composed of fines and organics were observed at the pipeline crossing.

A spring was identified on the right bank 65 m upstream of the exposed pipe location. Fish sampling was conducted using minnow traps and backpack electrofishing, no fish were captured or observed.

Spawning and rearing habitat potential were assessed as marginal for Arctic Grayling, Bull Trout, Mountain Whitefish, and White Sucker due low water depths, low flows, and a lack of suitable spawning gravels for the salmonid species. The lack of deep pool habitat and shallow depths provide unsuitable wintering habitat potential for all species. No barriers to fish migration were identified within the assessed reach, but low water depth and flow provide low migration potential for all fish species.

6.2.2.3 Petitot River (WC-access-3)

The proposed activity at this watercourse is to build IB-01 for access. No fish sampling was conducted.

The Petitot River at WC-access-3, within the assessed reach, is a sinuous, frequently confined channel. Within the assessed reach, the mean channel width and wetted width was 158 m and 123 m with a 1.0% stream gradient. The substrate was dominated by cobble and boulder with some large gravel, small gravel, rock, and fines. During the assessment the stream was not wadable, so an accurate discharge could not be collected, with water depths ranging from 0.43 m to 1.0 m.

At the proposed ice bridge location, a sloping, moderately unstable, left bank composed of cobble and large gravel and a sloping, moderately stable, right bank composed of boulder and cobble were observed.

A full fish habitat assessment was not conducted at this site, as the primary proposed work type is an ice bridge. Suitable coarse substrates (i.e., cobble and large and small gravel) provide important spawning habitat potential for Arctic Grayling, Bull Trout, and Mountain Whitefish, but marginal spawning habitat potential for White Sucker. Rearing habitat potential is important for Arctic Grayling and Bull Trout, but marginal for Mountain Whitefish and White Sucker, and is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows provide important wintering habitat potential for all species and no barriers to fish migration were identified within the assessed reach.

6.2.2.4 Liard River (WC-access-14)

The proposed activity at this watercourse is to build IB-02 for access. No fish sampling was conducted.

The Liard River at WC-access-14, within the assessed reach, is a sinuous, occasionally confined channel. Within the assessed reach, the mean channel width and wetted width was 500 m and 413 m, respectively. The substrate was dominated by cobble with fines and large gravel. The watercourse was not wadable, so no water depths were taken. The crew observed small-bodied fish species in the watercourse margins.

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At IB-02, the banks were vertical and moderately unstable composed of fines and cobble. The riparian area along both banks was vegetated with shrubs and deciduous trees. On the left bank there was infrastructure for a floating barge and dock system that may impact the riparian area.

A full fish habitat assessment was not conducted at this site. Habitat was uniform within the assessed reach and not limiting for any life stage. Deep run habitat with large substrates provide important spawning habitat potential for mountain whitefish; however, substrate size may limit spawning potential for Arctic Grayling, Bull Trout and White Sucker and they were rated as marginal. Rearing habitat potential important for mountain whitefish and marginal for Arctic Grayling, Bull Trout, and White Sucker and is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows provide marginal to important wintering habitat potential. No barriers to fish migration were identified within the assessed reach.

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7. Wildlife and Wildlife Habitat

This section summarizes the wildlife and wildlife habitat desktop review and field surveys that occurred in the NWT in 2021 to inform the ESA and in 2023 to inform the supplemental ESA.

7.1 Methods

The following subsections describe the methods used during the wildlife desktop review and field surveys.

7.1.1 Desktop Review

Before the wildlife field reconnaissance was conducted, desktop reviews were conducted to obtain information on the existing wildlife habitat conditions and potential for wildlife species at risk and species of special status to occur within the Wildlife and Wildlife Habitat LSA in the NWT. Publicly available data sources (e.g., NWT Species and Habitat Viewer) were searched for wildlife constraints within the Wildlife and Wildlife Habitat LSA of the NWT. The results of the desktop reviews were used to focus field data collection.

Desktop reviews were completed to assess if the Wildlife and Wildlife Habitat LSA interacts with any of the following in the NWT:

- NWT Biodiversity Species Distribution and Species at Risk (GNWT 2023a, b)
- NWT Delineated Bison Herd Ranges (GNWT 2023b)
- NWT Important Wildlife Areas (IWAs) (GNWT 2023a, b)
- Caribou Ranges (GNWT 2023b)
- Parks and Protected Areas (GNWT 2023b)
- Federally identified critical habitat for wildlife (Government of Canada 2023b)
- Species at Risk Public Registry (Government of Canada 2023e)
- Migratory Bird Sanctuaries (Government of Canada 2023a)
- Migratory bird nesting periods (Government of Canada 2023c)
- National Wildlife Areas (Government of Canada 2023d)
- Important Bird Areas (Bird Studies Canada and Nature Canada 2023)
- Ramsar wetlands (Bureau of the Convention on Wetlands 2014)
- Western Hemisphere Shorebird Reserve Network (WHSRN) sites (WHSRN 2021)
- World Biosphere Reserves (CBRA n.d.)

To identify wildlife species at risk and species of special status that have potential to occur within the Wildlife and Wildlife Habitat LSA in the NWT, a search of Endangered and Threatened species currently listed under the *Species at Risk (NWT) Act* (GNWT 2022) was conducted. The list was refined based on known species ranges, species habitat requirements, suitability of available habitat within the Wildlife and Wildlife Habitat LSA, professional judgment supported by scientific literature, and consideration of the winter construction schedule.

For this assessment, wildlife species at risk refers to species listed federally as endangered, threatened, or special concern under Schedule 1 of the *Species at Risk Act (SARA)* (Government of Canada 2023) or the *Species at Risk (NWT) Act*. Wildlife species of special status includes:

- Species listed as endangered, threatened, or special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (2023)

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- Species whose General Status Rank is listed as Sensitive, May Be at Risk, At Risk, or Extirpated under the *Species at Risk (NWT) Act* (GWNT 2021, 2022)

7.1.2 Field Data Collection

Wildlife fieldwork was conducted from August 4 to 5, 2021 and May 3 to 4, 2023, using a combination of aerial and ground-based reconnaissance-level wildlife surveys, wildlife feature searches, and wildlife habitat assessments.

Helicopter flyovers in 2021 and 2023 used an A-Star helicopter equipped with rear bubble windows. Aerial reconnaissance was conducted over the pipeline right-of-way, access routes, and the physical abandonment sites while flying at a relatively constant speed at a height of approximately 100 m aboveground and visually scanning for wildlife and wildlife habitat out to 1 km. Flying height and speed were reduced briefly in areas where landing was not possible to gather photos and take notes on site conditions. Aerial survey data gathered during the 2021 overflight was limited by adverse weather including fog and periods of heavy rain. In 2023, the additional temporary access road (Fort Liard to North Liard River Crossing), from Petitot ice bridge (IB-01) to North Liard ice bridge (IB-02), was also flown.

Foot reconnaissance was conducted at select locations within the Project Footprint and out to 30 m. Habitat out to 100 m was visually scanned using binoculars for raptor nests and other important wildlife habitat features that might warrant protection (e.g., dens and mineral licks), where possible. In 2021, ground-based surveys in the NWT were completed at select locations along the pipeline right-of-way and at the physical abandonment sites (PM-1, PM-2, PM-3, and PM-4). In 2023, ground-based field reconnaissance was conducted at the new physical abandonment site PM-4A and additional workspace at PM-4.

All wildlife observations (visual or auditory), evidence of wildlife use, and wildlife habitat features were documented. When possible, information recorded for each observation included the date, time, species, number, age, sex, general habitat description and Global Positioning System location.

Incidental wildlife observations recorded during field assessments for other disciplines (e.g., aquatics) have also been noted and included in the wildlife and wildlife habitat results.

7.2 Results

This section summarizes the results of the wildlife desktop reviews and field surveys.

7.2.1 Desktop Review

The Wildlife and Wildlife Habitat LSA in the NWT is not located within:

- Migratory Bird Sanctuaries (Government of Canada 2023a)
- National Wildlife Areas (Government of Canada 2023d)
- Important Bird Areas (Bird Studies Canada and Nature Canada 2023)
- Ramsar wetlands (Bureau of the Convention on Wetlands 2014)
- WHSRN sites (WHSRN 2021)
- World Biosphere Reserves (CBRA n.d.)
- Parks and Protected Areas (GNWT 2023b)

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Table 7-1 lists wildlife species at risk or species with special status with potential to interact with the Project. Because abandonment activities will take place in the winter, there is no anticipated Project interaction with migratory birds or amphibians.

Table 7-1. Wildlife Species at Risk or Species with Special Status with Potential to Interact with the Project

Common Name	Scientific Name	Federal Designation ^{a,b}	NWT Territorial Designation ^c
Grizzly bear	<i>Ursus arctos</i>	Special Concern ^{a,b}	Sensitive
Little brown myotis	<i>Myotis lucifugus</i>	Endangered ^{a,b}	At Risk
Northern myotis	<i>Myotis septentrionalis</i>	Endangered ^{a,b}	At Risk
Wolverine	<i>Gulo gulo luscus</i>	Special Concern ^{a,b}	Sensitive
Wood bison	<i>Bos bison athabasca</i>	Threatened ^a , Special Concern ^b	At Risk
Woodland caribou, boreal population	<i>Rangifur tarandus</i> <i>pop. 14</i>	Threatened ^{a,b}	At Risk
Woodland caribou, northern mountain population	<i>Rangifur tarandus</i> <i>pop. 15</i>	Special Concern ^{a,b}	At Risk

^a Listed as Endangered, Threatened, or Special Concern under Schedule 1 of SARA (Government of Canada 2023e).

- Endangered: A species that is facing imminent extirpation or extinction.
- Threatened: A species that is likely to become an Endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
- Special Concern: A species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats.

^b Designated as Endangered, Threatened, or Special Concern by COSEWIC (2023).

- Endangered: A species facing imminent extirpation or extinction.
- Threatened: A species that is likely to become an Endangered species if nothing is done to reverse the factors leading to its extirpation or extinction.
- Special Concern: A species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats.

^c NWT territorial designations include species listed as Sensitive, May Be at Risk, At Risk, or Extirpated under the *Species at Risk (NWT) Act* (GNWT 2021, 2022).

Note:

Status designations are only listed for the previously noted designations. Where the status is denoted by "--," the previously noted territorial or federal status designations are not applicable for the species.

Table 7-2 summarizes desktop findings of wildlife considerations for the physical abandonment sites and expanded workspaces. The Project Footprint interacts with the boreal caribou population (NT-1 herd), which is considered critical habitat (Government of BC 2023a and ECCC 2020). The Project Footprint overlaps with trace occurrences of northern mountain caribou population, but not their identified range (GNWT 2023b, EC 2012).

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Table 7-2. Wildlife Desktop Considerations

Project Footprint Component	Wildlife Considerations
PM-1	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020) and the Nahanni wood bison range, a disease-free population in the NWT (GNWT 2023b).
PM-2	Within the Nahanni wood bison range, a disease-free population in the NWT, and IWAs for moose and western toad (GNWT 2023b).
PM-3	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020), the Nahanni wood bison range, a disease-free population in the NWT, and IWAs for moose and western toad (GNWT 2023b).
PM-4	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020), the Nahanni wood bison range, a disease-free population in the NWT, and IWAs for moose and western toad (GNWT 2023b).
PM-4A	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020), the Nahanni wood bison range, a disease-free population in the NWT and an IWA for moose (GNWT 2023b).
Fort Liard to North Liard River Crossing Access (including Ice Bridges IB-01 over the Petitot River and IB-02 over the Liard River)	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020) and IWAs for moose, beaver (<i>Castor canadensis</i>), western toad (<i>Anaxyrus boreas</i>), and wood bison (GNWT 2023b)
Pipeline right-of-way (including Ice Bridge IB-03 over the Kitanelee River)	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020) and IWAs for beaver, lynx (<i>Lynx canadensis</i>), moose, western toad, and wood bison (disease free).
North Work Camp Site Locations 1 and 2	Within the NT-1 boreal woodland caribou range (Government of Canada 2023b; ECCC 2020) and IWAs for beaver, moose, western toad, and wood bison (GNWT 2023b).

7.2.2 Field Data Collection

The Project Footprint consists mainly of previously disturbed areas (e.g., cleared pipeline and access rights-of-way, and oil/gas infrastructure) and the existing right-of-way is dominated by tame vegetation species (both native and agronomic) and in some areas aspen dominated regrowth. Forested habitat encountered adjacent to the Project is a mosaic of upland and lowland areas dominated by deciduous mixed wood.

Table 7-3 provides a summary of wildlife habitat conditions and any wildlife habitat features identified during the field assessments within the physical abandonment sites in the NWT.

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All wildlife observations (including visual, auditory, and signs of use) that were recorded during the 2021 and 2023 wildlife surveys, as well as a photolog, are provided in Appendix F. In 2021, two species at risk were observed in the field; wood bison (listed as Threatened under Schedule 1 of SARA and Special Concern by COSEWIC and At Risk under the *Species at Risk (NWT) Act*) and peregrine falcon (*Falco peregrinus*, listed as Special Concern under Schedule 1 of SARA and by COSEWIC, and Sensitive under the *Species at Risk (NWT) Act*). Wood bison were visually observed along the entire Project Footprint and sign (tracks, scat, wallows, rubs) of bison was the dominant wildlife sign at infrastructure sites. No species at risk were observed in 2023. Caribou or caribou sign (i.e., tracks, scat) were not observed in 2021 or 2023.

A large open water wetland complex located along the right-of-way footprint south of PM-1 was identified during the overflight in 2021 as an area of potential waterbird concentration. However, as the abandonment activities are scheduled to occur during the winter season, Project interactions with waterbirds are not anticipated. No amphibian species or breeding sites were observed within or near the footprint of any of the sites in the NWT in 2021 or 2023.

In August 2023, beaver activity was observed near PM-4 and PM-4a. A potential bear den was identified incidentally during aquatics field assessments in 2023, located approximately 113 m to the south of PM-4A.

Table 7-3. Wildlife Habitat Conditions and Features Identified During Fieldwork

Site	Habitat Description	Wildlife Habitat Features
PM-1	Habitat directly surrounding the site consists of cleared industrial area with grass and gravel dominant. Large open grass dominated area to the northeast. Forest surrounding the site consists of aspen dominated mix wood. Large open water wetland complex located south. Heavy bison sign.	None identified
PM-2	Habitat directly surrounding the site consists of regenerating right-of-way with aspen and alder. Surrounding forest is dominated by mature aspen with scattered spruce. Bison trail and sign.	None identified
PM-3	Habitat directly surrounding the site consists of open grass right-of-way surrounded by mixed wood mature forest consisting of aspen, birch, and spruce. Heavy bison sign.	None identified
PM-4	Habitat directly surrounding the site consists of a low, wet riparian zone with open areas of wet soil. The area surrounding the site consisted of willow thickets with larger trees toward the river. Cliffs located southeast of the site along the river. Heavy bison sign.	A beaver lodge is located within 50 m of the proposed facility abandonment (Photo 7, Appendix F)
PM-4A	Habitat directly surrounding the site consists of a slow-moving watercourse adjacent to shrubby wetlands	A bear den is located approximately 113 m to the south of PM-4A (Photo 8, Appendix F) Old beaver den activity is adjacent to PM-4A.

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8. Summary

The data collected for vegetation, wetlands, aquatics, wildlife, and wildlife habitat were used to inform the ESA and Supplemental ESA of potential impacts of the Project. Information was also used to support the development of technically and economically feasible site-specific mitigation measures to avoid or reduce potential impacts of the Project on the environment detailed in the Environmental Protection Plan (EPP). Site-specific features and associated mitigation measures have been included in the Project Environmental Site Information Sheets for 2022 ([CER A8A6U4](#)) and 2023 ([CER A8T1K3](#), Appendix B).

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Appendix A.

Weed Distribution and Density Codes



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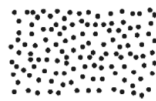
Table A-1. British Columbia Ministry of Forests - Weed Density Distribution Classes

Class	Density Distribution	Guidelines for Field Assessment ^a			
		Number of Plants in 20 by 20 m Area (Low Shrubs, Herbs, and Mosses)	Number of Plants per Hectare in 100 by 100 m Area (Tall Shrubs and Trees)	Diagram	Approximate % Cover Range
1	Rare individual, a single occurrence	1	< 5	.	1-5
2	A few sporadically occurring individuals	2-5	5-50	. . .	1-5
3	A single patch or clump of species	1 patch (occupying an area smaller than one quadrant of the plot)	Variable (3 patches)		1-10
4	Several sporadically occurring individuals	≥ 6	> 50		5-10
5	A few patches or clumps of species	2-5 patches (each occupying an area smaller than one quadrant of the plot)	Variable (3-10 patches)		10-30
6	Several well-spaced patches or clumps	≥ 6 patches (each occupying less than one quadrant of the plot)	Variable (10 - many disjunct patches)		10-30
7	Continuous uniform occurrence of well-spaced individuals	Many	Many		10-30
8	Continuous occurrence of a species with a few gaps in the distribution	Many	Many (continuous matrix formed by species crowns with some openings)		30-60

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Class	Density Distribution	Guidelines for Field Assessment ^a			
		Number of Plants in 20 by 20 m Area (Low Shrubs, Herbs, and Mosses)	Number of Plants per Hectare in 100 by 100 m Area (Tall Shrubs and Trees)	Diagram	Approximate % Cover Range
9	Continuous dense occurrence of a species	Many	Many		> 60

^a The distribution code is determined over a sufficiently large area to account for normal variation in distribution pattern.

Source: Luttmerding et al., 1990.

Note:

The density distribution class is determined over a sufficiently large area to account for normal variation in distribution pattern.

> = greater than

≥ = greater than or equal to

< = less than

m = metre(s)

Table A-2. British Columbia Invasive Alien Plant Program – Weed Density Codes

Density Code	Definition
1	< 1 plant/m ²
2	2-5 plants/m ²
3	6-10 plants/m ²

Source: British Columbia Ministry of Forests and Range, 2010.

m² = square metre(s)

References

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Appendix B. Observed Species List



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Table B-1. Scientific and Common Names of Observed Species

Scientific Name ^{a,b}	Common Name
Trees	
<i>Abies lasiocarpa</i>	subalpine fir
<i>Betula neoalaskana</i>	Alaska paper birch
<i>Larix laricina</i>	tamarack
<i>Picea glauca</i>	white spruce
<i>Picea mariana</i>	black spruce
<i>Populus balsamifera</i>	balsam poplar
<i>Populus tremuloides</i>	trembling aspen
Shrubs	
<i>Alnus alnobetula</i> ssp. <i>crispa</i>	green alder
<i>Alnus alnobetula</i> ssp. <i>sinuata</i>	Sitka alder
<i>Alnus incana</i> ssp. <i>tenuifolia</i>	mountain alder
<i>Amelanchier alnifolia</i> var. <i>alnifolia</i>	prairie saskatoon
<i>Betula glandulosa</i>	dwarf birch
<i>Cornus sericea</i>	red-osier dogwood
<i>Rhododendron groenlandicum</i>	Labrador-tea
<i>Ribes oxycanthoides</i> var. <i>oxycanthoides</i>	northern gooseberry
<i>Rosa acicularis</i> ssp. <i>sayi</i>	prickly rose
<i>Rubus idaeus</i> ssp. <i>strigosus</i>	red raspberry
<i>Salix arbusculoides</i>	northern bush willow
<i>Salix bebbiana</i>	Bebb's willow
<i>Salix drummondiana</i>	Drummond's willow
<i>Salix interior</i>	narrow-leaf willow
<i>Salix maccalliana</i>	MacCalla's willow
<i>Salix myrtillofolia</i>	bilberry willow
<i>Salix pedicellaris</i>	bog willow
<i>Salix petiolaris</i>	meadow willow
<i>Salix proluxa</i>	Mackenzie willow
<i>Salix pyrifolia</i>	balsam willow
<i>Salix scouleriana</i>	Scouler's willow
<i>Shepherdia canadensis</i>	soopolallie
<i>Sorbus scopulina</i>	western mountain ash

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Scientific Name ^{a,b}	Common Name
<i>Vaccinium vitis-idaea ssp. minus</i>	lingonberry
<i>Viburnum edule</i>	highbush-cranberry
Forbs and dwarf shrubs^c	
<i>Achillea alpina ssp. multiflora</i>	Siberian yarrow
<i>Achillea borealis</i>	woolly yarrow
<i>Actaea rubra</i>	baneberry
<i>Alisma plantago-aquatica</i>	European water-plantain
<i>Alopecurus aequalis var. aequalis</i>	little meadow-foxtail
<i>Aquilegia sp.</i>	Columbine sp.
<i>Aralia nudicaulis</i>	wild sarsaparilla
<i>Arctous rubra</i>	red bearberry
<i>Arnica chamissonis</i>	meadow arnica
<i>Astragalus cicer</i>	chick-pea milk-vetch
<i>Beckmannia syzigachne</i>	American sloughgrass
<i>Betula occidentalis</i>	water birch
<i>Bidens cernua</i>	nodding beggarticks
<i>Botrypus virginianus</i>	rattlesnake fern
<i>Chamaenerion angustifolium</i>	fireweed
<i>Chrysosplenium tetrandrum</i>	northern golden-saxifrage
<i>Cicuta maculata var. angustifolia</i>	spotted cowbane
<i>Cinna latifolia</i>	nodding wood-reed
<i>Circaea alpina ssp. alpina</i>	enchanter's-nightshade
<i>Comarum palustre</i>	marsh cinquefoil
<i>Cornus canadensis</i>	bunchberry
<i>Crepis tectorum</i>	annual hawksbeard
<i>Delphinium glaucum</i>	tall larkspur
<i>Epilobium ciliatum ssp. ciliatum</i>	purple-leaved willowherb
<i>Epilobium ciliatum ssp. glandulosum</i>	purple-leaved willowherb
<i>Equisetum arvense</i>	common horsetail
<i>Equisetum fluviatile</i>	swamp horsetail
<i>Equisetum sylvaticum</i>	wood horsetail
<i>Fragaria virginiana ssp. glauca</i>	wild strawberry

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Scientific Name ^{a,b}	Common Name
<i>Galium boreale</i>	northern bedstraw
<i>Galium trifidum</i> ssp. <i>trifidum</i>	small bedstraw
<i>Galium triflorum</i>	sweet-scented bedstraw
<i>Gentianella amarella</i> ssp. <i>acuta</i>	northern gentian
<i>Geocaulon lividum</i>	false toad-flax
<i>Geum aleppicum</i>	yellow avens
<i>Geum macrophyllum</i> var. <i>macrophyllum</i>	large-leaved avens
<i>Lactuca biennis</i>	tall blue lettuce
<i>Lathyrus ochroleucus</i>	creamy peavine
<i>Lemna trisulca</i>	ivy-leaved duckweed
<i>Lemna turionifera</i>	Turion duckweed
<i>Leymus innovatus</i> ssp. <i>innovatus</i>	fuzzy-spiked wildrye
<i>Linnaea borealis</i> ssp. <i>borealis</i>	twinflor
<i>Maianthemum canadense</i>	wild lily-of-the-valley
<i>Maianthemum trifolium</i>	three-leaved false Solomon's-seal
<i>Matteuccia struthiopteris</i> var. <i>pensylvanica</i>	ostrich fern
<i>Mentha canadensis</i>	Canada mint
<i>Mertensia paniculata</i> var. <i>paniculata</i>	tall bluebells
<i>Mitella nuda</i>	common mitrewort
<i>Muhlenbergia</i> sp.	Muhly sp.
<i>Myrica gale</i>	sweet gale
<i>Parnassia palustris</i>	northern grass-of-Parnassus
<i>Petasites frigidus</i> var. <i>frigidus</i>	sweet coltsfoot
<i>Petasites frigidus</i> var. <i>palmatus</i>	sweet coltsfoot
<i>Petasites frigidus</i> var. <i>sagittatus</i>	arrow-leaved coltsfoot
<i>Plantago major</i>	common plantain
<i>Platanthera dilatata</i> var. <i>dilatata</i>	fragrant white rein orchid
<i>Polemonium occidentale</i>	western polemonium
<i>Potentilla norvegica</i>	Norwegian cinquefoil
<i>Pyrola asarifolia</i> ssp. <i>asarifolia</i>	pink wintergreen
<i>Ranunculus macounii</i>	Macoun's buttercup
<i>Ribes glandulosum</i>	skunk currant

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Scientific Name ^{a,b}	Common Name
<i>Ribes lacustre</i>	black gooseberry
<i>Ribes triste</i>	red swamp currant
<i>Rubus arcticus</i> ssp. <i>acaulis</i>	nagoonberry
<i>Rubus chamaemorus</i>	cloudberry
<i>Rubus pubescens</i>	dwarf red raspberry
<i>Scutellaria galericulata</i>	marsh skullcap
<i>Sium suave</i>	hemlock water-parsnip
<i>Solidago canadensis</i>	Canada goldenrod
<i>Symphyotrichum ciliatum</i>	rayless alkali aster
<i>Symphyotrichum ciliolatum</i>	Lindley's aster
<i>Symphyotrichum puniceum</i> var. <i>puniceum</i>	purple-stemmed aster
<i>Thalictrum venulosum</i>	veiny meadowrue
<i>Trifolium hybridum</i>	alsike clover
<i>Trifolium pratense</i>	red clover
<i>Typha latifolia</i>	common cattail
<i>Vicia americana</i>	American vetch
Grasses, sedges, and rushes	
<i>Agrostis scabra</i>	hair bentgrass
<i>Bromus ciliatus</i>	fringed brome
<i>Calamagrostis canadensis</i> var. <i>canadensis</i>	bluejoint reedgrass
<i>Calamagrostis purpurascens</i>	purple reedgrass
<i>Carex bebbii</i>	Bebb's sedge
<i>Carex foenea</i>	bronze sedge
<i>Carex utriculata</i>	beaked sedge
<i>Dactylis glomerata</i>	orchard grass
<i>Elymus repens</i>	quackgrass
<i>Elymus trachycaulus</i> ssp. <i>subsecundus</i>	slender wheatgrass
<i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>	slender wheatgrass
<i>Glyceria borealis</i>	northern mannagrass
<i>Hordeum jubatum</i> ssp. <i>jubatum</i>	foxtail barley
<i>Luzula parviflora</i> ssp. <i>parviflora</i>	small-flowered wood-rush
<i>Poa palustris</i>	fowl bluegrass

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Scientific Name ^{a,b}	Common Name
<i>Scirpus microcarpus</i>	small-flowered bulrush
Bryophytes and lichens	
<i>Abietinella abietina</i>	None
<i>Hylocomium splendens</i>	step moss
<i>Peltigera aphthosa</i>	silver-edge pelt
<i>Peltigera canina</i>	felt pelt
<i>Pleurozium schreberi</i>	red-stemmed feathermoss
<i>Polytrichum juniperinum</i>	None
<i>Ptilium crista-castrensis</i>	knight's plume
Weeds and Agronomics^d	
<i>Achillea millefolium</i>	yarrow
<i>Hieracium umbellatum</i>	narrow-leaved hawkweed
<i>Leucanthemum vulgare</i>	oxeye daisy
<i>Medicago sativa ssp. falcata</i>	alfalfa
<i>Melilotus albus</i>	white sweet-clover
<i>Melilotus officinalis</i>	yellow sweet-clover
<i>Phleum pratense ssp. pratense</i>	common timothy
<i>Rhinanthus minor ssp. minor</i>	yellow rattle
<i>Sonchus arvensis ssp. arvensis</i>	perennial sow-thistle
<i>Sonchus asper</i>	prickly sow-thistle
<i>Taraxacum officinale</i>	common dandelion
<i>Trifolium repens</i>	white clover
<i>Tripleurospermum inodorum</i>	Scentless chamomile (scentless mayweed)
<i>Urtica dioica ssp. dioica</i>	stinging nettle

^a Some scientific names contain abbreviations, which are defined as follows:

^b Nomenclature follows the British Columbia (BC) Conservation Data Centre (CDC) Species and Ecosystems Explorer (BC CDC 2023).

^c **Bold** font denotes culturally important plant species for the Acho Dene Koe First Nation.

^d The status of species as native or not is according to the BC CDC Species and Ecosystems Explorer (BC CDC 2023).

Notes:

ssp. = subspecies

var. = varietas: variety

Reference:

British Columbia Conservation Data Centre (BC CDC). 2023 BC Species and Ecosystems Explorer. B.C. Ministry of Environment. Victoria, B.C. Website: <http://a100.gov.bc.ca/pub/eswp/>. Accessed August 2023.

Appendix C.

Observed Vegetation Features Photolog



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C.1 Observed Vegetation Features



Photo 1. PM-4A exposure site, shrub-dominated area. Photo direction east.

Taken by: Neil Webster

Date taken: July 31, 2023



Photo 2. PM-4A exposure site, graminoid-dominated portion closer to the wetland with mature trees at edges. Photo direction north.

Taken by: Neil Webster

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Photo 3. PM-3 shrub-dominated site. Photo direction north.

Taken by: Neil Webster

Date taken: August 1, 2023



Photo 4. PM-4 shrub-dominated site. Photo direction south.

Taken by: Neil Webster

Date taken: August 1, 2023

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Photo 5. View south of forest land cover on pipeline right-of-way approximately 392 m south of PM-4

Taken by: Neil Webster

Date taken: August 5, 2021



Photo 6. View north of shrub land cover at PM-4. The shrub land cover is due to a combination of the construction and maintenance of the pipeline and beaver activity.

Taken by: Neil Webster

Date taken: August 5, 2021

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Photo 7. View south of disturbed land cover at PM-1.

Taken by: Neil Webster

Date taken: August 4, 2021



Photo 8. View south of disturbed land cover at PM-1.

Taken by: Neil Webster

Date taken: August 5, 2021

Appendix D.

Potential Rare Vascular Plants and Rare Ecological Communities



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Table D-1. Potential Rare Vascular Plant Species in the Northwest Territories

Scientific Name	Common Name	NWT Designation ^a	NWT General Species Ranking ^b	Federal/Global Designations ^{c,d}
<i>Acorus americanus</i> (<i>Acorus calamus</i>)	Several Vein Sweetflag (Rat Root)	S2	May Be At Risk	--
<i>Agastache foeniculum</i>	Blue Giant Hyssop	S2	May Be At Risk	--
<i>Agoseris glauca</i>	Pale False Dandelion	S3	Sensitive	--
<i>Agrostis exarata</i>	Spike Bentgrass	S3	Sensitive	--
<i>Alisma triviale</i> (<i>Alisma plantago-aquatica</i> var. <i>americanum</i>)	Northern Water Plantain	S3S4	Sensitive	--
<i>Almutaster pauciflorus</i> (<i>Aster pauciflorus</i>)	Marsh Alkali Aster	S2	May Be At Risk	--
<i>Anaphalis margaritacea</i>	Pearly Everlasting	S3	Sensitive	--
<i>Angelica lucida</i> (<i>Coelopleurum gmelinii</i>)	Seaside Angelica	S2	May Be At Risk	--
<i>Arabidopsis arenicola</i> (<i>Arabis arenicola</i>)	Arctic Cress	S3	Sensitive	--
<i>Arenaria longipedunculata</i>	Long-stemmed Sandwort	S3	Sensitive	--
<i>Arethusa bulbosa</i>	Dragon's Mouth	S2	May Be At Risk	--
<i>Arnica latifolia</i>	Mountain Arnica	S3	Sensitive	--
<i>Artemisia alaskana</i>	Alaska Sagebrush	S2	May Be At Risk	--
<i>Artemisia dracunculus</i>	Dragon Sagebrush	S2	May Be At Risk	--
<i>Artemisia ludoviciana</i>	White Sagebrush	S2	May Be At Risk	--
<i>Asplenium viride</i> (<i>Asplenium trichomanes-ramosum</i>)	Green Spleenwort	S2	May Be At Risk	--
<i>Astragalus canadensis</i>	Canadian Milk-vetch	S3	Sensitive	--
<i>Athyrium filix-femina</i>	Subarctic Lady fern	S2S3	Sensitive	--
<i>Atriplex dioica</i> (<i>Atriplex subspicata</i>)	Thick-leaved Orache	S2	May Be At Risk	--

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Scientific Name	Common Name	NWT Designation ^a	NWT General Species Ranking ^b	Federal/Global Designations ^{c,d}
<i>Atriplex gmelinii</i>	Gmelin's Orache	S2	May Be At Risk	--
<i>Blysmopsis rufa</i> (<i>Blysmopsis rufus</i> , <i>Blysmus rufus</i>)	Red Clubrush	S3S4	Sensitive	--
<i>Boechera calderi</i> (<i>Arabis calderi</i>)	Calder's Rockcress	S2	May Be At Risk	--
<i>Bolboschoenus maritimus</i> (<i>Schoenoplectus maritimus</i>)	Saltmarsh Bulrush	S2	May Be At Risk	--
<i>Botrychium minganense</i>	Mingan Moonwort	S2	May Be At Risk	--
<i>Botrychium pinnatum</i>	Northwestern Moonwort	S2	May Be At Risk	--
<i>Botrychium spathulatum</i>	Spatulate Moonwort	S2	May Be At Risk	--
<i>Botrypus virginianus</i> (<i>Botrychium virginianum</i>)	Rattlesnake Fern	S3	Sensitive	--
<i>Braya pilosa</i>	Hairy Braya (Hairy Rockcress, Pilose Braya)	S2	At Risk	Endangered
<i>Calamagrostis deschampsoides</i>	Circumpolar Reed Grass	S3	Sensitive	--
<i>Cardamine microphylla</i>	Small-leaved Bittercress	S2	May Be At Risk	--
<i>Cardamine parviflora</i>	Small-flowered Bittercress	S2	May Be At Risk	--
<i>Cardamine pensylvanica</i>	Pennsylvania Bittercress	S3S4	Sensitive	--
<i>Cardamine umbellata</i>	Few-seeded Bittercress	S3	Sensitive	--
<i>Carex adelostoma</i> (<i>Carex morrisseyi</i>)	Circumpolar Sedge	S3	Sensitive	--
<i>Carex bebbii</i>	Bebb's Sedge	S3	Sensitive	--
<i>Carex crawfordii</i>	Crawford's sedge	S3	Sensitive	--
<i>Carex duriuscula</i> (<i>Carex stenophylla</i>)	Needle-leaved Sedge	S2	May Be At Risk	--
<i>Carex eleusinoidea</i>	Goose-grass Sedge	S3	Sensitive	--

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Scientific Name	Common Name	NWT Designation ^a	NWT General Species Ranking ^b	Federal/Global Designations ^{c,d}
<i>Carex filifolia</i> (<i>Carex elyniformis</i>)	Thread-leaved Sedge	S3	Sensitive	--
<i>Carex heleonastes</i>	Hudson Bay Sedge	S3S4	Sensitive	--
<i>Carex hoodii</i>	Hood's Sedge	S2	May Be At Risk	--
<i>Carex lasiocarpa</i>	Slender Sedge	S3	Sensitive	--
<i>Carex laxa</i>	Weak Sedge	S2	May Be At Risk	--
<i>Carex livida</i>	Livid Sedge	S3S4	Sensitive	--
<i>Carex loliacea</i>	Rye-grass Sedge	S3	Sensitive	--
<i>Carex mackenziei</i>	Mackenzie's Sedge	S2	May Be At Risk	--
<i>Carex micropoda</i> (<i>Carex pyrenaica</i> ssp. <i>micropoda</i>)	Small-rooted Sedge	S3	Sensitive	--
<i>Carex oligosperma</i>	Few-seeded Sedge	S2	May Be At Risk	--
<i>Carex peckii</i>	Peck's Sedge	S3	Sensitive	--
<i>Carex prairea</i>	Prairie Sedge	S2	May Be At Risk	--
<i>Carex retrorsa</i>	Retorse Sedge	S2	May Be At Risk	--
<i>Carex richardsonii</i>	Richardson's Sedge	S3	Sensitive	--
<i>Carex sychnocephala</i>	Many-headed Sedge	S3	Sensitive	--
<i>Cerastium maximum</i>	Great Chickweed	S2	May Be At Risk	--
<i>Ceratophyllum demersum</i>	Common Hornwort	S3	Sensitive	--
<i>Chamaerhodos erecta</i> (<i>Chamaerhodos</i> ssp. <i>nuttallii</i>)	Rose Chamaerhodos	S2	May Be At Risk	--
<i>Chimaphila umbellata</i>	Pipsissewa (Common Wintergreen)	S2	May Be At Risk	--
<i>Chrysosplenium wrightii</i>	Wright Golden Saxifrage	S3	Sensitive	--
<i>Cirsium drummondii</i>	Drummond Thistle	S3	Sensitive	--

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Scientific Name	Common Name	NWT Designation ^a	NWT General Species Ranking ^b	Federal/Global Designations ^{c,d}
<i>Cirsium foliosum</i>	Leafy Thistle	S2	May Be At Risk	--
<i>Claytonia megarhiza</i>	Alpine Spring Beauty	S2	May Be At Risk	--
<i>Coleanthus subtilis</i>	Moss Grass	S2	May Be At Risk	--
<i>Comastoma tenellum</i> (<i>Gentianella tenella</i>)	Dane's Gentian	S2	May Be At Risk	--
<i>Corispermum hookeri</i> (<i>Corispermum hyssopifolium</i>)	Hooker's Bugseed	S3	Sensitive	--
<i>Cornus suecica</i>	Swedish Dogwood	S2	May Be At Risk	--
<i>Crassula aquatica</i> (<i>Tillaea aquatica</i>)	Water Pigmyweed	S2	May Be At Risk	--
<i>Cryptogramma sitchensis</i>	Alaska Parsley-fern	S2	May Be At Risk	--
<i>Cryptogramma stelleri</i>	Slender Rock-brake	S2	May Be At Risk	--
<i>Cystopteris montana</i>	Mountain Bladder-fern	S3	Sensitive	--
<i>Danthonia spicata</i>	Poverty Wild Oat Grass	S3	Sensitive	--
<i>Deschampsia mackenzieana</i>	Mackenzie Hairgrass	S2	May Be At Risk	Special Concern
<i>Descurainia pinnata</i>	Pinnate Tansy Mustard	S2	May Be At Risk	--
<i>Distichlis spicata</i>	Coastal Salt Grass	S2	May Be At Risk	--
<i>Draba albertina</i>	Slender Whitlow-grass	S2	May Be At Risk	--
<i>Draba arctica</i> (<i>Draba cinerea</i> var. <i>arctica</i>)	Arctic Draba	S3	Sensitive	--
<i>Draba arctogena</i>	Fell-field Whitlow-grass	S3	Sensitive	--
<i>Draba crassifolia</i>	Snowbed Whitlow-grass	S3	Sensitive	--

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<i>Draba incerta</i>	Yellowstone Whitlow-grass	S2	May Be At Risk	--
<i>Draba lonchocarpa</i> (<i>Draba lonchocarpa</i> var. <i>lonchocarpa</i>)	Lance-pod Whitlow-grass	S3	Sensitive	--
<i>Draba ogilviensis</i>	Ogilvie Range Whitlow-grass	S2	May Be At Risk	--
<i>Draba pauciflora</i>	Few-flowered Whitlow-grass	S3?	Sensitive	--
<i>Draba porsildii</i>	Porsild's Whitlow-grass	S3	Sensitive	--
<i>Draba simmonsii</i> (<i>Draba alpina</i> var. <i>gracilescens</i>)	Simmons Draba	S3	Sensitive	--
<i>Drosera linearis</i>	Slenderleaf Sundew	S3	Sensitive	--
<i>Dryopteris carthusiana</i> (<i>Dryopteris spinulosa</i>)	Spinulose Wood-fern	S2	May Be At Risk	--
<i>Dryopteris expansa</i> (<i>Dryopteris dilatata</i>)	Northern Wood-fern	S2	May Be At Risk	--
<i>Eleocharis elliptica</i> (<i>Eleocharis compressa</i>)	Slender Spikerush	S2	May Be At Risk	--
<i>Eleocharis uniglumis</i>	One-Glume Spikerush	S3	Sensitive	--
<i>Elymus canadensis</i>	Canada Nodding Wild Rye	S3	Sensitive	--
<i>Epilobium lactiflorum</i>	White-flower Willowherb	S3	Sensitive	--
<i>Erigeron denalii</i>	Denali Fleabane (Mex's Fleabane)	S3	Sensitive	--
<i>Erigeron yukonensis</i>	Yukon Fleabane	S2	May Be At Risk	--
<i>Eritrichium splendens</i>	Showy Forget-me-not	S2	May Be At Risk	--
<i>Erythranthe guttata</i> (<i>Mimulus guttatus</i>)	Common Large Monkey Flower	S2	May Be At Risk	--
<i>Eutrema salsugineum</i>	Saltwater Cress	S3	Sensitive	--
<i>Festuca auriculata</i>	Lobed Fescue	S2S3	May Be At Risk	--

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<i>Festuca brevissima</i> (<i>Festuca ovina</i> spp. <i>alaskana</i>)	Alaska Fescue	S2	May Be At Risk	--
<i>Festuca lenensis</i> (<i>Festuca ovina</i> spp. <i>alaskana</i>)	Tundra Fescue	S2	May Be At Risk	--
<i>Gentiana prostrata</i>	Pygmy Gentian	S3	Sensitive	--
<i>Gentianopsis virgata</i>	Macoun's Fringed Gentian	S3	Sensitive	--
<i>Geranium richardsonii</i>	Richardson Geranium	S3	Sensitive	--
<i>Geum glaciale</i>	Glacier Avens	S3	Sensitive	--
<i>Geum triflorum</i>	Prairie-smoke	S2	May Be At Risk	--
<i>Grindelia hirsutula</i> (<i>Grindelia squarrosa</i> var. <i>integrifolium</i>)	Broadleaf Gumweed	S2	May Be At Risk	--
<i>Harrimanella hypnoides</i> (<i>Cassiope hypnoides</i>)	Moss Heather	S2	May Be At Risk	--
<i>Helictotrichon hookeri</i> (<i>Avenula hookeri</i>)	Hooker's Alpine Oat Grass	S2	May Be At Risk	--
<i>Hesperostipa curtisetia</i> (<i>Stipa curtisetia</i>)	Canadian Needle Grass	S3	Sensitive	--
<i>Heuchera richardsonii</i>	Richardson Alumroot	S2	May Be At Risk	--
<i>Hieracium albiflorum</i>	White-flowered Hawkweed	S2	May Be At Risk	--
<i>Hippuris tetraphylla</i>	Four-leaved Maretail	S3	Sensitive	--
<i>Hudsonia tomentosa</i>	Woolly Beach-heath (Sand Heather)	S3	Sensitive	--
<i>Isoetes lacustris</i> (<i>Isoetes macrospora</i>)	Lake Quillwort	S2	May Be At Risk	--
<i>Juncus dudleyi</i>	Dudley's Rush	S3S4	Sensitive	--
<i>Juncus stygius</i> (<i>Juncus stygius</i> spp. <i>americanus</i>)	Moor Rush	S3	Sensitive	--
<i>Koeleria asiatica</i> (<i>Koeleria cairnesiana</i>)	Oriental Koeler's Grass	S2	May Be At Risk	--

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<i>Koeleria macrantha</i>	Prairie Koeler's Grass	S3	Sensitive	--
<i>Koenigia islandica</i>	Iceland Purslane	S3	Sensitive	--
<i>Lathyrus japonicus</i>	Beach Pea	S2	May Be At Risk	--
<i>Limosella aquatica</i>	Northern Mudwort	S2	May Be At Risk	--
<i>Liparis loeselii</i>	Loesel's Twayblade	S2	May Be At Risk	--
<i>Lobelia dortmanna</i>	Water Lobelia	S2	May Be At Risk	--
<i>Luetkea pectinata</i>	Segmented Luetkea	S2	May Be At Risk	--
<i>Luzula kjellmaniana</i>	Kjellman Woodrush	S2	May Be At Risk	--
<i>Luzula rufescens</i>	Rufous Wood Rush	S2	May Be At Risk	--
<i>Lysimachia europaea</i> (<i>Trientalis europaea</i>)	Arctic Starflower	S3	Sensitive	--
<i>Lysimachia maritima</i> (<i>Glaux maritima</i>)	Sea Milkwort	S2	May Be At Risk	--
<i>Malaxis monophyllos</i>	White Adder's-mouth	S2	May Be At Risk	--
<i>Malaxis paludosa</i>	Bog Adder's-mouth	S2	May Be At Risk	--
<i>Matteuccia struthiopteris</i>	Ostrich Fern	S2S3	Sensitive	--
<i>Mertensia drummondii</i>	Drummond Bluebell	S2	May Be At Risk	--
<i>Mertensia maritima</i>	Sea Bluebell	S3	Sensitive	--
<i>Micranthes ferruginea</i> (<i>Saxifraga ferruginea</i>)	Rusty-hair Saxifrage	S2	May Be At Risk	--
<i>Moehringia macrophylla</i> (<i>Arenaria macrophylla</i>)	Large-Leaved Sandwort	S3	Sensitive	--

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<i>Monarda fistulosa</i>	Wild Bergamot	S2	May Be At Risk	--
<i>Myriophyllum alterniflorum</i>	Alternate-flower Water Milfoil	S3	Sensitive	--
<i>Najas flexilis</i>	Slender Naiad	S2S3	Sensitive	--
<i>Nassella viridula</i> (<i>Stipa viridula</i>)	Green Tussock Grass (Feather Grass)	S2	May Be At Risk	--
<i>Neottia cordata</i> (<i>Listera cordata</i>)	Heart-leaved Twayblade	S2S3	Sensitive	--
<i>Nuphar polysepala</i> (<i>Nuphar lutea ssp polysepala</i>)	Rocky Mountain Pond Lily	S2	May Be At Risk	--
<i>Nymphaea leibergii</i>	Dwarf White Waterlily	S2	May Be At Risk	--
<i>Nymphaea tetragona</i>	Pygmy White Waterlily (Small White Water-lily)	S3	Sensitive	--
<i>Orthocarpus luteus</i>	Yellow Owl's Clover	S2	May Be At Risk	--
<i>Oxybasis glauca</i>	Rocky Mountain Goosefoot	S3	Sensitive	--
<i>Oxybasis rubra</i> (<i>Chenopodium rubrum</i>)	Red Pigweed (Coast-Blite Goosefoot)	S3	Sensitive	--
<i>Oxytropis scammaniana</i>	Scamman's Locoweed	S2	May Be At Risk	--
<i>Packera ogoturukensis</i> (<i>Senecio ogoturukensis</i>)	Ogoturuk Creek Groundsel	S2	May Be At Risk	--
<i>Packera pauciflora</i> (<i>Senecio pauciflorus</i>)	Alpine Goundsel (Few-Flower Ragwort)	S3	Sensitive	--
<i>Papaver mcconnellii</i>	McConnell's Poppy	S3	Sensitive	--
<i>Pedicularis flammea</i>	Red-tip Lousewort	S3	Sensitive	--
<i>Pedicularis oederi</i>	Oeder's Lousewort	S2	May Be At Risk	--
<i>Pedicularis verticillata</i>	Whorled Lousewort	S2	May Be At Risk	--

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<i>Pellaea glabella</i>	Smooth Cliff-brake	S2	May Be At Risk	--
<i>Penstemon gormanii</i>	Gorman's Beardtongue	S2	May Be At Risk	--
<i>Phegopteris connectilis</i>	Northern Beech Fern	S3	Sensitive	--
<i>Phyllodoce caerulea</i>	Purple Mountain Heather	S3S4	Sensitive	--
<i>Physaria calderi</i> (<i>Lesquerella calderi</i>)	Calder's Bladderpod	S2	May Be At Risk	--
<i>Physostegia ledinghamii</i> (<i>Physostegia parviflora</i>)	Ledingham's False Dragonhead	S2	May Be At Risk	--
<i>Plantago maritima</i> (<i>Plantago juncooides</i>)	Seaside Plantain	S3	Sensitive	--
<i>Platanthera dilatata</i> (<i>Habenaria dilatata</i>)	White Bog Orchid	S2	May Be At Risk	--
<i>Platanthera orbiculata</i> (<i>Habenaria orbiculata</i>)	Small Round-leaved Bog Orchid	S3	Sensitive	--
<i>Poa ammophila</i>	Sand Bluegrass	S3	Sensitive	--
<i>Poa pseudoabbreviata</i>	Polar Bluegrass	S2	May Be At Risk	--
<i>Podistera macounii</i> (<i>Ligusticum mutellinoides</i>)	Macoun's Podistera	S2	May Be At Risk	--
<i>Polygonum fowleri</i>	Fowler Knotweed	S2	May Be At Risk	--
<i>Potamogeton foliosus</i>	Leafy Pondweed	S3S4	Sensitive	--
<i>Potamogeton illinoensis</i>	Illinois Pondweed	S2	May Be At Risk	--
<i>Potamogeton natans</i>	Floating Pondweed	S3	Sensitive	--
<i>Potamogeton obtusifolius</i>	Blunt-leaf Pondweed	S3	Sensitive	--
<i>Potamogeton robbinsii</i>	Flatleaf Pondweed	S2	May Be At Risk	--
<i>Potamogeton subsibiricus</i> (<i>Potamogeton porsildiorum</i>)	Yenisei River Pondweed	S3	Sensitive	--

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<i>Potentilla villosula</i>	Beringian Hairy Potentilla	S2	May Be At Risk	--
<i>Primula pumila</i>	Arctic Primrose	S2	May Be At Risk	--
<i>Prunus virginiana</i>	Choke Cherry	S3	Sensitive	--
<i>Pseudocherleria macrocarpa</i>	Long-pod Stitchwort	S2	May Be At Risk	--
<i>Puccinellia banksiensis</i>	Bank Island Alkali Grass	S2	May Be At Risk	--
<i>Puccinellia bruggemannii</i>	Prince Patrick Alkali Grass (Goose-Grass)	S3	Sensitive	--
<i>Pyrrocoma uniflora</i>	Goldenweed	S2	May Be At Risk	--
<i>Ranunculus abortivus</i>	Kidney-leaved Buttercup	S3	Sensitive	--
<i>Ranunculus grayi</i>	Tundra Buttercup	S3	Sensitive	--
<i>Ranunculus rhomboideus</i>	Prairie Buttercup	S2	May Be At Risk	--
<i>Ranunculus turneri</i>	Turner's Buttercup	S2	May Be At Risk	--
<i>Rhynchospora alba</i>	White Beakrush	S2	May Be At Risk	--
<i>Rorippa barbareaifolia</i>	Hoary Yellowcress	S2	May Be At Risk	--
<i>Rorippa crystallina</i>	Mackenzie River Yellowcress (Asiatic Cress)	S2	May Be At Risk	--
<i>Rumex lapponicus</i>	Lapland Sorrel	S2	May Be At Risk	--
<i>Sabulina stricta</i>	Bog Stitchwort	S3S4	Sensitive	--
<i>Sagina nodosa</i>	Knotted Pearlwort	S3	Sensitive	--
<i>Sagina saginoides</i> (<i>Sagina linnaei</i>)	Alpine Pearlwort	S3	Sensitive	--
<i>Salicornia rubra</i>	Red Glasswort	S2	May Be At Risk	--

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Scientific Name	Common Name	NWT Designation ^a	NWT General Species Ranking ^b	Federal/Global Designations ^{c,d}
<i>Salix chamissonis</i>	Chamisso's willow	S3	Sensitive	--
<i>Salix discolor</i>	Pussy Willow	S3	Sensitive	--
<i>Salix farriae</i> (<i>Salix farriae</i> var. <i>microserrulata</i>)	Farr's Willow	S2	May Be At Risk	--
<i>Salix ovalifolia</i> (<i>Salix ovalifolia</i> var. <i>arctolitoralis</i>)	Arctic Seashore Willow	S2	May Be At Risk	--
<i>Salix raupii</i>	Raup's Willow	S2	May Be At Risk	--
<i>Salix sphenophylla</i>	Wedgeleaf Willow	S2	May Be At Risk	--
<i>Salix tyrrellii</i>	Tyrrell's Willow	S2	May Be At Risk	Not At Risk
<i>Saxifraga eschscholtzii</i>	Cushion Saxifrage	S2	May Be At Risk	--
<i>Saxifraga funstonii</i>	Yellowdot Saxifrage	S3	Sensitive	--
<i>Saxifraga paniculata</i> (<i>Saxifraga aizoon</i>)	White Mountain Saxifrage	S2	May Be At Risk	--
<i>Sceptridium multifidum</i> (<i>Botrychium multifidum</i>)	Leathery Grapefern	S2	May Be At Risk	--
<i>Schoenoplectus pungens</i>	Three-square Bulrush	S2	May Be At Risk	--
<i>Senecio eremophilus</i>	Desert Ragwort	S3	Sensitive	--
<i>Senecio sheldonensis</i>	Mount Sheldon Ragwort	S2	May Be At Risk	--
<i>Smelowskia media</i> (<i>Smelowskia calycina</i> var. <i>media</i>)	Alpine Smelowskia	S3	Sensitive	--
<i>Spergularia salina</i> (<i>Spergularia marina</i>)	Saltmarsh Sandspurry	S2	May Be At Risk	--
<i>Sporobolus michauxianus</i> (<i>Spartina pectinata</i>)	Freshwater Cordgrass	S2	May Be At Risk	--
<i>Stellaria umbellata</i>	Umbellate Stitchwort	S2	May Be At Risk	--

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<i>Streptopus amplexifolius</i>	Clasping Twisted Stalk	S2S3	Sensitive	--
<i>Suaeda maritima</i>	White Sea-blite	S3	Sensitive	--
<i>Symphyotrichum nahanniense</i> (<i>Aster nahanniensis</i>)	Nahanni Aster	S3	Sensitive	Special Concern
<i>Symphyotrichum yukonense</i> (<i>Aster yukonensis</i>)	Yukon Aster	S2	May Be At Risk	--
<i>Tanacetum bipinnatum</i> (<i>Tanacetum huronense</i>)	Floccose Tansy	S2	May Be At Risk	--
<i>Tephroseris lindstroemii</i> (<i>Senecio lindstroemii</i>)	Twice-hairy Groundsel	S3	Sensitive	--
<i>Utricularia ochroleuca</i>	Northern Bladderwort	S3	Sensitive	--
<i>Vaccinium membranaceum</i>	Mountain Huckleberry	S2	May Be At Risk	--
<i>Vaccinium myrtilloides</i>	Velvetleaf Blueberry	S3	Sensitive	--
<i>Valeriana dioica</i> (<i>Valeriana eptentrionalis</i>)	Wood Valerian	S3	Sensitive	--
<i>Veronica alaskensis</i> (<i>Synthyris borealis</i>)	Alaska Kitten-tail	S2	May Be At Risk	--
<i>Veronica americana</i>	American Speedwell	S3	Sensitive	--
<i>Viola palustris</i>	Alpine Marsh Violet	S3	Sensitive	--
<i>Zannichellia palustris</i>	Horned pondweed	S3	Sensitive	--

Appendix E. Aquatic Site Cards





Watercourse: Petitot River (WC-access-3)
Kilometre Post: N/A
Reference Location UTM (Zone 10V): 473200E, 6677251N
Field Crew: Brianne Lunn, Kellen Martel

Survey Date: August 26, 2023
Total Traversed Length (m): 100
Restricted Activity Timing Window: August 15 to July 15

Channel and Flow Conditions (No. of Transects: 3)		Channel and Flow Conditions Continued		
Confinement	Frequently Confined	Beaver Dams	No	
Channel Pattern	Sinuuous	Native Channel Width (m)	N/A	
Channel Width (m): Mean; Range	157.7; 149.0-165.0	Bank Conditions	Left Bank	Right Bank
Wetted Width (m): Mean; Range	123.0; 117.0-134.0	Bank Shape	Sloping	Sloping
Water Depth (m): Mean; Range	0.64; 0.43-1.00	Bank Stability	Moderately Unstable	Moderately Stable-
Ordinary Highwater Mark (m): Mean; Range	1.3; 0.8-1.9	Bank Texture	Cobble/Large Gravel	Boulder/Cobble
Discharge (m³/s)	-	Mean Bank Height (m)	3.1	2.3
Estimated ZOI (m)	-	Grade of Approach Slopes (%)	4-14	4-14
Stream Gradient (%)	1	Riparian Area Width (m)	10	10
Embeddedness	-	Riparian Vegetation Type	Grass/Shrub	Grass/Shrub

Substrate	%	Habitat	No.	Length (m)	%	Cover Types	Amount (m²)
Organics	-	Pool 1 (depth > 1.00 m)	-	-	-	Boulders	-
Fines (<2 mm)	10	Pool 2 (depth 0.5–1.00 m)	-	-	-	Undercut Banks	-
Small Gravel (2-20 mm)	10	Pool 3 (depth < 0.5 m)	-	-	-	Overhanging Vegetation	-
Large Gravel (21-65 mm)	17	Run 1 (> 1.00 m)	-	-	-	Woody Debris	-
Cobble (66-250 mm)	27	Run 2 (0.5-1.00 m)	-	-	-	Depth	-
Boulder (>250 mm)	27	Run 3 (< 0.5 m)	-	-	-	Instream Vegetation	-
Rock (> 400 mm)	10	Flat 1 (> 1.00 m)	-	-	-	Other	-
		Flat 2 (0.5-1.00 m)	-	-	-	Other	-
		Flat 3 (< 0.5 m)	-	-	-	Other	-
		Riffle	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Total Cover (m²)	-
		Habitat Assessment Length (m)	N/A			Stream Shading (%)	0

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Suitability	Wintering	Migration
Arctic Grayling	Important	Important	Important	Important	Important
Bull Trout	Important	Important	Important	Important	Important
White Sucker	Important	Marginal	Important	Important	Important
Mountain Whitefish	Marginal	Marginal	Marginal	Important	Important

Fish Species Previously Documented in the Petitot River
Arctic Grayling, Brook Stickleback, Burbot, Finescale Dace, Goldeye, Lake Chub, Leopard Dace, Longnose Dace, Longnose Sucker, Ninespine Stickleback, Northern Pike, Slimy Sculpin, Trout-perch, Umatilla Dace, Walleye, and White Sucker.

Additional Habitat Comments
Due to conditions at time of assessment, discharge measurements could not be collected across the channel. Suitable coarse substrates (i.e., cobble and gravels) are available for salmonid spawning; however, substrate size may limit White Sucker spawning habitat potential. Rearing habitat potential is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows exist for wintering habitat potential. No barriers to fish migration were observed within the assessed reach.
No fish sampling was conducted at this location.

Notes:
- = not assessed
% = percentage
°C = degrees Celsius
< = less than
> = greater than
µS/cm = microSiemen(s) per centimetre
m = metre(s)
mm = millimetre(s)
m² = metre(s) squared

m³/s = cubic metre(s) per second
m/s = metre(s) per second
mg/L = milligram(s) per litre
No. = number
N/A= not applicable
NTU = Nephelometric Turbidity Unit
UTM = Universal Traverse Mercator
ZOI = zone-of-influence



Plate 1. Photograph taken at WC-access-3 crossing looking upstream.



Plate 3. Photograph taken at WC-access-3 crossing, looking at the left bank.



Plate 5. Photograph taken at WC-access-3, 50 m downstream from the crossing, looking at the left bank.



Plate 2. Photograph taken at WC-access-3 crossing looking downstream.

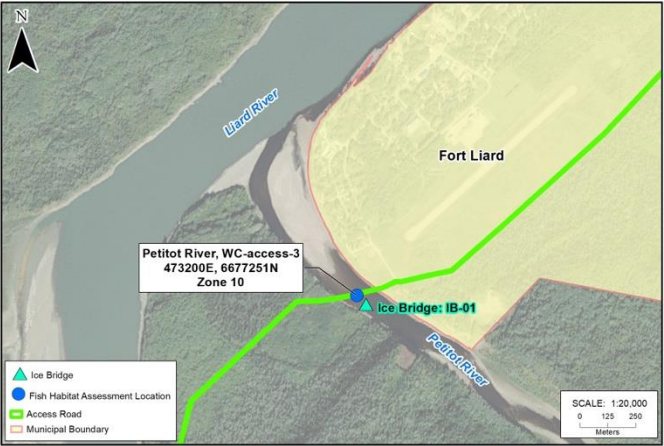


Plate 4. Photograph taken at WC-access-3, looking crossing at the right bank.



Plate 6. Photograph taken at WC-access-3, 50 m downstream from the crossing, looking at the right bank.

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Watercourse: Liard River (WC-access-14)
Kilometre Post: N/A
Reference Location UTM (Zone 10U): 463558E, 6672452N
Field Crew: Brianne Lunn, Kellen Martel

Survey Date: August 26, 2023
Total Traversed Length (m): 200
Restricted Activity Timing Window: August 15 to July 15

Channel and Flow Conditions (No. of Transects: 3)		Channel and Flow Conditions Continued		
Confinement	Occasionally Confined	Beaver Dams	No	
Channel Pattern	Sinuuous	Native Channel Width (m)	N/A	
Channel Width (m): Mean; Range	499.7; 486.0-508.0	Bank Conditions	Left Bank	Right Bank
Wetted Width (m): Mean; Range	412.7; 386.0-442.0	Bank Shape	Vertical	Vertical
Water Depth (m): Mean; Range	-	Bank Stability	Moderately Unstable	Moderately Unstable
Ordinary Highwater Mark (m): Mean; Range	1.8; 1.6-2.0	Bank Texture	Fines/Cobble	Fines/Cobble
Discharge (m³/s)	-	Mean Bank Height (m)	4.8	5.0
Estimated ZOI (m)	-	Grade of Approach Slopes (%)	< 4	< 4
Stream Gradient (%)	1	Riparian Area Width (m)	30	30
Embeddedness	Moderately Embedded	Riparian Vegetation Type	Shrub/Deciduous	Shrub/Mixed Coniferous and Deciduous

Substrate	%	Habitat	No.	Length (m)	%	Cover Types	Amount (m²)
Organics	-	Pool 1 (depth > 1.00 m)	-	-	-	Boulders	-
Fines (<2 mm)	20	Pool 2 (depth 0.5–1.00 m)	-	-	-	Undercut Banks	-
Small Gravel (2-20 mm)	8	Pool 3 (depth < 0.5 m)	-	-	-	Overhanging Vegetation	-
Large Gravel (21-65 mm)	13	Run 1 (> 1.00 m)	-	-	-	Woody Debris	-
Cobble (66-250 mm)	57	Run 2 (0.5-1.00 m)	-	-	-	Depth	-
Boulder (>250 mm)	2	Run 3 (< 0.5 m)	-	-	-	Instream Vegetation	-
Rock (> 400 mm)	-	Flat 1 (> 1.00 m)	-	-	-	Other	-
		Flat 2 (0.5-1.00 m)	-	-	-	Other	-
		Flat 3 (< 0.5 m)	-	-	-	Other	-
		Riffle	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Habitat Assessment Length (m)	N/A			Total Cover (m²)	
						Stream Shading (%)	0

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Suitability	Wintering	Migration
Arctic Grayling	Marginal	Marginal	Important	Important	Important
Bull Trout	Marginal	Marginal	Important	Important	Important
White Sucker	Marginal	Marginal	Marginal	Marginal	Important
Mountain Whitefish	Important	Important	Important	Important	Important

Fish Species Previously Documented in the Liard River	
Arctic Cisco, Arctic Grayling, Bull Trout, Brook Stickleback, Burbot, Chinook Salmon, Chum Salmon, Dolly Varden, Emerald Shiner, Finescale Dace, Flathead Chub, Goldeye, Inconnu, Lake Chub, Lake Trout, Lake Whitefish, Longnose Dace, Longnose Sucker, Mountain Whitefish, Northern Pearl Dace, Northern Redbelly Dace, Northern Pike, Pygmy, Whitefish, Rainbow Trout, Round Whitefish, Slimy Sculpin, Spoonhead Sculpin, Spottail Shiner, Trout-perch, Walleye, and White Sucker.	

Additional Habitat Comments
Small-bodied fish were observed along the margins of the river. Watercourse was not wadable, so water depths and flows could not be collected. Deep run with large suitable substrates is available for Mountain Whitefish spawning; however, substrate size may be limiting for Arctic Grayling, Bull Trout, and White Sucker. Habitat was uniform within the assessed reach and not limiting for any life stage. Rearing habitat potential is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows for wintering habitat potential. No barriers to fish migration were observed within the assessed reach.

Notes:
- = not assessed
% = percentage
°C = degrees Celsius
< = less than
> = greater than
µS/cm = microSiemen(s) per centimetre
m = metre(s)
mm = millimetre(s)

m² = metre(s) squared
m³/s = cubic metre(s) per second
m/s = metre(s) per second
mg/L = milligram(s) per litre
No. = number
N/A= not applicable
UTM = Universal Traverse Mercator
ZOI = zone-of-influence



Plate 1. Photograph taken at WC-access-14 crossing, looking upstream.



Plate 2. Photograph taken at WC-access-14 crossing, looking downstream.



Plate 3. Photograph taken at WC-access-14 crossing, looking at the left bank.



Plate 4. Photograph taken at WC-access-14 crossing, looking at the right bank.



Plate 5. Photograph taken at WC-access-14, 100 m downstream, looking downstream.



Plate 6. Photograph taken at WC-access-14, 100 m downstream from the crossing, looking at the left bank.



Pointed Mountain Pipeline Abandonment Project





Watercourse: Kotaneelee River (WC-22.1)
Kilometre Post: 19.254
Reference Location UTM (Zone 10V): 447056E, 6679257N
Field Crew: Brianne Lunn, Kellen Martel

Survey Date: August 25, 2023
Total Traversed Length (m): 100
Restricted Activity Timing Window: August 15 to July 15

Channel and Flow Conditions (No. of Transects: 3)		Channel and Flow Conditions Continued		
Confinement	Occasionally Confined	Beaver Dams	No	
Channel Pattern	Sinuuous	Native Channel Width (m)	N/A	
Channel Width (m): Mean: Range	73.7: 63.0-88.0	Bank Conditions	Left Bank	Right Bank
Wetted Width (m): Mean: Range	32.3: 31.0-34.0	Bank Shape	Sloping	Vertical
Water Depth (m): Mean: Range	0.83: 0.37-1.10	Bank Stability	Stable	Moderately Unstable
Ordinary Highwater Mark (m): Mean: Range	1.8: 0.9-3.0	Bank Texture	Cobble/Large Gravel	Fines/Cobble
Discharge (m³/s)	See Comments	Mean Bank Height (m)	1.9	2.4
Estimated ZOI (m)	N/A	Grade of Approach Slopes (%)	< 4	4-14
Stream Gradient (%)	2.7	Riparian Area Width (m)	5-10	20
Embeddedness	Unembedded	Riparian Vegetation Type	Shrub/Grass	Deciduous/Shrub

Substrate	%
Organics	0
Fines (<2 mm)	5
Small Gravel (2-20 mm)	8
Large Gravel (21-65 mm)	18
Cobble (66-250 mm)	53
Boulder (>250 mm)	8
Rock (> 400 mm)	7

Water Quality Parameters	
Water Temperature (°C)	13.7
pH	8.9
Dissolved Oxygen (mg/L)	9.0
Conductivity (µS/cm)	492.6
Turbidity (NTU)	23.3
Turbidity (visual)	Lightly Turbid

Habitat	No.	Length (m)	%
Pool 1 (depth > 1.00 m)	-	-	-
Pool 2 (depth 0.5–1.00 m)	-	-	-
Pool 3 (depth < 0.5 m)	-	-	-
Run 1 (> 1.00 m)	-	-	-
Run 2 (0.5-1.00 m)	-	-	-
Run 3 (< 0.5 m)	-	-	-
Flat 1 (> 1.00 m)	-	-	-
Flat 2 (0.5-1.00 m)	-	-	-
Flat 3 (< 0.5 m)	-	-	-
Riffle	-	-	-
Other	-	-	-
Other	-	-	-
Other	-	-	-
Habitat Assessment Length (m)	N/A		

Cover Types	Amount (m²)
Boulders	-
Undercut Banks	-
Overhanging Vegetation	-
Woody Debris	-
Depth	-
Instream Vegetation	-
Other	-
Other	-
Other	-
Other	-
Other	-
Total Cover (m²)	
Stream Shading (%)	1-20

Fish Habitat Potential Ratings					
Species	Spawning	Rearing	Adult Suitability	Wintering	Migration
Arctic Grayling	Marginal	Important	Important	Important	Important
Bull Trout	Important	Important	Important	Important	Important
White Sucker	Marginal	Marginal	Marginal	Important	Important
Mountain Whitefish	Important	Important	Important	Important	Important

Fish Species Previously Documented in the Kotaneelee River
Bull Trout have been previously documented.

Additional Habitat Comments
The Kotaneelee River was not wadable at the time of assessment due to flows and water depth, so measurements were taken from river left. Due to conditions at time of assessment, discharge measurements could not be collected across the channel. Discharge from river left to approximately mid-channel was calculated as 7.5 m³/s, so the discharge for the entire channel was estimated at approximately 15 m³/s. The riparian area along the left bank is a flood plain and along the right bank within the right-of-way is a young forest; outside of the right-of-way it is mature forest. Large, coarse substrates (i.e., cobble and large gravel) are available for fall spawning salmonids; however, substrate size will limit spawning potential for Arctic Grayling and White Sucker. Rearing habitat potential is likely limited to slowly moving areas (i.e., stream margins) and areas with sufficient cover. Sufficient water depth and flows for wintering habitat potential. No barriers to fish migration were identified within the assessed reach.
No fish sampling was conducted at this location.

Notes:
- = not assessed
% = percentage
°C = degrees Celsius
< = less than
> = greater than
µS/cm = microSiemen(s) per centimetre
m = metre(s)
mm = millimetre(s)
m² = metre(s) squared

m³/s = cubic metre(s) per second
m/s = metre(s) per second
mg/L = milligram(s) per litre
No. = number
N/A= not applicable
NTU = Nephelometric Turbidity Unit
UTM = Universal Traverse Mercator
ZOI = zone-of-influence



Plate 1. Photograph taken at WC-22.1 crossing looking downstream.



Plate 2. Photograph taken at WC-22.1 crossing looking upstream.



Plate 3. Photograph taken at WC-22.1 crossing, looking at the left bank.



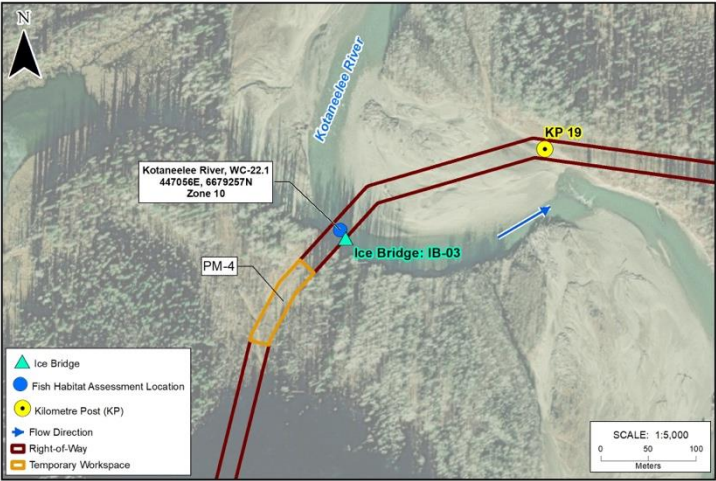
Plate 4. Photograph taken at WC-22.1 crossing, looking at the right bank.



Plate 5. Photograph taken at WC-22.1 50 m upstream from the crossing, looking downstream.



Plate 6. Photograph taken at WC-22.1 50 m upstream from the crossing, looking upstream.



Pointed Mountain Pipeline Abandonment Project





Watercourse: Unnamed tributary to the Kotaneelee River (WC-27a)
 Kilometre Post: 28.919
 Reference Location UTM (Zone 10V): 443754E, 6670250N
 Field Crew: Brianne Lunn, Kellen Martel

Survey Date: August 23 and 26, 2023
Total Traversed Length (m): 250
Restricted Activity Timing Window: August 15 to July 15

Channel and Flow Conditions (No. of Transects: 6)		Channel and Flow Conditions Continued		
Confinement	Occasionally Confined	Beaver Dams	No	
Channel Pattern	Irregular, Wandering	Native Channel Width (m)	NA	
Channel Width (m): Mean; Range	2.4; 1.8-3.3	Bank Conditions	Left Bank	Right Bank
Wetted Width (m): Mean; Range	0.7; 0.2-1.4	Bank Shape	Sloping	Sloping
Water Depth (m): Mean; Range	0.07; 0.01-0.19	Bank Stability	Moderately Unstable	Moderately Unstable
Ordinary Highwater Mark (m): Mean; Range	0.2; 0.1-0.4	Bank Texture	Fines/Organics	Fines/Organics
Discharge (m³/s)	Negligible	Mean Bank Height (m)	1.2	1.4
Estimated ZOI (m)	< 50	Grade of Approach Slopes (%)	< 4	< 4
Stream Gradient (%)	2	Riparian Area Width (m)	2	2
Embeddedness	Highly Embedded	Riparian Vegetation Type	Deciduous/Shrub	Deciduous/Shrub

Substrate	%	Habitat	No.	Length (m)	%	Cover Types	Amount (m²)
Organics	13	Pool 1 (depth > 1.00 m)	-	-	-	Boulders	-
Fines (<2 mm)	58	Pool 2 (depth 0.5–1.00 m)	-	-	-	Undercut Banks	7
Small Gravel (2-20 mm)	28	Pool 3 (depth < 0.5 m)	-	-	-	Overhanging Vegetation	-
Large Gravel (21-65 mm)	-	Run 1 (> 1.00 m)	-	-	-	Woody Debris	32
Cobble (66-250 mm)	-	Run 2 (0.5-1.00 m)	-	-	-	Depth	-
Boulder (>250 mm)	-	Run 3 (< 0.5 m)	-	250	100	Instream Vegetation	-
Rock (> 400 mm)	-	Flat 1 (> 1.00 m)	-	-	-	Other	-
		Flat 2 (0.5-1.00 m)	-	-	-	Other	-
		Flat 3 (< 0.5 m)	-	-	-	Other	-
		Riffle	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Other	-	-	-	Other	-
		Habitat Assessment Length (m)	250			Total Cover (m²)	39
						Stream Shading (%)	71-90%
Water Quality Parameters							
Water Temperature (°C)	9.8						
pH	8.7						
Dissolved Oxygen (mg/L)	6.3						
Conductivity (µS/cm)	612.0						
Turbidity (visual)	Stained						

Fish Habitat Potential Ratings						
Species	Spawning	Rearing	Adult Suitability	Wintering	Migration	
Arctic Grayling	Marginal	Marginal	Marginal	Unsuitable	Marginal	
Bull Trout	Marginal	Marginal	Marginal	Unsuitable	Marginal	
White Sucker	Marginal	Marginal	Marginal	Unsuitable	Marginal	
Mountain Whitefish	Marginal	Marginal	Marginal	Unsuitable	Marginal	

Fish Species Previously Documented in the Unnamed Tributary to the Kotaneelee River
There are no previously documented fish species in the unnamed tributary to the Kotaneelee River.

Fish Sampling Effort			Fish Species Present	Life stage	No. Captured	No. Observed	Fork Length (mm); Mean, Range
Sampling Method	Backpack Electrofishing	Minnow Traps	No fish captured or observed				
No. of seconds/hours	582 seconds	20 hours					
Distance (m)/No. of traps	250 m	9 traps					
No. Captured	0	0					
Catch-per-unit-effort	0	0					

Additional Habitat Comments
The watercourse had very low water depths but flow was still present. Spawning, rearing, and adult suitability habitat potential were limited by the shallow water depths, lack of suitable gravels, and embeddedness. Unsuitable wintering habitat attributed to lack of deep pools and shallow water depths. There was a spring located on the right bank, approximately 65 m upstream of the exposed pipe.

Notes:		
Catch-per-unit-effort is the number of fish captured per 100 seconds of electrofishing and per hour of minnow trapping		
- = not assessed	m = metre(s)	No. = number
% = percentage	mm = millimetre(s)	NA = not available
°C = degrees Celsius	m ² = metre(s) squared	UTM = Universal Transverse Mercator
< = less than	m ³ /s = cubic metre(s) per second	ZOI = Zone of Influence
> = greater than	m/s = metre(s) per second	
µS/cm = microSiemen(s) per centimetre	mg/L = milligram(s) per litre	

No. = Number
NA = Not Applicable
UTM = Universal Traverse Mercator
ZOI = zone-of-influence



Plate 1. Photograph taken at WC-27a crossing, looking upstream.



Plate 2. Photograph taken at WC-27a crossing, looking downstream.



Plate 3. Photograph taken at WC-27a crossing, looking at the left bank.



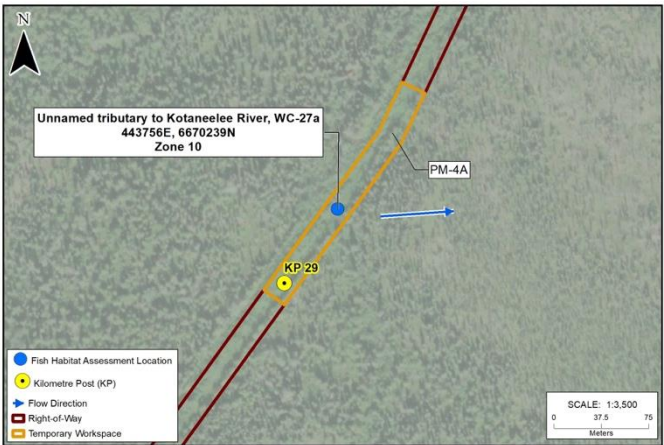
Plate 4. Photograph taken at WC-27a crossing, looking at the right bank.



Plate 5. Photograph of the exposed pipe at WC-27a, facing north.



Plate 6. Photograph of right bank, where the spring enters.





Appendix F. Observed Wildlife Features

Date: 19 December 2023

Subject: Pointed Mountain Pipeline Abandonment Project Environmental
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Table F-1. Wildlife Observations

Common Name	Scientific Name	Federal Designation ^{a,b}	NWT Designation ^c	Observation Type	Total
Birds					
American crow	<i>Corvus brachyrhynchos</i>	--	--	Visual	1
American robin	<i>Turdus migratorius</i>	--	--	Visual	2
Black-capped chickadee	<i>Poecile atricapillus</i>	--	--	Visual	4
Bohemian waxwing	<i>Bombycilla garrulus</i>	--	--	Visual	1
Canada jay	<i>Perisoreus canadensis</i>	--	--	Visual	2
Grouse spp.	--	--	--	Auditory	2
Hairy woodpecker	<i>Dryobates villosus</i>	--	--	Visual	1
Northern flicker	<i>Colaptes auratus</i>	--	--	Visual	1
Osprey	<i>Pandion haliaetus</i>	--	--	Visual	1
Peregrine falcon	<i>Falco peregrinus</i>	Special Concern ^{a,b}	Sensitive	Visual	1
Pine siskin	<i>Spinus pinus</i>	--	--	Visual	1
Red-breasted nuthatch	<i>Sitta canadensis</i>	--	--	Visual	1
Ruffed grouse	<i>Bonasa umbellus</i>	--	--	Visual	1
Sapsucker spp.	<i>Sphyrapicus spp.</i>	--	--	Foraging evidence	1
Trumpeter swan	<i>Ygnus buccinator</i>	--	--	Visual	1
Varied thrush	<i>Ixoreus naevius</i>	--	--	Visual	2
Warbler spp.	--	--	--	Visual	1
White-crowned sparrow	<i>Zonotrichia leucophrys</i>	--	--	Auditory	2
White-winged crossbill	<i>Loxia leucoptera</i>	--	--	Visual	1
Yellow-rumped warbler	<i>Setophaga coronata</i>	--	--	Visual	2

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Common Name	Scientific Name	Federal Designation ^{a,b}	NWT Designation ^c	Observation Type	Total
Mammals					
American beaver	<i>Castor canadensis</i>	--	--	Browsing evidence, scat, dams/lodges	Multiple
American black bear	<i>Ursus americanus</i>	--	--	Tracks, forage, climb marks, scat, den	Multiple
Deer spp.	--	--	--	Tracks	Multiple
Moose	<i>Alces alces</i>	--	--	Scat, antler shed	Multiple
Red squirrel	<i>Sciurus vulgaris</i>	--	--	Auditory, midden	Multiple
Wood bison	<i>Bos bison athabasca</i>	Threatened ^a , Special Concern ^b	At Risk	Tree rub, tracks, wallow, visual	Multiple

^a Listed as Endangered, Threatened, or Special Concern under Schedule 1 of SARA (Government of Canada 2023e).

^b Designated as Endangered, Threatened, or Special Concern by COSEWIC (2023).

^c NWT territorial designations include species listed as Sensitive, May be at Risk, At Risk, or Extirpated under the NWT *Species at Risk Act* (GWNT 2021,2022).

Notes:

Status designations are only listed for the previously noted designations. Where the status is denoted by "--," the previously noted provincial or federal status designations are not applicable for the species.

spp. = species (plural form, several species); this abbreviation is used when the species cannot be differentiated.

Date: 19 December 2023

Subject: Pointed Mountain Pipeline Abandonment Project Environmental
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F.1 Photolog



Photo 1. Wood bison tree rub beside a wallow near PM-1

Taken by: Stacey Carnochan

Date taken: August 4, 2021



Photo 2. Wood bison tracks observed throughout Project Footprint

Taken by: Stacey Carnochan

Date taken: August 4 and 5, 2021

Date: 19 December 2023

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Photo 3. Bear foraging sign at an ant hill observed near PM-1 on August 4, 2021

Taken by: Stacey Carnochan

Date taken: August 4, 2021



Photo 4. Bear climb marks on an aspen tree near PM-1 on August 4, 2021

Taken by: Stacey Carnochan

Date taken: August 4, 2021

Date: 19 December 2023

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Photo 5. Bear scat observed near PM-3 on August 5, 2021

Taken by: Stacey Carnochan

Date taken: August 5, 2021



Photo 6. Black bear tracks observed near PM-4 on August 5, 2021

Taken by: Stacey Carnochan

Date taken: August 5, 2021

Date: 19 December 2023

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Photo 7. Beaver lodge observed near PM-4 on May 4, 2023

Taken by: Amy Sutley

Date taken: May 4, 2023



Photo 8. Potential bear den observed near PM-4A on August 29, 2023

Taken by: Brianne Lunn

Date taken: August 29, 2023