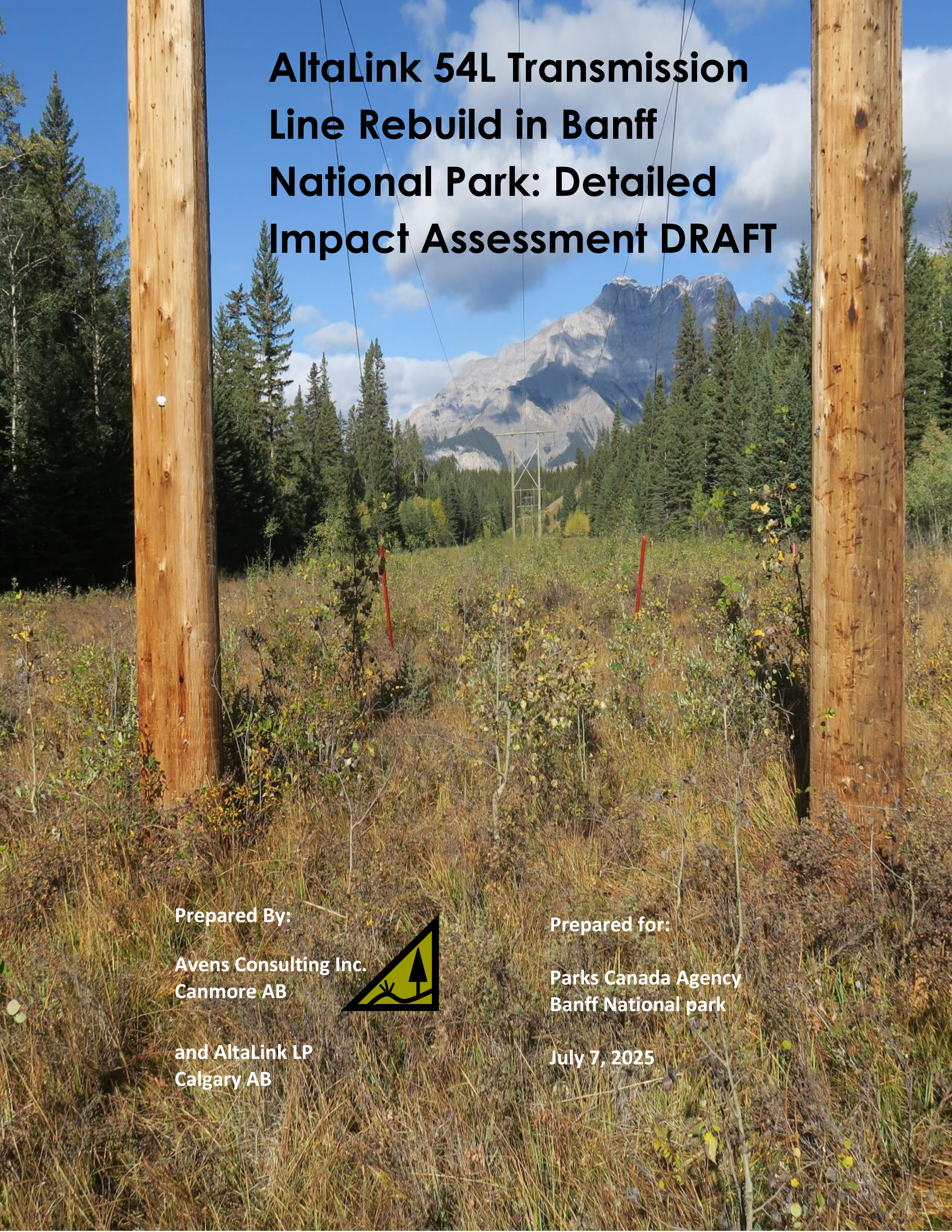

AltaLink 54L Transmission Line Rebuild in Banff National Park: Detailed Impact Assessment DRAFT

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Acronyms

Alberta Conservation Information Management System……………………………………….ACIMS

Alberta Electrical Utility Code…………………………………………………………………………AEUC

Archaeological Impact Assessment……………………………………………………………………AIA

Archaeological Overview Assessment…………………………………………………………………AOA

All-Terrain Vehicle……………………………………………………………………………………………ATV

Alberta Utilities Commission……………………………………………………………………………AUC

Banff Field Unit………………………………………………………………………………………………BFU

Basic Impact Assessment…………………………………………………………………………………BIA

Banff National Park…………………………………………………………………………………………BNP

Banff National Park Management Plan……………………………………………………………BNPMP

Bow Valley Parkway…………………………………………………………………………………………BVP

Canadian Council of Ministers of the Environment……………………………………………CCME

Critical Habitat…………………………………………………………………………………………………CH

Canadian Pacific Railway…………………………………………………………………………………CPR

Canadian Standards Association……………………………………………………………………CSA

Coarse Woody Debris……………………………………………………………………………………CWD

Diameter-At-Breast-Height…………………………………………………………………………DBH

Department of Fisheries and Oceans………………………………………………………………DFO

Detailed Impact Assessment……………………………………………………………………………DIA

Day Use Area…………………………………………………………………………………………………DUA

Declared Wilderness Area………………………………………………………………………………DWA

Erosion Control…………………………………………………………………………………………………EC

Ecological Land Classification…………………………………………………………………………ELC

Environmental Monitor……………………………………………………………………………………EM

Environmental Protection Plan…………………………………………………………………………EPP

Environmental Site Assessment………………………………………………………………………ESA

Erosion and Sediment Control…………………………………………………………………………ESC

Environmental Surveillance Officer……………………………………………………………………ESO

Environmentally Sensitive Site……………………………………………………………………………ESS

Electric Vehicle…………………………………………………………………………………………….EV

Geographic Information System………………………………………………………………………GIS

Global Positioning System………………………………………………………………………………GPS

Harmful Alteration, Disruption or Destruction……………………………………………….HADD

High-Risk (Class 4/5) Fire Area……………………………………………………………………….HRFA

High Visibility Areas…………………………………………………………………………………………HVA

High Water Mark……………………………………………………………………………………………HWM

Impact Assessment Act…………………………………………………………………………………IAA

Impact Assessment………………………………………………………………………………………….IA

Integrated Pest Management Plan ………………………………………………………………..IPMP

Light Detection and Ranging………………………………………………………………………LIDAR

Lake Louise, Yoho, Kootenay (field unit) …………………………………………………………LLYK

Local Study Area……………………………………………………………………………………………LSA

Model Class Screening Report ……………………………………………………………………..MCSR

Municipal District……………………………………………………………………………………………MD

Material Safety Data Sheets ……………………………………………………………………………MSDS

Non-Native Vegetation ……………………………………………………………………………………..NNV

Outlying Commercial Accommodation ………………………………………………………………..OCA

Overhead Optical Ground Wire ……………………………………………………………………..OPGW

Pentachlorophenol ……………………………………………………………………………………………PCP

Pileated Woodpecker………………………………………………………………………………………PIWO

Particulate Matter……………………………………………………………………………………………….PM

Preapproved Routine Impact Assessment ………………………………………………………….PRIA

Project Study Area……………………………………………………………………………………………PSA

Restricted Activity Permit…………………………………………………………………………………..RAP

Right-Of-Way ……………………………………………………………………………………………..ROW

Regional Study Area……………………………………………………………………………………………RSA

Species at Risk Act……………………………………………………………………………………………SARA

State of the Park Report ……………………………………………………………………………………..SOPR

Traffic Accommodation Strategy ………………………………………………………………………….TAS

Trans-Canada Highway……………………………………………………………………………………….TCH

Transport of Dangerous Goods …………………………………………………………………………….TDG

Tunnel Mountain Campground ……………………………………………………………………….TMC

Universal Transverse Mercator……………………………………………………………………………..UTM

Valued Component……………………………………………………………………………………………..VC

Very High Frequency……………………………………………………………………………………………..VHF

Vegetation Resource Inventory ……………………………………………………………………………..VRI

Whitebark pine …………………………………………………………………………………………………….WB

Western Toad…………………………………………………………………………………………………….WETO

Wood Frog…….WOFR

Qualified Aquatic Environmental Specialist ……………………………………………………………..QAES

Definitions

Danger trees – trees at the edge of the transmission line right-of-way that are tall enough to fall onto the line and cause outages or wildfire ignitions.

Valued Component – Environmental, health, social, economic and potentially other element of the natural and human environment that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance.

1.0 PROJECT DESCRIPTION

1.1 Background

AltaLink Management Ltd, (AltaLink), as General Partner of and on behalf of AltaLink L.P., owns and operates the 54L transmission line and related transmission facilities. The 54L transmission line is approximately 24 km in length with 8 km on private/provincial crown lands within the MD of Bighorn and communities of Canmore and Harvie Heights. The remaining 16 km are located within Banff National Park (BNP) from the east park boundary to the Banff substation in the town of Banff. The portion of the line within BNP and the town of Banff will be the focus of this assessment.

54L was constructed in 1941 and is one of AltaLink's highest risk lines due to its degraded condition, which is related to wood structure decay, line clearance deficiencies impacting public safety, and increasing wildfire risk. Many of the structures along this line have exceeded their expected service life. AltaLink anticipates new deficiencies will be identified during future inspections and components with existing deficiencies will deteriorate further, resulting in a higher likelihood of structure failure, electrical faults, and customer outages. AltaLink has determined that the condition of this asset cannot continue to be managed by replacing individual components since each vintage structure is already in a deteriorated state, as expected for assets beyond their projected service life.

AltaLink has also advised that 54L is the only source of power for BNP, Sunshine Ski Area, and Lake Louise. Any outage of 54L results in the loss of power to these major tourist areas. Based on the current condition and existing notifications, 54L is anticipated to experience more outages in the near term as the condition of the line continues to degrade. Considering the criticality of this line to the region, 54L needs to be rebuilt to address its deteriorating condition and extend its service life (AltaLink 2024).

AltaLink has identified that the majority of 54L is located within a high-risk fire area (HRFA), which is defined as "*high risk areas where the greatest impacts are more likely to occur from wildfires originating from AltaLink's transmission lines*" (Forsite 2020). Rebuilding 54L will reduce the wildfire ignition risk of this line.

AltaLink manages the reliability and wildfire ignition risk of 54L through routine operations and maintenance of the transmission line and its associated ROW. AltaLink completes routine inspections, which include patrols by helicopter and ground to identify required repairs or hazardous conditions. Data collected during the patrols determines the urgency of required maintenance activities. Maintenance activities are then completed and include replacement of structures or components, removal of hazard trees, brushing to maintain clearance to the conductor, or other activities as required. Routine maintenance of the transmission line will occur even after 54L is rebuilt, but AltaLink anticipates a reduction in the number of maintenance items identified through routine inspections, which will result in a reduced need for unplanned and urgent maintenance activities.

AltaLink submitted a Project Description to Parks Canada in 2021 detailing the proposed rebuild of the 54L transmission line (Project). The Project consists of a rebuild of the 54L transmission line and vegetation management activities within and adjacent to the transmission line ROW. The Project includes replacing all structures, conductor and hardware; removing Danger Trees and regrowth on the ROW; and completing access upgrades to facilitate long-term maintenance.

Under the IAA, Parks Canada determined that the Project has the potential for significant environmental effects and may generate public interest, which requires AltaLink to submit a DIA as per the IAA.

1.2 Purpose and Justification

AltaLink has advised that it is required to complete ongoing maintenance of transmission facilities, including complete rebuilds of transmission facilities that are at the end of their life cycle. The Project will increase reliability and mitigate wildfire ignition risk by reducing the probability of asset failures and vegetation contacts. The rebuilt line will meet AltaLink's current minimum design standards and will comply with the current electrical transmission codes (Canadian Standards Association CSA C22.3 No. 1-20, 2022, Overhead Systems and Alberta Electrical Utility Code 2022, 6th Edition (AEUC)), ISO rules and Alberta Reliability Standards. The vegetation clearing will remove Danger Trees on and off the ROW to reduce the potential for vegetation contacts.

AltaLink has advised that the rebuilt transmission line is expected to result in improvements in areas where unplanned outages are most common or probable:

- Clearance – The new line will have an average structure height increase of approximately 5.7 m (some structure heights along the line are decreasing in height but this number represents the average the height will increase) as per the proposed design based on current AEUC standards. This will result in fewer outages, a reduction in the number of hazard trees removed annually from outside of the ROW boundary, and a reduction in fire risk from trees contacting the line.

- Tree-related outages – Danger Trees along the ROW will be removed to significantly reduce the fire risk and the most common source of unplanned power outages on the line.

- Asset and component failures due to degraded condition – AltaLink has identified signs that indicate risks of increasing failures on 54L. Since 2016, AltaLink has addressed four emergency urgent repairs for crossarm and insulator issues. Although these failures did not result in an unplanned outage or electrical contact, rebuilding the line will reduce the probability of asset failures that result in outages.

- Avian safe design – AltaLink's current transmission line design results in an increased separation between the wire phases to meet electrical code requirements and to meet AltaLink's requirements for avian safe structure design.

By rebuilding the line under the proposed design and removing Danger Trees, AltaLink advises that it expects a significant reduction in tree contacts, lightning and wildlife-related outages, and ignition risk caused by component failures and tree contacts. Reducing these risk factors will also reduce the frequency that AltaLink is required to access the ROW for both maintenance and emergency repair work. This in turn will reduce the frequency of human-related disturbance to wildlife, aquatic resources, soil, and vegetation along the ROW in BNP.

1.3 Proposed Project

AltaLink proposes to rebuild the 138 kV transmission line using weathering steel structures, replace the existing conductor, and remove Danger Trees (both current and considering 20 years of growth) along the entire length of the line in Banff National Park.

Parks Canada identified the Johnson Lake Day-Use Area and Tunnel Mountain Campground area as areas of focus for tree retention (Parks Canada, 2022). AltaLink has advised that it explored a number of different options in these areas. AltaLink has observed an increase in tree mortality and additional wildfire fuel due to mountain pine beetle impacts. This has increased the wildfire and public safety risk in these high use tourist areas, which AltaLink proposes to mitigate through Danger Tree removal.

1.4 Alternatives to the Project Considered

AltaLink has advised that it considered several technical options in the Johnson Lake Day-use Area and Tunnel Mountain Campground to address the Project requirements to improve the reliability of the line, ensure public safety, mitigate wildfire risk, and satisfy regulatory requirements. Some options were not considered to be suitable or feasible due to technical and safety limitations, power restoration factors, cost, and environmental impact. AltaLink includes a discussion of the options considered, and why they are not suitable and/or feasible below.

For example, both underground options generally have a higher incremental cost than the cost of standard construction and would not have been economical to apply where there are no ROW constraints.

1.4.1 Shallow Bury with Pre-fabricated Cable Trays

AltaLink considered shallow-burying two portions of the line within prefabricated cable trays near Johnson Lake and in the Tunnel Mountain Campground. This option would allow AltaLink to retain the tree cover in these priority areas except at bare wire riser structure locations where the underground cables transition to overhead and vice versa. Cable-to-cable overhead transition structures would also be required in addition to bare wire transition structures in the Tunnel Mountain Campground area to reduce the restoration response time in the event of failed cable portions.

AltaLink has advised that this option was considered not suitable because the continuous line of exposed concrete lids was identified as having an adverse effect to aesthetics and visitor experience. At the transition structures where the line transitions from overhead construction to underground construction, the conductors are still exposed to wildfire risk. If the cables or terminations are damaged from the heat of a wildfire, restoration will require the installation of a temporary overhead line, which could take several weeks, followed by the replacement of the damaged cables. This could result in long restoration times and multiple outages to complete all of the work.

1.4.2 Underground 138 kV Cable Option ("underground")

AltaLink advised that it considered the option of an underground transmission line within an approximately 2.5 metre deep by 5 metre wide trench on the ROW with a concrete conduit poured in place. This underground option would require continuous ground disturbance from the excavations. If bedrock were encountered, higher impact methods including rock hammering or blasting would be required to allow the placement of conduits.

This underground option would eliminate the overhead line and pole structures and would be expected to reduce the visual impact associated with an overhead transmission design. The risks of electrical failures caused by lightning and/or trees falling on the line would be largely eliminated with an underground design with the exception of any transition structures where the transmission would transition from overhead to underground design. Danger Tree removal would not generally be required except at the transition structure locations.

However, AltaLink assessed that burying the conduit would have ecological and visual impacts associated with the trenching as well as technical challenges. A buried line requires additional infrastructure and would be anticipated to include many buried pull-boxes and significant ground disturbance and associated reclamation work.

At certain watercourse crossings, horizontal directional drilling may be required to install the conductor under the creeks, which may impact riparian areas for installation of drilling pits and ramps.

Although AltaLink expects the maintenance requirements on an underground line to be less frequent, if the line does fail, it requires more time to detect and repair the failure, resulting in a longer unplanned outage to the town of Banff, Lake Louise, and other customers.

Also, similar to the shallow bury with pre-fabricated cable tray option, if the cables or terminations are damaged from the heat of a wildfire, restoration will require installation of a temporary overhead line followed by replacement of the damaged cables. This could result in lengthy restoration times and multiple outages to complete all the work.

For these reasons AltaLink has advised that it considers that burying the line is not a feasible option for this rebuild Project.

1.4.3 Bare Rebuild with Catch Wire Option (“catch wire”)

AltaLink advised that it considered installing “catch wires” on the outer edges of the AltaLink ROW to prevent falling trees from contacting the transmission line. This option would not require the removal of Danger Trees specifically; however, it would require permanent secondary lines to be built alongside the powerline on either side of the ROW where trees are present.

AltaLink advised that it had investigated whether other utilities have employed catch wires, and could not identify use of this potential solution by any other utility. The secondary lines would require long term maintenance. The catch wire option was anticipated to result in higher costs, increased maintenance requirements and additional environmental effects over the proposed Project. AltaLink had concerns regarding the effectiveness of this option. For example, a tree falling into the catch fence might break and continue to contact the line.

AltaLink indicated that the catch wire option was anticipated to cost more than an overhead solution without catch wire. The catch wire option was also anticipated to result in additional environmental effects in building and maintaining a secondary line and negative aesthetic effects. AltaLink also advised that permanent anchors would be required off-ROW to ensure the secondary lines could support the weight of trees falling on the line. For these reasons, AltaLink indicated that it does not consider the catch wire a feasible option.

1.4.4 138 kV Covered Conductor (tree wire)

AltaLink advised that it also considered the use of covered (insulated) conductor on the line in place of the existing bare conductor as a measure to reduce the need for Danger Tree removal along selected transmission line spans. However, tree removal would still be required at each structure location as the tree wire installation includes approximately 3 metres of energized area around the structures. In addition, with the heavier covered conductor, AltaLink would be required to construct additional structures to support the weight, and structures would be taller and larger in diameter.

The existing 54L transmission line is designed at 138 kV; however, current covered conductor technology is only available in 69 kV voltage class (See 1.4.2 for the 69 kV tree wire option). AltaLink was advised that the manufacturers have conducted testing at voltage levels higher than 69 kV, but there is no data on the longevity and performance over time for tree wire constantly energized at 138 kV.

AltaLink does not consider the 138 kV covered conductor a feasible option in this radial application due to the risk of deploying a technology that has not been field tested over a period of time. Due to the radial nature of 54L, a performance issue could result in lengthy service disruptions to Banff and Lake Louise. A premature failure of this technology would require restringing or rebuilding the line using a standard 138 kV bare conductor, which would occur on an unplanned basis and would result in additional disturbances.

1.4.5 69 kV Covered Conductor (tree wire)

AltaLink advised that it also considered the installation of 69 kV covered conductor, which would require the voltage of the line to be reduced from 138 kV to 69 kV. In order to reduce the voltage class of the line, modifications and, in some cases, new equipment including 138/69kV transformers would be required at all the terminal substations, which include Canmore 118S, Cascade 29S, and Banff 123S, as well as Rundle 35S and reconductoring of the 85L. Alternatively, a new 138/69kV transformation station would need to be installed in the Canmore area, but modifications would still be required at the Cascade 29S, and Banff 123S substations. The substation modifications required for this option would be a significant additional cost to the Project.

In addition, the maximum loading of the line would be reduced with the reduction to 69 kV. AltaLink's load forecasts indicate that future loads would exceed the capacity of a single circuit

69 kV line, and would require AltaLink to look at different options at greater incremental cost, such as double circuiting the line. As a result, AltaLink viewed this option as not feasible.

1.5 Site Overview

1.5.1 Project Location

The Project location is defined as the portion of the 54L transmission line in BNP between the east park boundary and AltaLink's Banff 123S substation.

The transmission line generally runs northwest from the east park boundary to the TransAlta Cascade structure, crosses the Trans-Canada Highway (TCH), continues west-southwest through Tunnel Mountain Campground, and then terminates at the Banff 123S substation in the industrial park within the town of Banff. The transmission line is approximately 16 km long within the park boundary.

1.5.2 Length of Transmission Line and Sections

In total, 114 wooden structures will be salvaged along approximately 16 km of transmission line between the east park boundary and the Banff 123S substation. The rebuild of the transmission line will require the installation of approximately 134 new steel structures. The rebuilt transmission line will have three conductors (same as current line) and an overhead optical ground wire (OPGW).

The Project is separated into 10 different sections with varying lengths based on pole spans (Table 1-1). The exact location of the section splits was largely influenced by ease of access, reducing ecological effects. At each end of a section, "deadend" structures will be installed. Deadends are guyed structures that serve to limit cascading structure failures in the event of a catastrophic failure of a structure or the conductor.

Table 1-1. Section numbers within the BNP boundary and associated pole spans for AltaLink 54L rebuild Project (existing structure numbers).

Section No.	Pole spans	Section No.	Pole spans
3	200-215	7	269-275
4	216-232	8	276-296
5	233-254	9	297-299
6	255-268A	10	300-313

1.5.3 Land Use Agreement

AltaLink has a Utility Right of Way Agreement (ROW Agreement) with the federal government for electric transmission services in BNP from the east park boundary to the Banff 123S substation, which is located within the town of Banff. The ROW Agreement outlines the commitment from AltaLink to adhere to environmental protection measures based on mitigations provided in the BNPMP, the MCSR, and any other environmental assessment process as required by the *IAA* .

1.5.4 Park Zoning (Zone II and III)

Under the BNP Management Plan (Parks Canada 2022a), BNP is divided into five zones according to level of protection, facilities, and allowable human use, as defined in *Parks Canada: Guiding Principles and Operational Policies* (Parks Canada 2023a). 54L falls into zones II and III.

Under the *National Parks Act,* Zone II Wilderness areas are designated as such by means of regulations (*National Parks of Canada Wilderness Area Declaration Regulations* 2000*)*. In these declared wilderness areas (DWAs), human interference is minimized and motorized access and circulation are not permitted. Only activities that are unlikely to impair the wilderness character of the area may be authorized within the DWA in BNP (Parks Canada 2022a).

The edge of the DWA for 54L is 25 m from the center of the ROW. Sections 3 to 6 of the transmission line ROW, between structures 200 and 264, are located near the boundary of the DWA and, under park regulations, any vegetation clearing or other disturbance beyond 25 m from the centre of the existing ROW will impinge on the DWA (Table 1-2 and Appendix A). In total, the DWA is 25 m from the centerline of the ROW on approximately 9.5 km (62% of ROW length) of the line between the east park boundary and the Banff 123S substation. AltaLink proposes to clear 211 m^2, or approximately 32 Danger Trees, from the DWA as part of this Project. Four accesses (one proposed and three existing) are also located within the DWA.

Table 1-2. Sections of the transmission line where the DWA is 25 m from the center of the existing ROW.

Section number	Existing structure numbers*	Length of transmission line (m)
3	200-215 (N and S)	2,442
4	216-232 (N)	2,534
5	233-254 (N)	3,030
6	255-264 (N)	1,512

* (N) = North; (S) = South.

1.5.5 Laydown and Staging areas

There are six proposed temporary laydown areas that AltaLink is proposing to use to store equipment, machinery, and materials during yearly construction (Table 1-3; Appendix A). AltaLink plans to designate the Mannix pit laydown area as the main site office where construction planning and operation will occur for the entire Project. The Mannix pit laydown area is anticipated to be used to store supplies, materials, generators, fuel, helicopter, equipment, machinery, washrooms, and office trailers (Appendix A). AltaLink plans to use the Carrot Creek staging area to transport structures to the ROW by helicopter between structures 200 and 264, as well as store salvaged structures, equipment, and materials. AltaLink plans to use the Cascade helicopter staging area to transport structures by helicopter between Cascade powerplant and the Banff 123S substation, as well as store salvaged structures, equipment, and materials. The other laydown areas will be used by AltaLink as short-term staging areas for delivery of materials to be used in specific sections of the line during active construction periods.

Table 1-3. Proposed laydown areas for AltaLink 54L transmission line rebuild.

Laydown Area	Location Description	UTM (NAD 83 Zone 11)	Function	Proposed Season*
Mannix Pit	Access from TCH	572991 E 5681433 N	Construction office/main staging (trailers, structures, materials, equipment); overnight storage and fueling of helicopter	All seasons
Carrot Creek	Access from TCH	610502 E E5667447 N	Equipment/material storage (strs 200-231); helicopter staging to transport structures to ROW and store salvaged structures (strs 200-264)	Fall/Winter (Sep 1 - Mar 31)
Johnson Lake parking lot	Access from Johnson Lake road	605477 E 5673112 N	Equipment/material storage (including hand-falling and logging; strs 231-270)	Fall/Winter (Sep 1 - Mar 31)
Tunnel Mountain Campground east end	Gravel area, NE corner of Tunnel Mtn Village II Campground	602649 E 5672350 N	Equipment/material storage (strs 276-294)	All seasons
Banff Industrial loop	Access from Compound Road	601325 E 5672371 N	Equipment/material storage (strs 294-313)	All seasons
Cascade helicopter Staging	Access from Tunnel Mountain Road	605082 E 5672259 N	Helicopter staging; equipment/material storage; transporting structures between Cascade powerplant (str 274) and Banff substation (str 313)	All seasons

* Hand-falling is planned to start September 1, but all fallen trees will remain on ROW to be hauled out or burned starting December 1.

1.5.6 Access

Table 1-4 describes existing and proposed access routes onto the 54L ROW and any associated highway closure requirements for each route. There are a total of 21 accesses: 20 existing routes, and one proposed route (see Appendix A for mapped access routes). For accesses that require highway lane closures or a temporary pause in traffic, a traffic accommodation strategy will be submitted to Parks Canada for approval before construction.

See section 1.7.3. below for a description of work required to prepare each access.

Table 1-4. Existing and proposed access routes onto the AltaLink 54L transmission line ROW.

Access	Str Span	Hwy Closure[1]	Comments
1a	198-207	L	Existing access; Harvey Heights/TCH merge lane closure
1b	208-213	N/A	Existing access, overgrown
1c	198-216	N/A	Existing access, overgrown
2	214-216	N	Existing access
3a	217-264	L	Existing access
3b	232-264	N/A	Proposed access on ROW; use of access 3a requires this access
3c	232-264	N/A	Existing access, overgrown
3d	243-244	N/A	Existing access; required to access across Girouard ridge (use of access 3ab, 4a requires this access)
4a	232-264	N	Existing access; partial closure of Johnson Lake parking lot required
4b	265-270	N	Existing access; partial closure of Johnson Lake parking lot required
5	273	N	Existing access on ROW
6	274-275	L	Existing access
7	276-278	L	Existing access
8a, 8b, 9a, 9b, 10a	279-294	L	Existing access; campground road closures required
10b	291-297	N/A	Existing access; foot access only
11	298-301	L	Existing access; temporary traffic disruption; gate installation required
12	302	L	Open meadow on ROW; temporary traffic disruption

[1] Hwy Closure (<15 minutes): Not applicable (N/A; access is on the ROW, not from highway); No (N); single-lane closure (L)

1.6 Detailed Scope of Project

1.6.1 Pre-project Weed Treatment

There are pre-existing patches of invasive non-native vegetation (NNV) species on the 54L ROW. AltaLink has marked and treated these weed patches every summer since 2022. The NNV will continue to be treated every summer to reduce the infestations on the ROW prior to the start of construction on the Project. The full list of existing NNV on the ROW is provided in section 4.3.5 below. The NNV are being treated using the herbicides and methods outlined in the approved AltaLink Integrated Pest Management Plan (IPMP) (AltaLink 2023a).

1.6.2 Mobilization and Setup of Laydown and Staging Areas

There are six proposed staging areas and material yards for this Project (Table 1-5). AltaLink will maintain the existing fence at the Mannix Pit while it is being used. The other staging areas will not be fenced.

Table 1-5. Work required to set up staging areas.

Site	Work Required to Set up Site
Mannix Pit	Main yard already fenced; no work required
Carrot Creek	Weed treatment and topsoil stripping to level site prior to yard setup
Johnson Lake Parking Lot	Partial closure of the parking lot, site on paved surface, no vegetation removal required
Tunnel Mountain East End	Nothing required
Banff Industrial Loop	Permanent gate installation; on-going treatment of weeds
Cascade Helicopter Staging	Nothing required

1.6.3 Access Preparation

Prior to the start of construction each year, AltaLink will brush and improve all access routes onto the ROW for that year’s sections of the line as required to allow for access of all machinery and equipment onto the ROW. Work involved in access preparation will vary and may include brushing and removal of some tree branches on existing trails, clearing mature trees and shrubs to widen existing trails, or large cut-and-fill operations on side slopes or on steep terrain (Table 1-6). The access trails will be wide enough to allow machinery to travel along them unimpeded (approximately 5 m wide).

Table 1-6. Accesses onto the ROW.

Access	Access length (m)	Description of access	Work Required
1a	1026	Access onto east end of ROW near str 199 just outside the east park boundary	Brushing and tree removal along access, cut and fill on side slope 1/2 way along
1b	425	Access around strs 207-208 wetland on ROW	Cut and fill across ROW on steep slope near end of wetland
1c	2384	Off ROW access from Carrot Creek to avoid steep slope from strs 213-214	Brushing and removal of downed trees, levelling of surface as required
2	649	Carrot Creek access, access 1c north of ROW to travel east	Nothing required
3a	609	Existing gated access from the TCH	Brushing and widening; widening of gate may be required for machines
3b	224	Steep slope west of Morrison Coulee	New proposed cut and fill north of ROW for access up steep slope to west of Morrison Coulee *if this access is developed, reopening Access 3c is not required
3c	959	Access to north of ROW and re-enter ROW near wetland between strs 235-236	Completely overgrown, needs extensive tree removal to reopen, not necessary if Access 3b cut and fill developed
3d	195	Very steep cut and fill between strs 242-244	Cut and fill on bottom 1/3 of slope to reduce slope on existing access
4a	70	Across Johnson Lake outlet at west end of lake	Replacement of existing pedestrian bridge across the outlet with a wider bridge to accommodate machinery
4b	1028	Existing gated access road from the Johnson Lake day use area parking lot	Nothing required

Access	Access length (m)	Description of access	Work Required
5	113	Existing gated access trail from the TCH	Brushing and tree removal, cut and fill required
6	1. 1868 2. 212	1. Existing gated access road from Tunnel Mountain Road 2. Side branch of access trail to strs 274-275	Install temporary bridge at Cascade Creek crossing, no vegetation removal required
7	89	Existing gated access trail on ROW east of Tunnel Mountain Road	Potential gate widening and cut and fill on berm at start of access
8a	81	Existing gated access trail on ROW west of Tunnel Mountain Road	Nothing required
8b,9a, 9b, 10a	1. 63 2. 80 3. 44 4. 439	Existing access trails along ROW from access roads within Tunnel Mountain Campground	Nothing required
11	397	Existing old RV parking lot off Compound Road with boulders to prevent public access	Permanent gate installation required
12	100	Open grassland east of Compound Road, new access to str 1	Nothing required

1.6.4 Danger Tree Removal

AltaLink proposes selective tree removal along the edge of the ROW to remove the identified Danger Trees using a combination of hand falling and machine logging.

AltaLink developed a detailed vegetation encroachment model (see constraint maps, Appendix A) that identifies Danger Trees along the edges of the ROW and accounting for tree growth over a 20 year period. These areas have been identified with a model using 2024 LIDAR data (OGL

Engineering 2024) taking into account terrain variability, the height of the conductor, and slope. The model utilizes millions of elevation points taken from ground elevation, structure height, conductor height, as well as tree top height adjacent to the line to accurately determine the trees adjacent to the line that could contact the transmission line if the tree were to fall over.

The model indicates that there are only a few scattered individual Danger Trees on the eastern 6.31 km of the line from the east park boundary to structure 243 through the Carrot Creek fuel break and the 2003 wildfire area (Appendix A). West of structure 244 there are a larger quantity of Danger Trees and large continuous patches of trees that need to be cleared to reduce wildfire ignition risk. In addition, some brushing will be required along the edge of the ROW to prevent the temporary bypass line conductor from swinging into the vegetation. AltaLink requires the installation of a temporary bypass line in sections 3-6, as described in more detail in section 1.6.8.

Danger Trees within 5 m of wetlands and streams, within wildlife movement areas, or with bird nesting cavities and sapwells will be assessed individually on a site-specific basis and all of these trees will either be removed or topped. All Danger Tree removal or topping in these constraint areas will be approved by the Parks Canada ESO in consultation with the Project Environmental Monitor (EM). All Danger Trees within 5 - 30 m of wetlands and streams will be cleared using hand falling. Cleared trees may be removed from these zones with a cable skidder that pulls them out of the riparian area but does not enter this zone.

An analysis was done to approximate the total area of Danger Trees to be cleared on the ROW versus those in constraint areas (Table 1-7).

Table 1-7. Area of Danger Trees removal or topping in the project area.

Danger Tree Categories	Area (m^2)	Percentage (%)
All Danger Trees Removed (all other trees)	41,755	85.9
0-5 m Riparian areas (top or hand removal)	45	0.1
5-30 m Riparian areas (hand removal)	1,930	4.0
Wildlife movement corridors (top or hand removal)	4,901	10.1
Total	**48,631**	**100.0**

Prior to any Danger Tree removal, AltaLink will survey and flag the outer boundary of larger areas of Danger Trees. In areas with scattered Danger Trees, the individual trees will be marked with paint or ribbon for removal. The trees requiring brushing for the temporary bypass conductor will be flagged for hand falling during the bypass structure staking, similar to the 551L rebuild.

The procedures that will be used for tree clearing for the Project vary with the terrain, soils, and access in each section. Work methods to remove trees will utilize low ground pressure logging equipment, hand falling, or a combination of the two. The use of logging equipment involves tree falling using a feller-buncher or harvester/processor and removing the stems from the site using a forwarder or skidder to a location where they can be loaded onto a logging truck for transport to a mill.

Trees will be logged with machinery with low ground pressure equipment (<7 psi) and in frozen conditions and snow cover to minimize the ground disturbance and compaction. Where logs are removed from the ROW, trees will be processed in the field and then loaded onto a forwarder for transport to the nearest access where they will be loaded onto a logging truck. The tops and any unmerchantable wood will then be burned in a mobile burn unit.

Where possible, the tops, limbs, and woody debris will be burned in a large open forced-air burner similar to that employed on AltaLink's 551L rebuild project. The burner will be pulled along the ROW with an excavator in machine-accessible areas. In areas with limited access (e.g. steep slopes) or areas where only a few trees are removed, the trees will be burned on the ground. In this case, the topsoil will be stripped before the trees are burned and replaced after the burning is complete and the ground has cooled. All burning will occur in the winter (December to March) when there is snow cover and the wildfire hazard is low.

In challenging terrain or near ecological constraints such as wetlands and streams, trees will be selectively harvested by hand or in some cases topped. Topping will eliminate the hazard to the line posed by Danger Trees that can fall on the line but keep most of the tree intact in ecological constraint zones. Topped trees will have higher survival in spruce and Douglas fir stands which have full crowns to the ground or at least 2/3 of the tree. Lodgepole pine stands have crowns concentrated in the top half to third of the tree in dense stands and may not survive the topping. All crowns, branches, and other excess woody debris will be piled to dry and then burned in an open burner or on the ground.

1.6.5 Removal of Immature Trees On the ROW

Smaller trees and other non-compatible vegetation on the ROW will be removed to meet line clearance standards. These trees and non-compatible vegetation types pose a high risk for wildfire ignition when they grow within flashover distance of the line and pose a high risk of an unplanned power outage to Banff, Lake Louise and surrounding areas.

In the area of the ROW affected by the 2003 wildfire, from structures 217 to 242, there are dense 1-4 m tall immature pine trees which are growing rapidly and starting to interfere with the safe operation of the line. Annually, AltaLink selectively removes these trees. Estimates derived from LIDAR imagery conservatively identifies approximately 5.2 ha (14.7%) of the total 35.1 ha area of the ROW, between the east park boundary and the Banff 123S substation requires removal of regrowth.

Line incompatible vegetation will be removed by hand using chainsaws or brush saws and then piled and burned on the ground or within a burner if it can be brought to site. Shrubs on the ROW will be preserved to the extent possible during hand removal.

1.6.6 Site Preparation Prior to Construction

In difficult terrain with steep slopes or sections of the accesses and ROW with side slopes, site preparation may include cut-and-fills to facilitate access by large machinery used during construction of the line including excavators, bucket trucks, nodwells, and stringing equipment (See maps in Appendix A). In addition, some sections may require the construction of flat pads on uneven ground to set up the stringing equipment to string the conductor after the structures are replaced. All site preparation cut-and-fills will be undertaken with an excavator on frozen ground.

The potential location of cut-and-fills on the accesses and the ROW are mapped based on an initial site assessment by a civil contractor in 2020 (Appendix A). However, the exact location and size of all required cut-and-fills will be finalized after the detailed construction plan is complete. All site-specific mitigation for these areas will be outlined in the annual Environmental Protection Plans for the vegetation removal and transmission line rebuild work each year.

1.6.7 Creek and Wetland Crossings

Four wetlands on the ROW will need to be crossed by machinery to complete Project activities. The wetland between structures 207-208, which has an existing access trail through the end of the fen, will need to be crossed and a new structure will be installed at the west end of the wetland (Appendix A- Access and ROW Constraint Maps, map sheet 3). This area of the wetland will be crossed only when frozen and all machines will remain on the hard snow road prepared on the existing access. The wetland between structures 211 and 212, as well as on the south side of Anthracite Creek, will also need to be crossed using access mats and/or travel during frozen conditions. Crews will also need to access the wetland between structures 219 and 221 to salvage an old structure and install temporary bypass structures.

Five channels or active watercourses will be crossed as part of the Project. Girouard Creek and Morrison Coulee are dry/ephemeral drainages and will be crossed with snow fills. Bridges will be used to cross Anthracite and Cascade Creeks (one-time fords will also be required in these locations), and the unnamed creek between structures 267 and 268 will be crossed using an access mat (the stream is very narrow; for more detail see below and section 4.5). Detailed construction plans for all crossings will be provided for PCA review as part of annual Environmental Protection Plans (EPPs).

Johnson Lake Outlet

At the Anthracite crossing (Johnson Lake outlet), the existing pedestrian bridge will be replaced by a wider, machine-accessible permanent bridge with new, engineered abutments. The existing pedestrian bridge superstructure will be removed by a crane and an excavator. The existing concrete abutment and weir will remain in place to avoid erosion and sediment release downstream. The area behind the existing abutments will be excavated and the new abutments for the wider bridge will be built higher than the existing abutments. If required for aesthetics, riprap may be installed to conceal the existing abutments. The new superstructure will be installed using a crane and an excavator. All work will occur above the HWM except for the one-time ford by an excavator to remove the old pedestrian bridge and install the new bridge. The new bridge will be at least 40 feet x 14 feet; the proposed design will be similar to Figure 1-1. This bridge will be used by all machinery and vehicles for access to structures east of structure 264 during all Project activities, as well as future operations and maintenance of the 54L transmission line.

Figure 1-1. Potential bridge design for replacement of the pedestrian bridge across Johnson's Lake Outlet.

Cascade Creek

A temporary clear span bridge will be installed prior to construction to allow heavy machinery to cross Cascade Creek on access 6. The abutments for this temporary bridge will consist of access mats and/or lock blocks and all work will occur above the HWM except for a one-time ford by an excavator to install and remove the temporary bridge. The bridge clearance will meet maximum allowable discharge levels from the Cascade TransAlta dam.

After the Project has been completed, the clear span bridge will be removed and AltaLink will install a permanent hard-ford rock riprap crossing in this location for ongoing maintenance of the line (Figure 1-2, ISL 2023). Installation of the hard-ford will require isolation of the creek by constructing an open bypass diversion channel or using a pump around method with coffer dams or sumps. The stream isolation method will depend on flow, time of year and whether the creek is fish-bearing at the time of construction; details will be provided in the annual EPP prior to installation. After the work area is dry, existing substrate will be excavated from the streambed. A rock mattress approximately 300 mm thick will be installed for vehicle crossing, and riprap anchor comprising of Class 1 riprap (600 mm thick) will be installed immediately downstream of the mattress to prevent mattress movement. The finished grade will tie into the up and downstream existing creek bed elevations and will be shaped to include a low flow channel to facilitate year-round fish passage (ISL 2023). Main channel velocity will be the same as current existing conditions. The crossing will be designed to prevent movement and scour of rock riprap during normal operating and maximum allowable dam discharge levels. The hard-ford crossing feature will require regular inspection and potential maintenance after high flows/emergency dam releases to ensure no major rock movement has occurred.

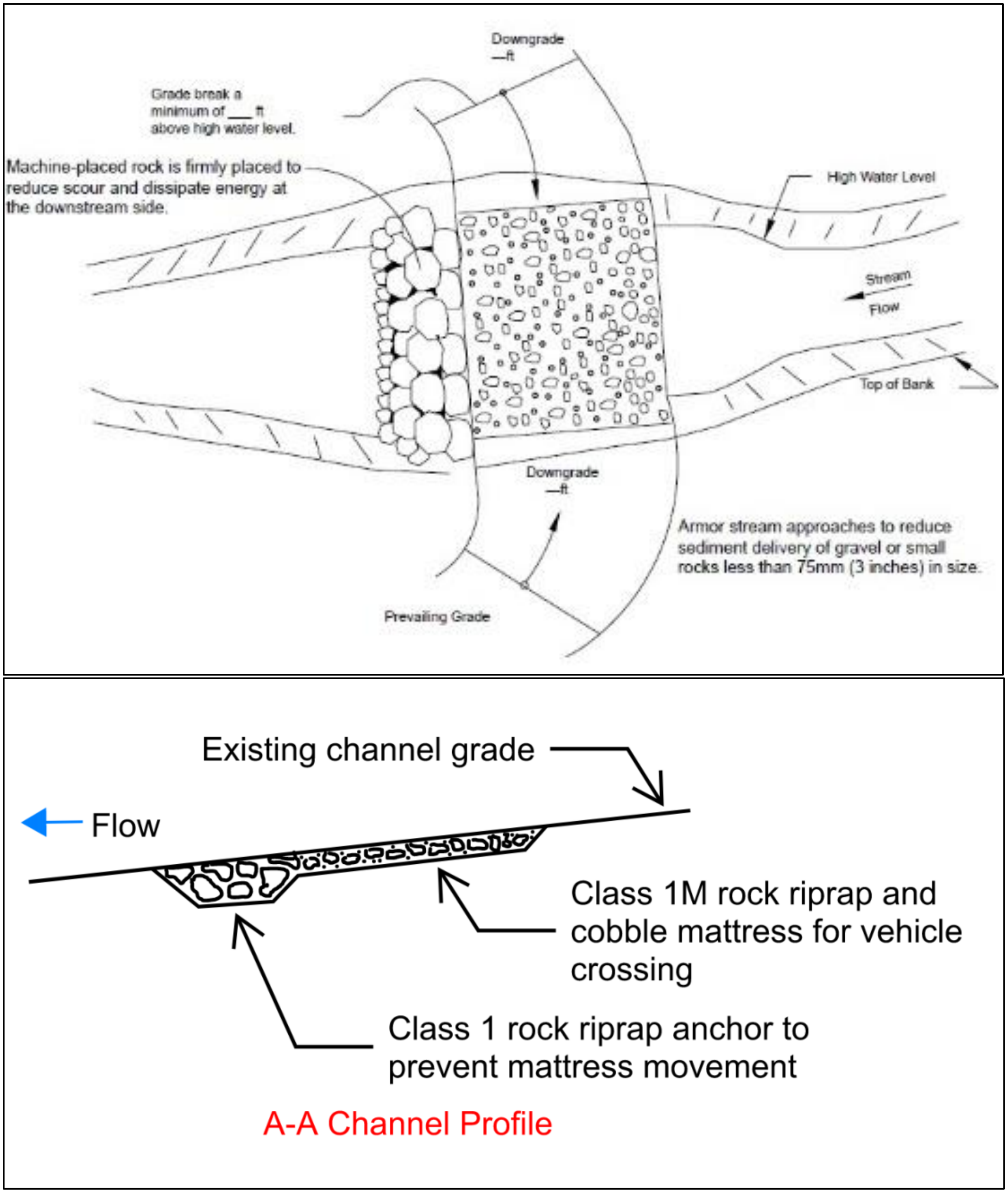

Figure 1-2. Hard-ford rock riprap crossing design for Cascade Creek; proposed to be installed on access 6 where the AltaLink ROW crosses Cascade Creek (ISL 2023).

1.6.8 Construction of Temporary By-pass Line

As 54L is a radial transmission line, AltaLink requires the installation of a temporary bypass line for each section of the line in sections 3-6 while the transmission line is rebuilt in those sections. A temporary bypass line is not required for sections 7-10 as there is a Fortis line that provides an alternate electricity supply between the West Cascade 177S and Banff 123S substations.

Construction of a temporary bypass line involves installing 18 m tall untreated wooden poles approximately one metre inside the ROW boundary (approximately 9 m from centerline) at spacing slightly less than the existing line (approximately every 100 m). The structures will be buried approximately 3 m in the ground. Each structure will be strung with three conductors placed in a vertical configuration (one on top of the other, spaced approximately 1 m apart).

Prior to installation of the temporary bypass structures, vegetation will be cleared to create temporary workspace at each structure site. An excavator or auger will then be used to dig holes for the temporary structures.

In general, ground disturbance required for temporary poles will be smaller in size than that required for the mainline structures because they are shorter and therefore not buried as deep. A typical excavation for a temporary pole using an excavator is expected to be 4 m x 4 m based on AltaLink's experience rebuilding 551L transmission line between 2016-2020 in BNP (Avens Consulting 2015). Topsoil will be stripped and stored beside each structure excavation while the by-pass line is functioning. In the winter topsoil piles will be stored on snow cover. In wet areas with high groundwater (e.g., adjacent to wetlands), excavations may fill with water but no requirement for dewatering is anticipated based on AltaLink's experience with the 551L rebuild.

In areas that have suitable soil (i.e., in or near valley bottom wetlands with deep organic soils), an auger may be used to install the structure. Augered sites have a reduced amount of required excavation and only minor displacement of soil is anticipated to auger a hole approximately 75 cm in diameter for pole setting.

After the structures are installed in sections 3-6, the temporary bypass line will have conductor strung and the electrical load will be transferred to the bypass line which will isolate and de-energize the existing mainline structures in the section being rebuilt. Then the existing mainline conductor and structures can be salvaged and replaced. Existing structures in wetlands or on inaccessible terrain will be cut off at ground level to avoid additional disturbance.

Once construction is complete on the permanent 54L line, the bypass structures and conductor will be salvaged and the structures reused for the next section. All topsoil will be replaced at each bypass structure site before machines leave the site on March 31st each year.

1.6.9 Structure Replacement on 54L Transmission Line

The transmission line is proposed to be rebuilt as an above-ground transmission line with bare conductor (see photos, Appendix B). AltaLink is proposing to install weathering steel poles for the project. Steel poles are not susceptible to woodpecker holes and are more resilient in the case of a large wildfire event. Weathering steel poles look similar to wood poles, and have been utilized in a line rebuild in the Canmore area.

All steel structures will be installed either using an excavator or an auger the 551L rebuild, or using open barrel piles. For structure installation using barrel piles, a small area of topsoil will be stripped at the structure site (approximately 1.5 x 1.5 m) prior to work commencing. Then a 42" diameter (approximately 1.1 m) steel pipe with teeth on the end will be screwed into the ground. The pile will be twisted into the ground through soil and rock using a drilling attachment on an excavator (Appendix B). The pile will be installed by screwing in the pipe to a specified depth and then drilling out the material inside the pipe to be hauled away and then repeating these steps until the required depth is achieved. Fine mesh wire will be used to cover the pile opening and ratcheted around the perimeter; the pile will then be capped. After an unspecified amount of time, the structure will be inserted into the pile and backfilled with gravel. The depth of the pile will vary and correspond to approximately 10% of the height of the structure being installed plus 1.2 m.

On slopes or uneven ground, a level pad for the drill rig may need to be created and these could be up to 20 m x 20 m and involve a cut and fill to access the structure site. However, using the steel piles on flat sites will result in less overall ground disturbance than excavations. There will also be more soil compaction within the pile which will prevent the structures from leaning over time and reduce required structure maintenance. The soil surrounding the pile remains undisturbed.

Any barrel piles used for temporary bypass structures, will remain in the ground permanently and the tops will be cut off 30 cm below the ground surface. These temporary piles will have topsoil stripped (e.g., 1.5 m x 1.5 m) prior to being installed and after the pile is cut off, the topsoil will be replaced and the site reclaimed. All temporary bypass anchors will also remain in the ground after the Project is complete (the wire and anchor attachment will be cut off just below the ground surface).

Depending on the structure type and terrain, various types of equipment will be used to set the poles, install the insulators, and attach the conductor to the structures including radial arm diggers, boom trucks, and bucket trucks. Machinery with regular rubber tires will be used wherever possible. Where the terrain is steep or where the snow limits accessibility for rubber-tired vehicles in the winter, tracked machines (e.g., Nodwells) will be used with the various types of equipment mounted on the back of the machine including a crane, drill, radial arm, auger, or bucket.

1.6.10 Installation of Structure Anchors

Anchors are buried structures that attach to guy wires on transmission line structures for the purpose of stabilizing the structures. Anchors are necessary to stabilize poles in areas where the transmission line changes direction (i.e., sharp angle) or at transition structures. Anchors are either excavated or augered into the ground approximately 1.8 to 3 m deep. The most common type of anchor to be used on the Project is a log anchor that consists of a metal or treated wood pole section, 0.35 m wide x 2.4 m long, buried 2.3 m in the ground to which guy wires are attached. A backhoe is used to dig the hole for installation of this type of anchor and after it is installed the hole is backfilled.

In areas of steep terrain, highly erodible surfaces, or ecological sensitivity, self-supporting steel structures which do not require anchors may be utilized. A self-supporting structure may require a wider diameter pole and deeper setting depth.

1.6.11 Stringing Conductor

After all the structures are in place for a section, stringing equipment will be set up at either end of the section near the deadend structures and the new conductor will be strung between the new poles. Stringing equipment consists of two specialized pieces of heavy machinery called a tensioner and a puller (Grisby 2012). The tensioner lets the new conductor out under tension which keeps the conductor off the ground thereby minimizing potential damage to the conductor or damage to vegetation, soils, and infrastructure (e.g., roads), and facilitating the crossing of obstacles such as rivers. The new conductor is attached to the old conductor or another pilot wire and then the conductor is pulled through a system of rollers (travelers) attached near the top of each structure by the puller that spools up the old conductor and pulls along the new conductor (Appendix B). The conductor is then attached permanently to each structure. On uneven ground, level pads for the stringing equipment may be required as well as temporary log anchors to stabilize the stringing equipment. An excavator will be used to create the level pads which will average 20 m x 10 m. In difficult or inaccessible terrain (e.g., road crossings and steep slopes), the pilot wire may be installed with the aid of a helicopter that flies wire between structures.

1.6.12 Burying Fortis Distribution Line in Sections 9-10

The Fortis distribution line is currently underbuilt on the AltaLink structures from structure 298 to 302 in sections 9 -10 northeast of Compound Road. The Fortis line will be buried in this section prior to the AltaLink line being rebuilt but after Danger Trees and other incompatible vegetation has been removed in this section. Fortis will install the new section of line on the south side of the ROW using directional drilling which involves drilling horizontally from pull box locations and installing the conduits and cable underground without surface ground disturbance. The line will be buried within 1.5 m of the edge of the existing AltaLink ROW and 1.2 – 1.5 m below the ground surface.

A switching cubicle will be installed on the underground section of distribution line as well as two riser poles at either end to terminate the underground cable onto the overhead line. A backhoe will be used to dig the required hole for the switching cubicle and a pre-cast concrete box will be installed in the hole. The cubicle will be buried approximately 2 m south of the Fortis alignment to avoid conflicts with AltaLink operations and will be visible 5 to 8 cm above ground. The switching cable will have a 3 x 3 m disturbance footprint.

Drill pits approximately 2 m x 3m will be excavated at each of the six deflection points on the line in this section to accommodate the drill rig. An excavator and a depth sensor will be used to dig each drill pit to a depth range of 1.2 to 2.2 m. After each section is drilled, electrical conduit (102 mm diameter) will then be pushed back through the drilled area to each pull box. Three hundred meter sections of 25 kV electrical cables will then be threaded through the plastic conduit to reach the pull boxes. Open drill pits will be fenced-off after each workday for safety when workers are not present on the site. The pits will be backfilled after completion of drilling and installation of the cable/conduit.

If bedrock is encountered, or any other unforeseen conditions belowground result in directional drilling not being possible, then the Fortis line will be buried in the same location using trenching.

If trenching is used, topsoil will be stripped and stored in separate piles along one side of the trench, and then subsoil will be excavated to depth using a backhoe and piled separately on the other side of the trench. An electrical conduit and conductor will then be placed in the trench and sand added above and below the conduit to protect it from sharp rocks. Then the trench will be backfilled with the stored subsoils and topsoil. Each section of trench will be backfilled on a daily basis as it is completed and will not remain open overnight. Reclamation will be completed the following spring. All excess subsoil will be transported off-site to an approved facility as determined by Parks Canada. The expected width of the surface disturbance footprint along the ROW to accommodate all equipment movement and materials along the trench is 5 m. Standard mitigation is provided in the later sections of the BIA to minimize ground disturbance and loss of vegetation, minimize spread of weeds, and minimize disturbance to wildlife that all contractors on the ROW will be subject to.

Based on results of a geotechnical assessment in the area completed in October 2023, groundwater was 4.7 m below the surface; therefore, dewatering is not expected to be required during excavations for trenching or installation of drill pits or power boxes if work proceeds in the fall.

1.6.13 Waste Disposal

All food and garbage will be stored in vehicles to avoid attracting wildlife to the site and disposed of in bear proof bins at the material yard.

All waste materials generated during construction will be transported off-site daily to prevent litter and to minimize wildlife attractants along the ROW. All construction waste will be sorted at the operations yard for disposal outside the park. The conductor will be salvaged and hauled to a metal salvage facility in Calgary to be melted down and recycled. The salvaged transmission line structures will be removed from site and recycled or disposed of, depending on their age and condition.

During operation of the rebuilt transmission line, waste disposal requirements are expected to be minimal. Waste generated during maintenance activities will continue to be separated and disposed of as per the AltaLink PRIA (AltaLink 2023b).

1.6.14 Handling and Storage of Toxic/Hazardous Materials

Removal of Danger Trees, vegetation clearing, and rebuild of the line will require the use of hydraulic fluids, oil, and fuel for machinery and small equipment such as chainsaws and brush saws used to clear vegetation for required workspace in each location. An anti-corrosion product will be applied to the belowground portion of the steel structures. This product will be applied to most structures at the manufacturer’s off-site facility; however, some application in the field may be required. In addition, herbicides will be used to treat invasive non-native vegetation species during the summer each year in the pre-construction phase, following construction, and in the reclamation phase of the Project. Procedures for safe handling and storage of these hazardous materials are as follows:

- All refueling of vehicles and equipment will be 100 m or further from any water bodies, including ditches with standing water.

- All deleterious substances including fuels, oil, and hydraulic fluids, anti-corrosion products and herbicides will be stored in 110% containment at least 100 m from any water bodies including wetlands.

- Any handling of toxic/hazardous materials will be carried out in accordance with specifications outlined in the MSDS for each product and TDG requirements will be followed.

- All truck-mounted fuel storage tanks will be double-walled.

- Large generators to power site trailers in the main materials and laydown yard will be operated within a containment system.

- Any spray application of the anti-corrosion polyurethane products to metal structures will only occur in the AltaLink yard at Mannix pit with complete coverage of the ground with leakproof material (e.g., heavy-duty plastic) under the structures.

1.6.15 Erosion and Sediment Control

During the transmission line rebuild, there will be ongoing ground disturbance associated with creating access to the structure sites, cut-and-fills on steep slopes, and excavating holes for the new temporary and permanent structures and anchors along the ROW.

Erosion control measures will be implemented to prevent surface organics, topsoil, and subsoil materials from moving off-site and either burying adjacent undisturbed vegetation or moving into nearby water bodies prior to reclamation of the disturbed areas. Below is a list of standard procedures for erosion control that will be employed, as required, depending on site and soil conditions. A detailed site-specific erosion and sediment control plan will be written in the spring each year following construction, and prior to the initiation of spring runoff, and submitted to Parks Canada for approval similar to those submitted for the 551L Rebuild Project (Avens Consulting 2016, 2017, 2018).

General erosion and sediment control measures for stored topsoil when the ground is thawed from spring to fall include the following:

- All soil stockpiles will be kept a minimum of 30 m from the high-water mark of any water feature unless storage within the 30 m buffer is approved by Parks Canada due to terrain or limited soil storage area or to minimize moving soil during construction and reclamation.

- Topsoil piles will not be sifted and will contain all rock, woody debris, and vegetation from the area where the soil was stripped which will give the piles a rough surface that will significantly reduce the erosion potential of stored piles, as observed on the 551L Rebuild from 2016-2020.

- Topsoil will be replaced on disturbed areas before the construction crew leaves the ROW each spring. Any piles that cannot be replaced and are within 30 m and upslope of a water feature with a slope > 10% will be contained by sediment fence that is keyed into the ground at least 15 cm (6 inches) on the uphill side of the stakes used to secure the sediment fence. Topsoil piles that are stored on the ROW through the summer will be seeded to reduce erosion potential and maintain biological function until they are replaced.

Where there is ground disturbance on slopes of greater than >25% or on lower grade slopes with highly erodible soil along the ROW (including all cut-and-fills) interim erosion control methods prior to vegetation establishment may include the following:

- Creating a rough surface on large, disturbed areas by creating small hummocks on the surface of the slope with an excavator that will reduce erosion potential.
- Spreading and keying in CWD across slopes, which will provide surface roughness and break down to allow surrounding native grass and forb species to become established in the area; CWD will be minimum 7 cm diameter.
- Keying in sterile straw or wood chip filled EC logs with biodegradable netting across slope contours on long slopes to break up the slope and absorb any surface water travelling down the slope. Logs will be keyed into the slope a minimum of 10 cm to ensure complete contact of the log with the ground. EC logs will be secured to the ground using metal rebar or wooden stakes pounded through the logs. The intent is to remove the metal bars or stakes once vegetation is established.
- Hydromulching areas with machine access, very steep slopes (>30%), and highly erodible fine textured soils with a flexible wood fiber-based mulch blended with a tackifier that will prevent erosion on most slopes for up to 18 months until vegetation is established.
- Disturbed areas with slopes draining towards a wetland or other waterbody will have sediment fence installed at the edge of the construction area if there is an insufficient vegetation buffer to prevent sediment from leaving the work site and entering the water body. Sediment fences will be installed within the boundary of the disturbed area where possible (at the outermost edge to minimize the vegetation disturbed). The bottom of the fencing will be buried at least 15 cm into the soil.
- Permanent erosion control on slopes will be achieved by reclaiming these disturbed areas as quickly as possible in the first growing season following construction. Areas will

be seeded with a Parks Canada approved native seed mix and planted with plugs of shrub and forb species as per the reclamation plan each year (see section 12 below).

2.0 SCOPE OF THE ASSESSMENT

2.1 Study Area

For the purposes of this DIA, the PSA encompasses the existing 54L transmission line ROW between the east park boundary and the Banff substation within the town of Banff. The ROW ranges from approximately 20 m to 30 m wide. The LSA is the PSA plus a 100 m buffer on both sides of the PSA to encompass potential effects of this Project on wildlife and aquatic resources. This results in an LSA that is up to 220 m wide and centered on the transmission line.

The RSA is the valley bottom terrain in the montane and lower subalpine ecoregions below 1800 m within the Bow Valley from the east park boundary to Banff with the addition of 2 km on each end, excluding Minnewanka and Spray River (Figure 2-1). The RSA encompasses the town of Banff and most of the functional wildlife movement corridors surrounding the town and the PSA. Cumulative effects to Valued Components will be assessed at the scale of the RSA.

Figure 2-1. Regional Study Area (RSA).

2.2 Temporal and Spatial Boundaries

2.2.1 Temporal Boundaries

The temporal boundary for the environmental impact analysis for the Project includes three timelines – baseline, line rebuild operations and reclamation, and ongoing operation and maintenance of the transmission line. The baseline period is from the start of the present assessment process until the rebuilding of the 54L line begins and represents current conditions in the absence of the Project. Work activities are currently planned to begin in October 2026 and will continue for six years, including reclamation, with all post-construction reclamation monitoring finishing by December 2032. Reclamation in each section will be completed in the spring or fall after each year's construction is complete. The operation period is from the end of the line rebuild until the end of the operational life of the transmission line.

2.2.2 Spatial Boundaries

The spatial boundary for effects analysis for soil and vegetation for the Project is confined to the PSA, except NNV which must be assessed at the LSA scale due to potential for these plants to spread off the immediate Project footprint. Effects to cultural resources are also assessed at the PSA scale. Aquatics and hydrology are assessed at the LSA scale plus 300 m downstream of where watercourses intersect the transmission line in the Project area. The spatial boundary for effects analysis for wildlife is the LSA and RSA as well as laydown areas not included in the RSA (i.e. Mannix pit) due to the variety of wildlife species using the study area and the potential for wide-ranging effects to wildlife movement for some species (Figure 1-1).

2.3 Phases of the Impact Assessment

The assessment of effects related to the rebuild of the 54L transmission line involves the following phases:

- Defining the scope of the assessment and VCs;
- Collection of data through field studies and reviewing existing reports and data analysis;
- Determination of potential impacts and mitigation measures, following applicable guidelines and standards and drawing on previous project experience;
- Determination of potential residual impacts after mitigation measures have been applied;
- Cumulative impact assessment considering the effect of the Project in relation to all other past, present, and future projects in the region; and
- Design of follow-up, surveillance, and monitoring programs, as appropriate.

2.4 Required Permits and Submissions

2.4.1 Development Permit

In addition to the requirement for AltaLink to prepare a DIA, the construction of a transmission line in a national park requires a development permit issued by Parks Canada and is subject to the following conditions:

- Written consent from other land use agreement holders (CP and town of Banff) indicating AltaLink has approval to conduct activities on their lands;
- Review and approval of the Project by the AUC and notification to the public pursuant to AUC Rule 007;
- That a copy of the public communications and engagement plan and subsequent response, as well as confirmation of Project notification has been provided to Parks Canada; and
- Notification and engagement with the following Treaty 7 First Nations and the Métis Nation Region 3 to determine their interest in the Project and potential site-specific adverse effects:
    - Tsuut'ina Nation;
    - Siksika Nation;
    - Kainai Nation;
    - Piikani Nation;
    - Métis Nation of Alberta; and
    - Stoney Nakoda Nations (3 Bands: Chiniki, Bearspaw, and Goodstoney).

2.4.2 Building Permit

After these steps are completed, AltaLink must file for a building permit and requires the signature of the Parks Canada superintendent for the Banff field unit. AltaLink must also provide a building permit fee to Parks Canada.

2.4.3 Restricted Activity Permits and Business Licenses

Restricted activity permits (RAPs) issued by the Banff field unit will be required to undertake the transmission line rebuild activities, including access for the necessary machinery along designated routes (Canada National Parks Act 2013).Restricted activity permits (RAPs) issued by the Banff field unit will be required to undertake some of the transmission line rebuild activities that are not covered under other permits (e.g., vehicle access to the RoW prior to construction). All required permits must be in place prior to the commencement of any work.. All workers will also require permits for their vehicles. These permits must be in place prior to the commencement of any work. In addition, all contractors require a business license to work in BNP with appropriate insurance values and naming both AltaLink and Parks Canada on insurance certificates.

2.4.4 PRIA/MCSR

A PRIA was prepared by AltaLink and submitted to Parks Canada in March 2023 and is currently being reviewed. The PRIA will replace the MCSR.

The PRIA describes environmental management and mitigation measures to ensure routine and repetitive projects undertaken on the AltaLink ROW are managed in a way that ensures compliance with the *Impact Assessment Act*, the *Parks Canada Agency Directive on Impact Assessment 2019* (Parks Canada 2020), the C*anada National Parks Act*, and the *Utility Right-of-Way Agreement*. The PRIA dictates environmental mitigations required for any future maintenance of the transmission line and requires an update every 10 years.

2.4.5 DFO Review/SARA Permit

A number of the watercourses in the Project area have been classified as CH for SARA-listed bull trout (*Salvelinus confluentus*). Project interactions with CH with the potential for residual adverse effects require DFO review for potential Harmful Alteration, Disruption, or Destruction of fish habitat (HADD) under the *Fisheries Act.* Other work requiring DFO review includes permanent bridge replacement across Johnson Lake outlet as well as temporary bridge installation and permanent hard-ford construction across Cascade Creek. Depending on the outcome of the review process, DFO authorization may be required prior to Project commencement.

It is in contravention of SARA to affect individuals, residences, or critical habitat of Schedule 1 listed species. A SARA permit may be issued, authorizing a person to engage in an activity that may incidentally affect a listed species, provided that all other reasonable alternatives have been exhausted. Parks Canada Agency is the authority for the *Species at Risk Act* and is responsible for issuing SARA permits within the park boundary.

3.0 REGULATORY CONSIDERATIONS

3.1 Impact Assessment Act

Section 82 of the IAA (SC 2019, c.28, s.1) requires all federal authorities to determine, prior to approving a project, that

> "*the carrying out of the project… is not likely to cause significant adverse environmental effects*."

The Parks Canada *Directive on Impact Assessment* (2019) outlines the legislative and policy framework and accountabilities relevant to environmental impact assessment of proposed projects within National Parks under the IAA.

Under the directive, projects that are deemed by Parks Canada to likely cause adverse effects to natural or cultural resources, or characteristics of the environment important to key visitor experience objectives are assigned to one of four EIA processes: Alternate Process, Best Management Practices, BIA, or DIA.

After review of the Project Description provided by AltaLink, Parks Canada determined that the proposed Project is subject to a DIA under the IAA. The directive lists the types of projects that will be subject to a DIA including:

> "*Projects involving expansion of regional or community power supply, rights-of-way, power-lines, submarine cables, pipelines or other regional utilities infrastructure.*"

Parks Canada provided AltaLink with a detailed scope for the DIA in the Terms of Reference in November 2022 (Parks Canada 2022b). For this Project, AltaLink is the proponent and Parks Canada, as a federal agency, is the Responsible Authority for environmental assessment. Parks Canada is responsible for the determination of significance of any potential environmental impacts that could occur as a result of this Project.

3.2 Canada National Parks Act

Projects undertaken in a National Park fall under the *Canada National Parks Act* (2000, amended 2013) which states:

> *"The National parks are dedicated to the people of Canada for their benefit, education and enjoyment. Subject to this Act and the regulations, all the parks shall be maintained and made use of so as to leave them unimpaired for the enjoyment of future generations. Maintenance or restoration of ecological integrity, through the protection of natural resources and natural processes, shall be the first priority of the Minister when considering all aspects of the management of parks.*"

This DIA was written considering maintenance of ecological integrity on all lands affected by this Project within BNP as a main concern while also considering the need for a reliable and safe power supply for both visitors and residents of the park.

3.3 Fisheries Act

Under the federal *Fisheries Act* (R.S.C., 1985, c. F-14, amended 2019):

> *34.4 (1) No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish.*
>
> *35 (1) No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat.*
>
> *36 (3) Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.*

Under the *Fisheries Act,* an exception can be made to the above-noted sections if authorization has been granted.

The transmission line crosses seven watercourses/channels within the LSA, four of which are fish-bearing. Potential impacts of the Project to fish and fish habitat and mitigation measures to reduce those impacts are discussed in the Aquatic and Hydrology, section 5.6.

A Request for Review must be submitted for all works that may affect the CH of a listed species. DFO will issue a Letter of Advice if the Project does not require authorization. Authorization from DFO must be obtained if the Project cannot avoid the following (after mitigation):

- causing the death of fish;
- Harmful Alteration, Disruption or Destruction of fish and fish habitat (HADD); or
- contravention of one or more SARA prohibitions, with respect to aquatic species at risk.

Under the *Aquatic Invasive Species Regulations* (SOR/2015-121), it is illegal to introduce non-indigenous species into any waterbody.

3.4 Migratory Birds Convention Act

The *Migratory Birds Convention Act* (S.C. 1994, c.22) and its regulations ensure the conservation of migratory bird populations by regulating potentially harmful human activities to migratory birds and their nests. Under this Act:

> *"Section 6: Subject to subsection 5(9), no person shall*
>
> *(a) disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird, except under authority of a permit therefore."*

This Project involves clearing trees and shrubs on accesses and preparing work sites on the ROW as well as removal of Danger Trees outside the ROW. These activities have the potential to affect migratory birds and their nests. Potential effects of the Project to migratory birds, and mitigation measures to eliminate those effects, are discussed in the Wildlife section (section 5.5).

3.5 Species at Risk Act

SARA (2002, amended 2013) is a legislative tool to enable the protection and conservation of biodiversity in Canada. The purpose of *SARA* is:

"*to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened*."

In the RSA there are several species-at-risk listed under *Schedule 1* of *SARA* that could potentially be affected by the Project including: Bull trout (*Threatened*); Westslope cutthroat trout, Alberta population (*Threatened*); little brown myotis and northern myotis (*Endangered*); and western toad (*Special Concern*; Government of Canada 2023a). In addition, the grizzly bear is listed as a species of *Special Concern* (Government of Canada 2023a), though this species is not listed under *Schedule 1* of SARA. Whitebark pine also occurs within the RSA, but this species is primarily a high-elevation species that occurs at treeline. There are no known records of whitebark pine in the ACIMS database below 1790 m in the RSA and therefore the effects to this species were not considered. Some of these listed species have designated Critical Habitat (CH) in the LSA/RSA.

Under SARA CH is defined as:

> *"…the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species' critical habitat in the recovery strategy or in an action plan for the species."* (subsection 2(1))

In addition, SARA defines habitat for aquatic species as:

> "*… spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced.*" (subsection 2(1)).

Mitigation measures to protect SARA listed species and their CH are outlined in the Wildlife and Aquatic sections below (sections 5.4 and 5.5). These mitigation measures have been designed to prevent any residual negative effects to these species at risk.

4.0 PROJECT SCHEDULE

4.1 Annual schedule

The Project will be carried out in phases over a six-year timeframe from October 2025 to December 2031 including surveys, civil work, construction and post-rebuild reclamation requirements (Table 4-1). In May or June of each year, an annual EPP will be submitted to Parks Canada outlining detailed, site-specific construction plans and mitigation measures for the section(s) that will be constructed in that year.

Table 4-1. Proposed Schedule for 54L Rebuild Project.

Date	Project Phase
March 2025	AltaLink submits draft DIA to PCA (Parks Canada Agency)
April 2025	AltaLink submits stakeholder engagement plan for PCA review
May 2025	PCA and AltaLink send joint FN engagement letters, AltaLink does AUC public mailout, PCA posts DIA
May – October 2025	Stakeholder engagement process including Traditional Land Use studies
November 2025	Finalize DIA
February 2026	AltaLink files Facility Application (FA) with Alberta Utilities Commission (AUC) after DIA is finalized
June 2026	PCA issues Building Permit and Project approvals
September 2026	AltaLink receives AUC approval
October 2026	Start access preparation and vegetation management
January 2027 – March 2029	Line construction
May 2027 – September 2032	Reclamation and access rollback (on-going throughout Project)

In general, vegetation management will occur from September 1st to March 31st for hand-removal only and from December 1 to March 31 for logging, brushing of regrowth, and burning. Any access or ROW preparation will occur on frozen ground between December 1st and March 31st. Table 4-2 describes the proposed time of year for various line construction activities in each section, and was developed based on ecological constraints as well as constructability requirements such as electrical load restrictions. AltaLink will endeavor to complete all phases of the Project for each section in the same year (including Danger Tree clearing, civil work, and rebuilding the line). In some sections, Danger Tree clearing and civil work may proceed before line construction to allow more space for safe line construction. Therefore, due to logistical constraints, work in some sections may need to extend across more than one year. Reclamation will occur in spring and fall of each year.

The section between Cascade power plant and Banff 123S substation (section 7 to 10) must be constructed between September long weekend and mid-October during low power loads (i.e. when ski hills are not in operation) as the electrical load will be transferred to the Fortis line for this portion of the line. In general, low electrical loads are from June 1st to October 15th. However, AltaLink has committed to scheduling the work after the September long weekend to mitigate disturbance to visitors. The other work activities not requiring isolation of the line will occur between December and March annually.

The work to bury the Fortis line in sections 9-10 east of Compound Road will occur in the fall after the long weekend in September but before the ground freezes.

Table 4-2. Proposed line construction season for each structure span for the 54L rebuild project.

Section	Str span	Year of construction	Season	Activity
3	200-215	1 or 2	Dec 1-Mar 31	Bare wire construction with bypass
4	216-232	1 or 2	Dec 1-Mar 31	Bare wire construction with bypass
5	233-254	1 or 2	Dec 1-Mar 31	Bare wire construction with bypass
6	255-268	1 or 2	Dec 1-Mar 31	Bare wire construction with bypass
7	269-274	1 or 2	Dec 1-Mar 31	Bare wire construction
7, 8	274-294	2	Sept long weekend-Oct 15	Bare wire construction with load transfer to Fortis
8, 9, 10	294-313	1	Sept long weekend-Oct 15	Bare wire construction with load transfer to Fortis

4.2 Seasonal Closures

The Fairholme bench environmentally sensitive site (ESS) closure (i.e., Fairholme Bench area south of Johnson Lake and northeast of the TCH) is in place each year to restrict human activity during sensitive wildlife periods from April 1st to August 31st. This area is afforded a high level of protection from human disturbance. All sections and accesses from AltaLink structures 230 (Morrison coulee) to 257 are within the Fairholme ESS closure (Figure 4-1); no foot or machine access is permitted during this time.

Parks Canada may revise the extent and timing of the Fairholme ESS closure on an annual basis. All phases of the Project will be scheduled to adhere to any access restrictions during this closure.

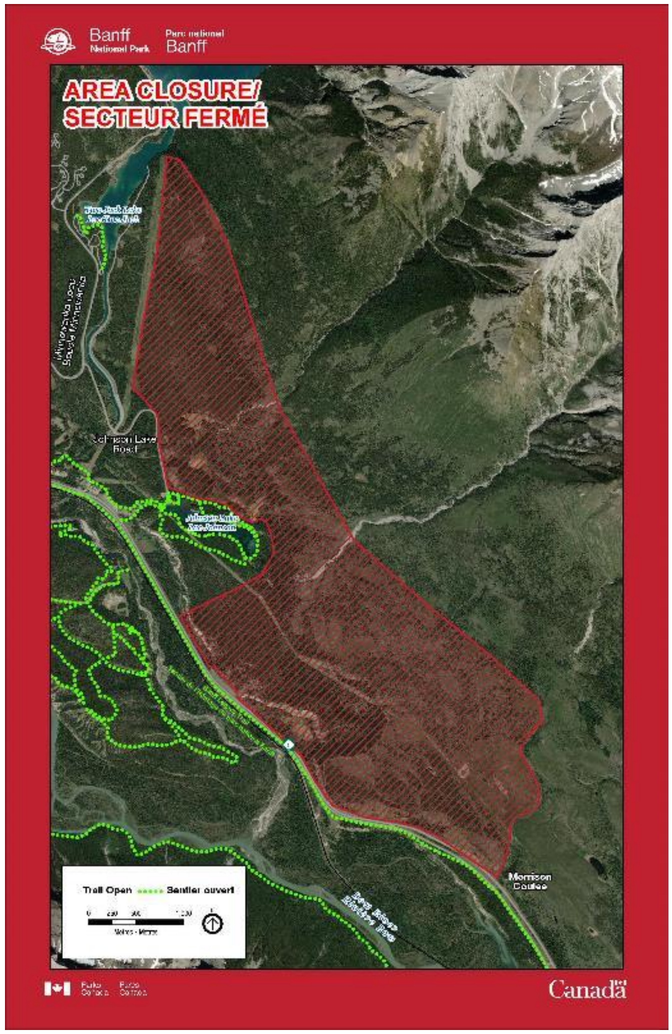

Figure 4-1. Annual Fairholme ESS closure between April 1st and August 31st (Parks Canada map; extent and timeline subject to change).

5.0 BASELINE SITE CONDITION

5.1 Air

The ambient air quality along the ROW is the same as that of the surrounding undisturbed land, given that there is consistently a very low-level use of machines/equipment along most of the ROW and considering its location within a National Park. There is potential for low levels of particulates and pollutants mostly originating from vehicles travelling along the nearby roads that intersect the ROW including the TCH, roads in the Tunnel Mountain Campground, and the Banff Industrial Park.

In the summer during wildfire season, levels of particulate matter (PM10) from smoke occasionally exceed the air quality thresholds for this pollutant.

5.2 Landforms and Soils

5.2.1 Ecoregion and Ecosections on the ROW

The 54L ROW is in the montane ecoregion of BNP under the ELC for the park (Holland and Coen 1982). The montane ecoregion occurs in the Bow Valley at elevations between 1350 m and 1500 m on north facing slopes and up to 1650 m on steep south facing slopes and covers 3 % of the park (Holland and Coen 1982). The montane is further divided into ecosections and then ecosites based on topography, slope position, soil, and vegetation types. There are nine ecosites that intersect the AltaLink ROW (Table 5-1).

Table 5-1. Ecosections and ecosites in the LSA.

Ecosection	Ecosite
AT - Athabasca	AT1
FR – Fireside	FR1
HD – Hillsdale	HD1, HD2,HD4
NY – Norquay	NY3
PT – Patricia	PT1
VL – Vermillion Lakes	VL3, VL4

5.2.2 Landforms and Soils on the ROW

Landform and soils information for each ecosite was derived from the ELC (Holland and Coen 1982) and then confirmed with a field assessment (Tables 5-2, 5-3). East of the TCH, the ROW occurs on a large terrace on rolling terrain above the valley floor associated with the PT1 ecosite. This terrace is broken up by several large wide incised gullies below the level of the terrace with active or historic stream channels and alluvial plains including Carrot Creek (HD1), Morrison Coulee (FR1), and Girouard Creek (HD1). The steep slopes between the terrace and the low-lying alluvial ecosites are in the NY3 ecosite. West of the TCH, the ROW crosses the floodplain of the original Cascade River before it was dammed (HD2) and then climbs to another flat terrace in the Tunnel Mountain Campground which is also in the PT1 ecosite. The ROW then descends again to the valley floor and crosses floodplain ecosites with saturated soils (VL3, VL4) and an alluvial plain east of the industrial park with drier soils (HD2, HD4).

Table 5-2. Soil properties on the 54L ROW by ecosite, section, and span (Source: ELC, Holland and Coen 1982).

Ecosite	Section	Span	Landform in the LSA	Summary of expected soil properties by ecosite
AT1	6	265.5-268	Terraces with gentle gradient and irregular channelled surface	Brunisolic soils and calcareous, coarse textured, glaciofluvial material; gentle slopes; potential for a veneer of medium textured eolian material or inclusions of ice contact stratified drift. Rapidly to well drained.
FR1	4	229 - 231	Alluvial fan and apron of Morrison Coulee	Brunisolic soils (some Regosols) and calcareous, coarse stratified fluvial material; slopes between 2 and 30%. Moderately to extremely calcareous. Well drained.
HD1	3, 4, 5	213.5-217 243.5-251	Fan, apron of Carrot Creek, Girouard Creek	Regosolic soils situated on calcareous, coarse-stratified fluvial landforms with slopes between 1 and 15%. Rapidly to moderately well drained. Surfaces usually channeled.
HD2	7	273 - 275	Floodplain of Cascade Creek	Same as HD1 (HD ecosites differentiated on vegetation).
HD4	10	300-303	Fan, apron of historic Whiskey Creek	Same as HD1 (HD ecosites differentiated on vegetation).

Ecosite	Section	Span	Landform in the LSA	Summary of expected soil properties by ecosite
NY3	3, 5, 6, 7, 8	213-13.5 243-43.5 264-267 270-273 275-276 294-297	Hummocky ice contact stratified drift on steep slopes	Brunisolic (dominant) and Regosolic soils characterized by inclined gullied and hummocky calcareous, variably textured ice contact stratified drift with steep slopes between 30 and 70%. Rapidly to well drained.
PT1	3, 4, 5, 6, 8	200- 213 217- 229 231- 243 252- 264 276-294	Ridged; hummocky including bedrock control (blankets)	Brunisolic and luvisolic soils situated on morainal landforms consisting of calcareous, medium textured till with linear slopes between 2 and 70%. Mesic, rapidly to well drained soils.
VL3	10	313-Banff sub	Wet level floodplain	Rego Gleysolic soils; calcareous, fine, stratified fluviolacustrine material and calcareous, coarse, stratified fluvial material situated in wet level floodplains; slopes range from 0 to 2%. Poorly drained soils (high water tables).
VL4	9	297.5-300	Wet level floodplain, aprons, fans	Same as VL 3 except imperfectly to poorly drained soils.

Several soil pits were hand dug to a depth of 30 cm in each ecosite along the ROW to confirm the soil characteristics and record more detailed information on May 29, September 23-24, and 28-29, 2020 (Appendix C). This soil data will help to inform reclamation methods and vegetation species for optimal re-establishment of native vegetation. It also provides information as to the susceptibility of soils to rutting and compaction. Information collected at each soil pit location included: soil horizons, texture, depth, root frequency, root diameter, drainage, course fragment content, aspect, slope, and slope position. A summary of relevant information is contained in Appendix C. Soil descriptors and methods are derived from the Canadian System of Soil Classification (SCWG 1998) and the *Field Manual for Describing Terrestrial Ecosystems* (B.C. Ministry of Forests and Range 2010).

In general, the upland terrace from spans 200-242 in the PT1 ecosite has well drained coarse soils with low to moderate susceptibility to compaction. The exception is the large wetlands at spans 207-208, 211-212, and 235-236 which have organic soils on top of finely textured silty clay. The Carrot Creek alluvial plain, Morrison Coulee, and the Cascade Creek floodplains have a matrix of very coarse soils with pockets of fines commonly associated with floodplains in mountain streams. The Girouard Creek floodplain at spans 243-246, and 250-251 has recent deposition of silt and sand overtop of the existing fine textured soil and no coarse material near the surface. The Tunnel Mountain Campground has fine textured soils and appears to be previously disturbed with evident compaction and rutting near the structures. The historical level floodplain of 40 Mile Creek from spans 298-300 has poorly drained soils with fine textured soils and evidence of periodic inundation.

5.3 Vegetation

5.3.1 Ecosites and Vegetation Communities

For the purposes of analyzing the area of each ELC ecosite and vegetation community type in the PSA and LSA the ELC and VRI GIS layers were overlaid on the LIDAR imagery and ecosite and community type was assigned to each VRI polygon with a combined label. The vegetation community type for each VRI polygon was assigned based on field assessments of plant dominants in each community type along the edge of the ROW using the keys in the ELC. This combination allows for a more accurate and detailed reflection of soil, vegetation, and structural stage (B.C. Ministry of Water, Land, and Air Protection 2004) for each distinct VRI polygon than each classification system on its own which in turn allows for a more detailed analysis of available wildlife habitat in the LSA (see section 5.4 below).

In total there were 14 distinct vegetation community types identified in the nine ecosites in the LSA and 13 in the PSA (Table 5-3). The ROW is dominated by four vegetation communities which make up over 80% of the upland areas. Two closed lodgepole pine forest communities, C6 and C19, and closed C1 stands dominated by Douglas fir occur in the upland bench areas. Open O3 white spruce forest communities occur in the floodplain areas near Girouard Creek and Cascade Creek. The ROW is dominated by structural stages 2-4 with both natural fire/ disturbance origin stands and modified logged areas within the Carrot Creek fuel break (2L and 3L). The adjacent forests outside the ROW in the LSA are 50% mature structural stage 6 with another 25% in structural stage 3 in the 2003 Carrot Creek Wildfire area.

Table 5-3. Vegetation communities and structural stages in the PSA and LSA.

Veg comm. (ELC)	Ecosite(s)	Community Description	PSA		LSA	
			Ha	%	Ha	%
C3	AT1, NY3	Lodgepole pine / juniper/ bearberry	0.42	1.20	4.28	1.38
C4	HD2, VL3, VL4	White spruce / prickly rose / horsetail	0.05	0.13	3.71	1.20
C5	NY3	White spruce - Douglas fir / feathermoss	1.29	3.67	10.68	3.45
C6	PT1	Lodgepole pine / buffaloberry / showy aster	16.34	46.62	133.42	43.14
C16	PT1	Aspen / hairy wild rye/ pea vine	1.07	3.05	12.29	3.98
C17	HD1	Balsam poplar / buffaloberry	--	--	2.31	0.75
C19	FR1, HD1, PT1	Lodgepole pine / buffaloberry/ twinflower	7.09	20.23	72.46	23.43
O3	HD1, HD2, NY3	White spruce / shrubby cinquefoil/ bearberry	4.61	13.15	28.29	9.15
O5	HD1, NY3	Douglas fir /common juniper/ bearberry	0.23	0.65	11.12	3.60
H6	HD4	Junegrass-pasture sage- wild blue flax	0.58	1.65	3.83	1.24
H8	HD1	Yellow dryad – willow herb	0.15	0.44	1.43	0.46
H11	NY3, PT1	Water sedge – beaked sedge	0.65	1.84	2.84	0.92
S1	PT1	Shrubby cinquefoil-willow / brown moss	0.09	0.26	0.20	0.07
Nil	N/A	Urban/ roads/ railway/ water	2.50	7.13	22.37	7.23
		Total	**35.05**	**100%**	**309.23**	**100%**
		Structural Stage	**Ha**	**%**	**Ha**	**%**
		1- Bare ground	---	--	--	--
		2 – Herb/Grass (<1.5m)	9.31	26.57	17.83	5.76
		2L – Herb /grass – logged fuel break	3.70	10.55	7.81	2.53

		3 – Shrub (1.5 – 10 m)	18.61	53.08	76.10	24.61
		3L – Shrub (1.5 – 10m) – logged fuel break	--	--	25.93	8.39
		4 – Pole sapling (>10m, <40 years)	--	--	2.54	0.82
		5 – Young forest (40-80 years)	--	--	--	--
		6 – Mature forest (81-250 years)	0.93	2.66	156.66	50.66
		7 – Old forest (> 250 years)	--	--	--	--
		Nil – urban/ roads/ railway / water	2.50	7.13	22.27	7.23
			35.05	**100**	**309.23**	**100**

5.3.2 Special Vegetation Resources

In BNP, there are several plant species and vegetation communities that are considered special resources that may require additional mitigation in order to prevent large scale loss or damage to these species. Whitebark pine (*Pinus albicualis*) is a SARA listed species that occurs primarily in high elevation sites near treeline in BNP. The 54L ROW and LSA do not occur in whitebark pine core or regeneration habitat.

Limber pine (*Pinus flexilis*) is another rare five needle pine that is listed as Endangered in Alberta (reference). Limber pine is discussed under rare plants as they do occur in the LSA (see section 4.3.4 below).

Douglas fir is not a rare species in BNP, but this species is at the northern end of its range and therefore mature, large diameter trees are considered a special resource in the park (Achuff 1986). Douglas fir makes up a component of the stands at the east end of the ROW near the park boundary between structures 199- 213, west of Carrot Creek and structures 217-244, 248-249, and in the Tunnel Mountain Campground from 276-294 in drier ecosites.

Rocky Mountain juniper (*Juniperus scopulorum*) is another identified special resource in the park (Achuff 1986). There are several ecosites that have Rocky Mountain juniper in the PSA and LSA. This juniper species was recorded in the dry O17 ecosite from structures 248-249, as well as the O3 and O17 ecosites between structures 264-273 and the steep slope between structures 294-297.

Foothills rough fescue and bluebunch wheatgrass grasslands are also important vegetation resource as they are relatively rare in the southern end of BNP. Rough fescue occurs as a component of the graminoid layer in most of the drier montane ecosites in the LSA but there are no rough fescue dominated grasslands in the LSA. However, the open ROW is conducive to the growth and persistence of this grass within the PSA. Bluebunch wheatgrass occurs in xeric vegetation communities and occurs as a small component of the open O3 and O5 communities between structures 243-250.

5.3.3 Species Richness and Community Diversity

There were 186 species of native vascular plants recorded on the ROW, which is 22% of the 844 known vascular plant taxa recorded during vegetation surveys conducted as part of the ELC (for full plant list see Appendix D) (Holland and Coen 1982). The open cleared ROW generally supports greater species richness than the adjacent undisturbed mature forest along the ROW edges. This is due to the higher light as well as nutrient and water availability in more open shrub and grass dominated communities compared to those with mature trees. The exception to this is the 2003 wildfire area from structure 217-243 where dense lodgepole pine regeneration occupies both the ROW and outside the ROW.

The open upland ROW vegetation communities including C1, C6, C19, on the flat benches had between 50-82 vascular plant species including diverse forb and grass layers. The drier ecosites on steep slopes including O5 and C5 had between 29-51 species. The wetlands had the least species richness with between 13-29 species, but these obligate wetland species are unique to wetlands and do not occur in any of the upland habitats.

An earlier study on AltaLink's 551L transmission line using paired vegetation plots on the open ROW and in the adjacent mature forest showed that the species richness is 1.5 – 2.5 times higher in the open ROW habitats than the mature forest and there is only 10% of the species in common between the two habitat types (Avens Consulting 2015). Therefore, these open ROWs with native plant communities contribute to native plant diversity on the regional park landscape of the Bow Valley resulting in an associated higher habitat diversity for wildlife in the montane ecoregion.

5.3.4 Rare plants and plant communities

The early rare plant survey was conducted between June 11th and 16th, 2020 and the late survey on July 29th and August 4th, 2020. An additional survey was conducted on July 18, 2023 near the wetland between structures 235-236. There were two rare plant species recorded on the 54L ROW during the surveys: limber pine and Tunux's moonwort (Table 5-4).

Table 5-4. Rank, location, and habitat of rare plant species recorded on the 54L ROW.

Species	Rank	Location	Population and Habitat
Limber pine (*Pinus flexilis*)	S2	Between structures 243-244 on steep slopes	2 immature trees growing on dry open steep west facing slope, 1 cone bearing, 1 with no cones
Tunux's moonwort (*Botrychium tunux*)	S1S2	Near wetland between structures 235-236	68 plants in moist open area just outside marsh wetland boundary

Limber pine

Two immature limber pine (*Pinus flexilis*) were recorded on the steep north facing slope above the Girouard creek floodplain between structures 243 and 244 (Figure 5-1). This species was identified and differentiated from whitebark pine by the large size of its cones which were 10 cm long (WB cones are 3-6 cm long). Also, whitebark pine are a high elevation treeline species and these limber pine were recorded at 1401-1412 m, well below the lowest recorded WB pine record in the ACIMS database at 1979 m and below the lower limit of the identified critical habitat for WB pine at 1750 m.

Figure 5-1. Immature limber pine with cones on the 54L ROW.

Tunux's moonwort

In July 2023, another rare species Tunux's moonwort (*Botrychium tunux*) was recorded near the wetland between structures 235-236(Figure 5-2). There were 68 plants recorded in a 5 x 10 m area on the southwest side of the wetland near the access trail around the wetland. This species was described as a new Botrychium species in 2002 studies from Alaska (Stensvold et al. 2002). However, it has since been found in B.C., Alberta, Yukon, California, Idaho, and Montana and is rare in all of its known range. This moonwort species has 4-6 pinnae pairs, yellow- green leafy blade, spore bearing blade (sporophore) stem length less that the leafy blade (tropophore) length, asymmetrical lower pinnae, and lower sporangia often twisted to point downward.

Figure 5-2. Rare Tunux's moonwort near the wetland between structures 235-236.

There was also a rare plant community recorded on existing but overgrown Access 3c which is NW of the ROW between structures 230 -235 (see Access map D, Appendix A). There is a rare montane grassland community on this original access that avoids a steep inaccessible slope on the ROW. The grassland is an open H13 Richardson needlegrass-junegrass-everlasting (*Achnatherum richardsonii – Koeleria macrantha-Antennaria parvifolia)* vegetation type (Figure 5-3), Rank S2. This dry grassland occurs as small patches within and bordering C3 and C1 forests (Holland and Coen 1982). To document this, rare community plant species and cover were recorded in 6 x 1 m^2 quadrats, soil was recorded in two shallow pits, and photos were taken.

Figure 5-3. Rare H13 grassland on Access 3C.

5.3.5 Invasive Non-native Plants

In total there were 26 species of non-native plants recorded in the PSA. Of these 26 species, 14 have a Parks Canada rank of 1 (Very Invasive) or 2 (Invasive) and most are rated as Noxious or Prohibited Noxious under the *Alberta Weed Control Act* (2010) (Table 5-5). The 54L ROW is in the Zone 3 Integrated Control for NNV management where the Parks Canada objectives are no net increase in spatial extent or density of Rank 1 and 2 species and no net increase in number of NNV species (Parks Canada 2019). There were also 12 nuisance weeds and agronomic species recorded on the ROW.

NNV infestations are concentrated in areas that have been previously disturbed and high public use areas including the accesses onto the ROW, the Carrot Creek fuel break, Johnson Lake area, the Tunnel Mountain Campground, and the Banff industrial Park (Appendix A).

Table 5-5. Non-native Rank 1 and 2 plant species recorded on the 54L ROW.

Common Name	**Latin Name**	**Rank (Parks Canada)**	**Alberta Designation**
Blueweed	*Echium vulgare*	1	Noxious
Bull Thistle	*Cirsium vulgare*	2	Not listed
Caraway	*Carum carvi*	1	Unregulated
Cicer Milk Vetch	*Astragalus cicer*	2	Not listed
Common Caragana	*Caragana arborescens*	2	Not listed
Common Toadflax	*Linaria vulgaris*	2	Noxious
Creeping Thistle	*Cirsium arvense*	2	Noxious
Meadow Hawkweed	*Pilosella caespitosum*	1	Prohibited noxious
Ox-Eye Daisy	*Leucanthemum vulgare*	2	Noxious
Perennial Sow-Thistle	*Sonchus arvensis*	2	Noxious
Scentless Chamomile	*Tripleurospermum inodorum*	1	Noxious
Tall Buttercup	*Ranunculus acris*	2	Noxious
Tufted Vetch	*Vicia cracca*	2	Not listed
White Cockle	*Silene latifolia*	2	Noxious

5.4 Wildlife

The baseline assessment evaluates wildlife and wildlife habitat occurring within three study areas at different scales, the PSA, LSA, and, as relevant, in the RSA. Wildlife and wildlife habitat are based on desktop studies, 2020 and 2023 field surveys, and vegetation community types represented as a combination of the ELC and the VRI as described in section 4.3.1.

Desktop studies included research from provincial and federal agencies, peer-reviewed reports, and consultation with Parks Canada biologists. Parks Canada also provided regional wildlife GPS data for bighorn sheep, cougar, grizzly bear, and wolf, VHF data for elk, as well as winter tracking for wolf and cougar.

Field studies consisted of the following and are described in more detail below:

- Bat habitat assessments, including audio recordings, to determine potential roost trees and occupancy at locations where bats were suspected.

- Songbird point count surveys to investigate species richness, abundance, and habitat use stratified based on vegetation communities and structural stage to ensure appropriate representation of habitat types, survey locations.
- Aerial raptor survey to identify active raptor nests within or near the AltaLink ROW, operational activity area, and proposed helicopter flight paths.
- Daytime owl call playback surveys to detect the presence of diurnal owl species (tree cavity nesters).
- Amphibian surveys consisting of visual and auditory assessments in and/or near wetlands in the LSA.
- Identification of key habitat features such as dens, cavity trees, and mammal movement routes within the LSA.

5.4.1 Wildlife-related Project Considerations

BNP is home to approximately 53 mammals, 311 species of birds, four amphibians, and one reptile (Parks Canada 2022c). A detailed list of potential and observed vertebrate wildlife species within the RSA, and their provincial and federal status ranking, can be found in Appendix E.

There are several species-at-risk listed under Schedule 1 of the federal SARA that occur in the RSA and therefore have the potential to interact with the project (Government of Canada 2023a):

- **Endangered:** Little brown myotis (*Myotis lucifugus*), Northern myotis (*Myotis septentrionalis*), , black swift (*Cypseloides niger*), , gypsy cuckoo bumblebee (*Bombus bohemicus*).
- **Threatened:** Bank swallow (*Riparia riparia*), barn swallow (*Hirundo rustica*), bobolink (*Dolichonyx oryzivorus*), Lewis's woodpecker (*Melanerpes lewis*), Westslope cutthroat trout (AB population; *Oncorhynchus clarkii lewisi*), bull trout (Saskatchewan-Nelson Rivers population; *Salvelinus confluentus*), Western bumblebee (*Bombus occidentalis*)
- **Special concern:** Grizzly bear (*Ursus arctos*), wolverine (*Gulo gulo*), common nighthawk (*Chordeiles minor*), evening grosbeak (*Coccothraustes vespertinus),* Harris' sparrow *(Zonotrichia querula*), horned grebe (*Podiceps auritus*), olive-sided flycatcher (*Contopus cooperi*), rusty blackbird (*Euphagus carolinus*), western grebe (*Aechmophorus occidentalis*), , red-necked phalarope (*Phalaropus fulicarius*), Western toad (calling population; *Anaxyrus boreas*), yellow-banded bumblebee (*Bombus terricola*)

Wildlife-related considerations for work activities along the 54L ROW include the following:

- The 54L ROW is within a portion of the Fairholme-Carrot Creek Benchlands ESS (east park boundary to Johnson Lake), and legally declared wilderness area, consisting of the largest remaining intact block of secure montane wildlife habitat in the park (Parks Canada 2022a). The montane ecoregion, which is the most biologically diverse and ecologically important area in BNP, provides important low elevation wildlife habitat and is a critical link for wildlife movement. Human use of this area, particularly during the summer, can displace wildlife and diminish habitat security (Parks Canada 2022a).

- Several wildlife underpasses in the RSA (n = 8) parallel the 54L at the TCH and are critical for landscape connectivity in the area. Several animal movement routes intercept the 54L in proximity to these underpasses at Carrot Creek, Morrison Coulee, and Girouard Creek (Appendix A).

- The 54L ROW is situated within three important wildlife corridors including: Penstock (between Two Jack Canal and the TCH), Fenlands-Indian Grounds (between Banff townsite/Tunnel Mountain and the TCH), and Norquay-Cascade (the south edge of this corridor runs along the north side of the TCH; Appendix F).

  - The Penstock Corridor has been cited as the most important route for wildlife to access this area from other parts of the Park (Heuer 1998).

  - The Fenlands-Indian Grounds Corridor has been identified as a regional pinch-point for wildlife movement, constrained by human use and topography (Whittington and Petersen 2018a).

  - The Norquay-Cascade Corridor is one of three travel routes that link wildlife habitat to the east and west past the Banff townsite. It has the greatest potential for use by large carnivores (Duke et al. 2001).

An important and relevant objective of the Banff National Park Management Plan (2022) is to maintain or improve the effectiveness of existing wildlife corridors by managing habitat and people, reducing human-wildlife conflict, and maintaining or improving habitat security for important species. These objectives have been considered during impact assessments on selected VCs.

5.4.2 Selected Valued Components (VCs)

To assess potential effects from project activities to wildlife and/or wildlife habitat, the following species and species groups are considered VCs because they:

- are a regional conservation or management concern;
- are potentially impacted by altered use of the Project area;
- are known to be sensitive to linear development and/or sensory disturbance;
- are indicators for a variety of wildlife due to similar biological processes or habitat requirements (i.e., keystone or umbrella species); and
- have regional monitoring data available.

VCs selected and rationale for selection are listed below in Table 5-6.

Table 5-6. Selected Valuable Components and Rationale for Selection.

Wildlife species/ group selected as VCs	**Rationale for Selection**
Elk	Specific management strategies for BNP, high public profile; utilize linear features for movement; VHF data available within the RSA
Bighorn sheep	Limited winter range occurs along the eastern portion of project; GPS/winter track data available within the RSA
Grizzly bear	Keystone species; listed as *Threatened* under the Alberta Wildlife Act and federally As *Special Concern*; high public profile; known use of transmission lines for forage, prone to sensory disturbance; GPS data available within the RSA
Wolf	Apex predator; high profile in the park; utilize linear features for movement; prone to sensory disturbance; GPS/winter track data available within the RSA
Cougar	Apex predator; utilize corridors/linear features for movement, prone to sensory disturbance; GPS/winter track data available within the RSA
Marten	Relevant species representing mesocarnivores; potential for project to effect movement patterns; prey habitat/species
Small mammals	Important component of prey base in the LSA; sensitive to small scale habitat alteration; large linear disturbances can create a movement barrier; potential for direct mortality
Bats (little brown myotis and Northern myotis)	Federally listed as Endangered; unique habitat requirements, including trees used for roosting/maternity roosts; potential for direct mortality (tree felling)

Avian (songbirds, raptors, owls)	Sensitive to small scale habitat alteration; large linear disturbances can create a movement barrier; potential for direct mortality (tree felling)
Amphibians (long-toed salamander, Columbia spotted frog, Western toad, wood frog)	Sensitive to development near wetland/riparian habitat, the first two are provincially listed as *Sensitive* and the third is federally listed as *Special Concern*; potential for direct mortality.

Moose and aquatic birds were also considered but are not included in this impact assessment because effects on these species and associated mitigation measures are covered in discussions of selected VCs below.

5.4.3 Wildlife and Wildlife Habitat in the PSA, LSA, and RSA

The following species and wildlife group summaries include current conservation status, local and regional information on habitat requirements, use of linear features, and results from field surveys or data analysis.

Parks Canada has provided the following GPS and VHF collar data that were invaluable to help inform assessment and proposed mitigation:

- Elk VHF collar data: 1996-2020
- Bighorn sheep GPS collar data (n=38): 2019-2022
- Grizzly bear GPS collar data, 2-hr fix (n=14): 2001, 2003, 2010, 2012-2017
- Wolf GPS collar data (n=11): 2004-2005, 2009-2010, 2015-2022 and winter tracking data (1993-2018)
- Cougar GPS collar data, 2-hr fix (n=5): 2001 to 2003 and winter tracking data (1994-2018)

For seasonal habitat use comparisons, spring was defined as March, April, May; summer as June, July, August; fall as September, October, November; and winter as December, January, February.

GPS collar data should be interpreted with caution due to small sample sizes, length and timing of sampling periods, and potential GPS error; data comparisons should be intraspecific only.

5.4.3.1 Ungulates

Elk (*Cervus canadensis*)

Elk are secure provincially and not listed federally.

Elk use a variety of habitats, including marshy meadows, aspen parkland, and coniferous forests and forest edges. Elk select habitats that provide open feeding areas and adjacent forest cover (Liley and Creel 2007; Robinson et al. 2010). Elk are primarily grazers but will also consume forbs and will browse on woody plants in the winter. They are most active at dawn and dusk.

Elk are the most numerous large animal in BNP and an important species as the primary herbivore and major prey species for carnivores such as wolves, grizzly bears, and cougar. There are close to 350 found in the park, with over 200 living in the lower Bow Valley close to the town of Banff (Parks Canada 2022d). Elk have shown high use of wildlife corridors surrounding the project area (Whittington and Petersen 2018a). The Vermilion Lakes Wetlands, west of the project area and within the RSA, is important to elk in the region because they provide calving grounds and mineral licks, a limited resource (Parks Canada 2022d).

Due to the high concentrations of elk in and around the Banff townsite, elk are actively managed – habituated elk in the town site of Banff can cause public safety concerns such as elk-human conflict (particularly in the spring calving season and fall rut) and ecological problems (e.g. high levels of herbivory). To mitigate these impacts, Parks Canada has implemented the Elk Management Strategy, which currently focuses on reducing elk-human conflicts, monitoring population trends, and maintaining predator-prey dynamics (Parks Canada 2022d).

Elk are relatively tolerant of disturbance and have been shown to take advantage of human use areas as a refugia from predators (Hebbelwhite and Merrill 2007). Elk will forage, bed, and travel along powerlines (e.g., Bartzke et al. 2014, Tattersall et al. 2023; Figure 5-4). Elk pellets were observed frequently within the LSA and can be encountered throughout the Project area.

Figure 5-4. Elk within the AltaLink 54L ROW near Tunnel Mountain Campground in 2023.

VHF Collar Data

Of the 7,877 elk VHF points recorded in the RSA, 29 were recorded in the PSA and 297 in the LSA. Location densities of VHF data were comparatively high, with 82.9/km^2 in the PSA, 61.6/km^2 in the LSA, and 63.1 km^2 in the RSA (Table 5-7). Considering elk travel in herds, the numbers are conservative as there were likely more than one individual per timestamp. Seasonal use was almost exclusively in the spring and winter for the Project area (~45% spring, ~45% winter) in contrast to similar use across months in the broader region (Figure 5-5). Most VHF points for elk occurred around the Banff townsite and surrounding areas: Vermillion Lakes to the west, Tunnel Mountain to the east, and the Banff Springs golf course to the south. There were very few elk VHF locations detected along and north of the transmission line from the east park boundary to Johnson Lake (Appendix F).

Table 5-7. Elk VHF collar data: 1996-2020.

Study Area	Area (ha)	Area (Km^2)	# of VHF Points	# of VHF Points per Km^2
PSA	35	0.35	29	82.9
LSA	482	4.82	297	61.6
RSA	12476	124.76	7877	63.1

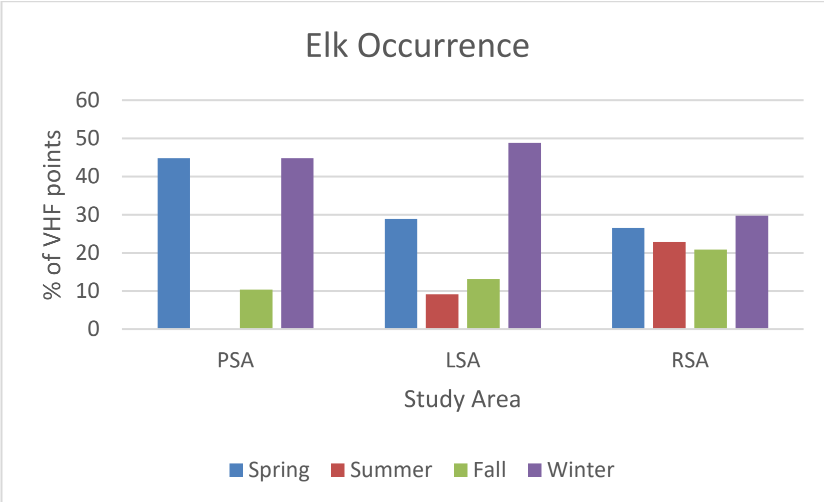

Figure 5-5. Seasonal elk occurrence in the PSA, LSA, RSA.

Bighorn Sheep (*Ovis canadensis*)

Bighorn sheep are secure provincially and not listed federally.

Bighorn sheep are predominantly grazers of grass and forbs and migrate seasonally between low grassy slopes and alpine meadows (PCA 2022e) and are active during the day, with peak feeding in early morning and at dusk.

The bighorn sheep is Alberta's official mammal and a recognizable iconic species in BNP. In 2020, the sheep population in the Park was estimated at 658 and considered stable, however a low 25% lamb-to-ewe ratio suggests the necessity of long-term population monitoring (Stevens 2020).

Rugged escape terrain (cliffs, talus slopes etc.) and secure winter range are important habitat requirements for bighorn sheep to reduce predation risk and to provide forage opportunities, respectively. Bighorn sheep demonstrate high fidelity to traditional winter ranges (Stevens and Heuer 2020) and it is likely the single most important factor controlling sheep populations in BNP. In the RSA, bighorn sheep winter range has been identified on the lower slopes of Mt. Norquay (Stevens and Heuer 2020).

During pregnancy, lambing, and while lactating (between April and July), ewes are particularly sensitive to human disturbance as they move regularly in search of high-quality forage (Wagner and Peek 1999). It is important to minimize disturbance during critical times (e.g., lambing, rut) and in critical habitats (e.g., wintering grounds, mineral licks, and lambing areas) (Demarchi 2004).

GPS Collar Data

Of the 11,377 bighorn sheep GPS points recorded in the RSA, none were recorded in the PSA and 11 in the LSA, demonstrating low use of the area (Table 5-8, Appendix F). Location densities of GPS collar data for the three study areas were 0/km^2, 2.3/km^2, and 91.2 km^2, respectively. Seasonal use in the broader RSA was highest in the spring and fall, and lowest in the summer (Figure 5-6). GPS points for bighorn sheep are predominantly above treeline (beyond the RSA boundary) along the Fairholme range and occur at lower elevations on the western end of the study area, north of the TCH among the slopes of Mt. Edith, Mt. Norquay (also winter range) and Cascade Mountain (Appendix F).

Table 5-8. Bighorn sheep GPS collar data (n=38): 2019-2022.

Study Area	Area (ha)	Area (Km^2)	# of GPS Points	# of GPS Points per Km^2
PSA	35	0.35	0	0.0
LSA	482	4.82	11	2.3
RSA	12476	124.76	11377	91.2

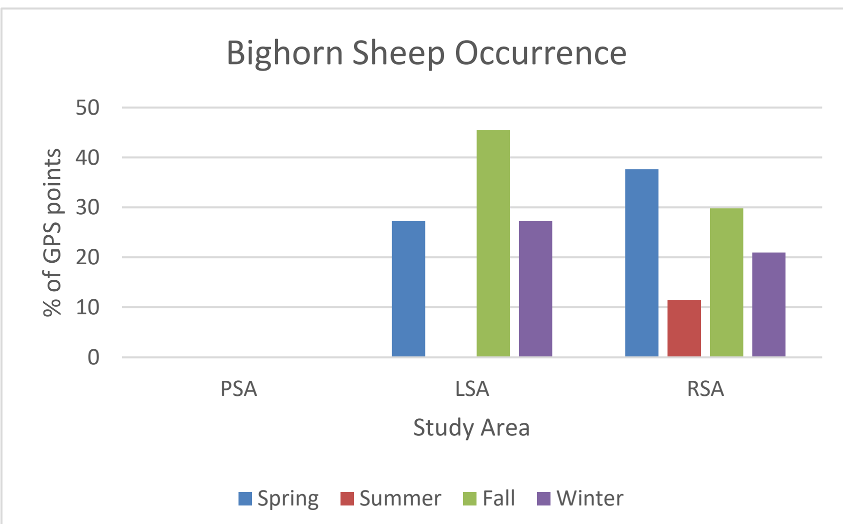

Figure 5-6. Seasonal bighorn sheep occurrence in the PSA, LSA, RSA.

5.4.3.2 Carnivores

Grizzly Bear (*Ursus arctos*)

Grizzly bears are listed in Schedule 1 of *SARA* as *Special Concern* (2018-current; Government of Canada 2023a). Provincially, they are listed as a *Threatened* species by the province of Alberta under the Wildlife Act (2010) and *At Risk* under the General Status evaluation (2010-current; Government of Alberta 2023).

Grizzly bears are omnivores, and in this region rely heavily on seasonally available vegetation, including graminoids (grasses, sedges, and rushes), horsetails, sweetvetch roots (*Hedysarum* spp.), and a variety of fruits, such as bearberries (*Arctostaphylos uva-ursi*), buffaloberries (*Shepherdia canadensis*), and strawberries (*Fragaria* spp.) (Hamer and Herrero 1987a, Munro et al. 2006). Important sources of animal protein for bears consist of carrion, ungulate calves, insects, and ground squirrels (*Spermophilis columbianus*).

Bears are generally active during the day; however, they will avoid areas and times of day with heightened human activity. Although there is individual variation in habitat selection, female bears with offspring are more likely to use habitats near people to reduce the risk of encounters with male bears (i.e., infanticide; Parks Canada 2023b). The primary threat to grizzly bears in Alberta is human-caused mortality from vehicle collisions from cars or trains (AEP 2020)).

There are roughly 65 grizzly bears in BNP (Parks Canada 2023b). Human activities are the primary factor impacting habitat security for bears in the region. The Banff townsite management unit has the lowest percentage of secure grizzly bear habitat of all Land Management Units in the park (Whittington 2018). Secure habitat areas are defined as areas that are below 2,500 m elevation, vegetated, *greater than 500 m from high human use* and have continuous habitat equal to or greater than the 9 km^2 average daily feeding area for a female grizzly bear (Gibeau et al. 2001). Parks Canada classified the area on the 54L transmission line between structures 204 and 255 as secure grizzly bear habitat (with the exception of a few gaps between structures 211-212 and 224-230). Maintaining secure habitat for bears and reducing potential for human-wildlife conflict are therefore key management objectives (Parks Canada 2022a).

The lower elevation montane areas, where the 54L transmission line occurs, provide important habitat for bears, particularly in the spring and fall, which are two highly sensitive time periods for bears (post- and pre-hibernation). Bears are attracted to the cleared ROWs of transmission lines, and other linear features, due to the presence of important bear foods at critical times of year and the proximity to protective forest cover (Gibeau and Herrero 1998, Eldegard et al. 2015).

GPS Collar Data

GPS collar data from 14 bears over a 9-year period demonstrates that grizzly bears can be encountered throughout the Project area, from the east park boundary to the Banff townsite and utilized the three wildlife corridors extensively. Use was concentrated north of the transmission line along the Fairholme range, within the Bankhead/Two Jack region, and south/southwest of the Banff industrial compound (Appendix F). GPS collar point densities were comparatively highest in the PSA at 77.1/km^2, 60.4/km^2 in the LSA, and 53.2/km^2 in the RSA (Table 5-9). Based on grizzly bear GPS positions, seasonal patterns of use for grizzly bears were consistent across spatial scales with notably higher use (~3x) in the summer, and lower levels of use in spring and fall (Figure 5-7).

Table 5-9. Grizzly bear GPS collar data (2-hr fix rate; n=14): 2001, 2003, 2009, 2010, 2012-2017.

Study Area	Area (ha)	Area (Km^2)	# of GPS Points	# of GPS Points per Km^2
PSA	35	0.35	27	77.1
LSA	482	4.82	291	60.4
RSA	12476	124.76	6633	53.2

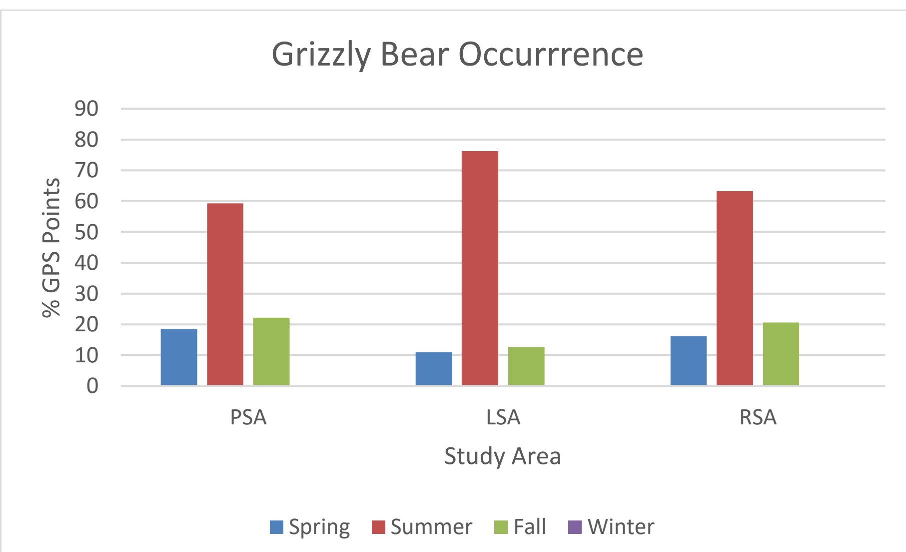

Figure 5-7. Seasonal grizzly bear occurrence in the PSA, LSA, RSA.

Gray Wolf (*Canis lupus*)

Wolves are secure provincially and not listed federally.

Wolves utilize a variety of habitats, including grasslands and mixedwood, coniferous and deciduous forests. Wolves have large home ranges and movement patterns but will avoid areas with human activity (Rogala et al. 2011). Wolves are most frequently found in areas with high prey availability (i.e., ungulates) and low human disturbance (Arjo and Pletcher 2004). Based on a regional study using remote cameras in the park, wolves were found to be active both day and night (Whittington and Petersen 2018b).

Wolves occur in low numbers in the lower Bow Valley, largely due to high levels of human-caused mortality (i.e., highway and railway mortality). Two wolf packs are known to use the RSA including the Bow Valley pack (mainly around Banff and the Bow Valley Parkway), and the Fairholme pack (mainly between Banff, Canmore and Johnson Lake). There are up to 17 wolves between the two packs (B. Khadka, pers. comm. 2023). Based on GPS data provided by PCA, out of 6919 wolf locations in the RSA, 4066 (58.8%) are from the Bow Valley pack and 2853 (41.2%) are from the Fairholme pack. Wolves have been documented denning in the Bow Valley bottom, where the Project is proposed.

A study on wolves in the Bow Valley demonstrated that wolves used the transmission line ROWs as a travel route, especially when machines that serviced the line compacted the snow. Rather than being a barrier to movement, the transmission line ROWs redirected the movements of wolves, i.e., wolves followed it, particularly when snow depths were high (Paquet et al. 1996). The Increased travel speeds and net daily movements on linear features suggests that linear features, such as powerlines, can influence hunting behaviour for wolves by increasing their search rate (Dickie 2017).

GPS Collar Data

GPS data from 11 wolves and 12 years of data demonstrate that, like grizzly bears, wolves can be encountered throughout the project area, from the east park boundary to the Banff townsite (Appendix F). Point densities display relatively high use within the PSA for wolves (94.3/km^2), with slightly lower densities at the LSA and RSA spatial scales (59.1 and 55.5/km^2, respectively; Table 5-10). Based on GPS positions, wolves use the PSA more in the fall than the other seasons; and they use the LSA/RSA most in the winter season (Figure 5-8). Spring and summer use was similar across spatial scales.

Table 5-10. Wolf GPS collar data (n=11): 2004, 2005, 2009, 2010, 2015-2022.

Study Area	Area (ha)	Area (Km^2)	# of GPS Points	# of GPS Points per Km^2
PSA	35	0.35	33	94.3
LSA	482	4.82	285	59.1
RSA	12476	124.76	6920	55.5

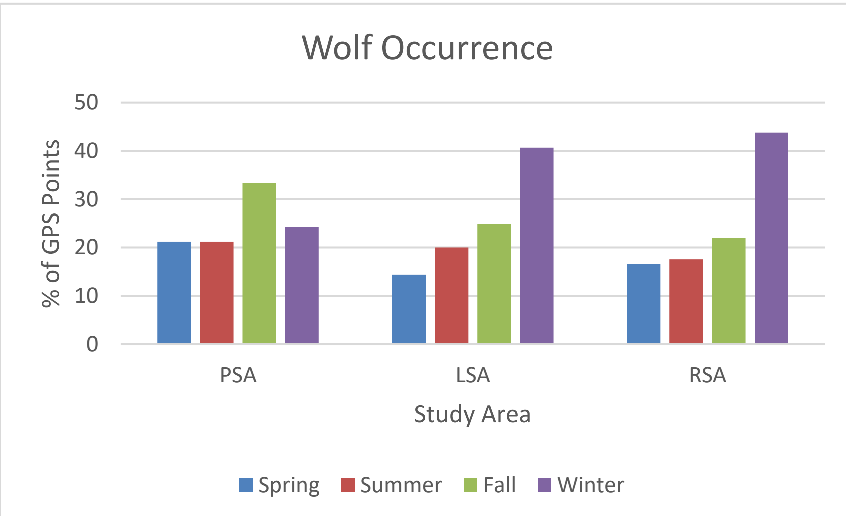

Figure 5-8. Seasonal wolf occurrence in the PSA, LSA, RSA.

Winter tracking shows that wolves travel along the narrow strip of the Fenlands-Indian Grounds corridor, north of the industrial compound, as well as along the Penstock/Two Jack/Canal corridor. Wolf paths parallel and intercept the 54L transmission line at three main locations: Girouard Creek, Morrison Coulee, and Carrot Creek (including access roads 1c and 2; Appendix F). Winter track data from wolves resulted in track densities that were 119.7, 30.1, and 20.5 km/km^2 in the PSA, LSA, and RSA, respectively (Table 5-11). Due to the comparatively small size of the PSA, track(s) within this spatial scale can have a disproportionate affect; however, it can be deduced that wolves used the PSA as a movement route, particularly west of Carrot Creek to the Morrison Coulee area. Wolves used the wildlife crossing structures within the RSA (Appendix F).

Table 5-11. Wolf winter track data (1993-2018).

Study Area	Area (ha)	Area (Km^2)	Track Length (Km)	Track Length per Km^2
PSA	35	0.35	41.9	119.7
LSA	482	4.82	145.3	30.1
RSA	12476	124.76	2555.5	20.5

Cougar (*Puma concolor*)

Cougars are secure provincially and not listed federally.

Cougars historically occupied a wide variety of habitats but are now generally associated with mountainous or remote undisturbed areas. Cougars are elusive and demonstrate shifts in activity patterns near human activity; in the absence of human disturbance, cougars are generally crepuscular (most active within 2 hours of sunset and sunrise), however near human developments, cougars are primarily nocturnal (Knopff et al. 2014).

There are approximately 12 cougars in the Bow Valley (Government of Alberta 2019a). The Bow Valley is a significant wildlife movement corridor and provides good quality habitat with a good prey base (e.g., ungulates, primarily deer) for cougars.

Research on cougars and linear features is limited, however a study in Revelstoke did find that cougars would predate deer and moose in human-created seral stands (e.g., powerlines) (Bird 2010).

Similar to grizzly bears and wolves in the Bow Valley, the largest source of mortality is from highway and railway collisions (Government of Alberta 2019a).

GPS Collar Data

No cougar GPS locations were recorded in the PSA and comparatively low density of use was recorded for the LSA (0.8/km^2) and RSA (6.2/km^2) (Table 5-12). Points were spread out within the RSA, with some clusters occurring at the edges of the RSA boundary. Overall, cougar use appears highest on the western end of the transmission line and surrounding area, from Mt. Norquay to Lake Minnewanka (Appendix F). Cougar GPS points within the LSA and RSA were recorded in the spring and winter only (Figure 5-9).

Table 5-12. Cougar GPS collar data (2-hr fix rate; n=5): 2001-2003.

Study Area	Area (ha)	Area (Km^2)	# of GPS Points	# of GPS Points per Km^2
PSA	35	0.35	0	0.0
LSA	482	4.82	4	0.8
RSA	12476	124.76	779	6.2

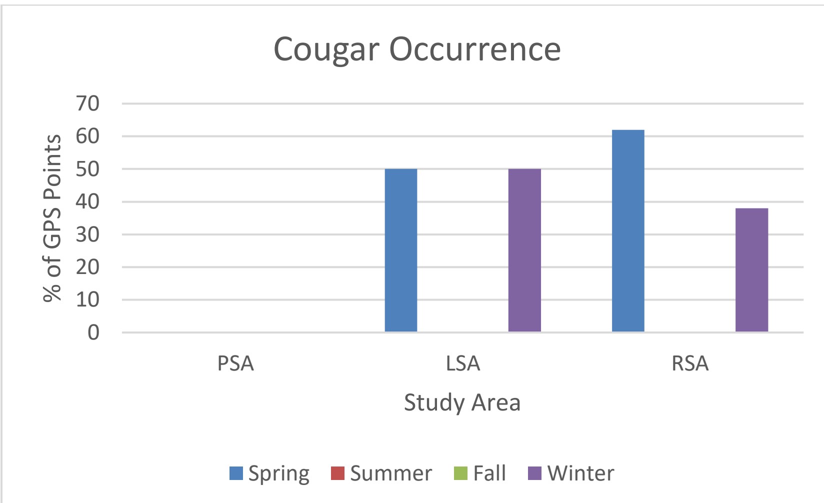

Figure 5-9. Seasonal cougar occurrence in the PSA, LSA, RSA based on GPS collar data.

Snow tracking in the Bow Valley identified that cougars travelled along the corridors within the RSA, mostly using the Norquay-Cascade corridor, and to a lesser extent the narrower Fenlands-Indian Grounds and Penstock corridors (Appendix F). Overall, cougar use appears highest on the western end of the power line and surrounding area, from Mt. Norquay to Lake Minnewanka (Appendix F). Tracks indicate that highway crossing structures are being utilized more so on the western end of the study area.

Winter track densities were 5.6, 3.6, and 8.6 km/km^2, respectively (Table 5-13). These data differ slightly from the GPS data as tracks indicate some use of the PSA.

Table 5-13. Cougar winter track data (1994-2018).

Study Area	Area (ha)	Area (Km^2)	Track Length (Km)	Track Length per Km2
PSA	35	0.35	1.97	5.6
LSA	482	4.82	17.3	3.6
RSA	12476	124.76	1073.9	8.6

5.4.3.3 Mesocarnivores

American marten (*Martes americana*)

Martens are not listed provincially or federally; however they are sensitive to forest disturbance including activities that reduce forest patch size, remove large and dying trees, and simplify forest structure (Evans and Mortelliti 2022). Martens generally use areas with dense overhead cover, shrub understory, and coarse woody debris for hunting, denning, resting, and travel (Jalkotzy et al. 1997). Within BNP, martens are associated with highly variable terrain (i.e., undulating topography with multiple drainages) and forest stand complexity, with the highest rated habitat in the bow valley occurring east of Castle Junction (Alexander and Gailus 2005). Because marten avoid areas lacking overhead cover and downed woody debris (Hatler et al. 2008), transmission lines are likely barriers to movement for marten.

5.4.3.4 Small mammals

There are approximately 40 species of small mammals in BNP, most of which are rodents (Parks Canada 2022c). Of the rodents known to occur in the park, the water vole (*Microtus richardsoni*) and red-tailed chipmunk (*Tamias ruficaudus*) are listed as *Sensitive* provincially (Government of Alberta 2023). Small mammals are an important part of the prey base in the LSA for numerous avian species (e.g., raptors), mesocarnivores (e.g., American marten), and large carnivores such as wolves. Small mammals will be assessed as a group rather than reviewing each species, aside from bats, which are discussed below.

5.4.3.5 Bats

Seven species of bats occur in BNP, with two species, the little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*), listed as *Endangered* in Schedule 1 of the *Species at Risk Act* (Government of Canada 2023a). In some parts of Canada, the little brown myotis and northern myotis have seen their population drop by more than 90%, largely due to the fungus which causes white-nose syndrome (ECCC 2018). Three species of migratory bat in BNP: hoary (*Lasiurus cinereus*), silver-haired (*Lasionycteris noctivagans*), and Eastern red (*Lasiurus borealis*), have been assessed as Endangered by COSEWIC and will be considered for future listing under SARA.

Bats will sometimes use mature trees as maternity or nursery roosts to raise their young which are flightless and nursing for the first few weeks of life (ACBP 2019). Bat maternity roosts are protected as residences under Section 33 of the *Species at Risk Act (*ECCC 2018*).* The bat roosting season in the region is from approximately April 15 to October 15th. Key habitat features in the non-hibernating season include those that provide shelter and/or opportunities to forage for aerial insects, including waterbodies/wetlands, and mature forest. Bats will use forest openings or gaps for foraging; therefore, the transmission line has the potential to attract bats. The little brown myotis and northern myotis select for tall, large-diameter (>25cm Diameter-At-Breast-Height (DBH)) trees in the early to middle stages of decay (ECCC 2018). Bats, including females with dependent young, will move between tree roosts regularly. Growth and survival of young bats depends primarily on having a secure warm roost and an abundant food source.

The location of winter bat roosts (natural hibernacula such as rock crevices, caves, and mines), which are occupied from approximately September through April, are relatively unknown, with only one confirmed cave-site recorded in BNP to-date (Parks Canada 2022f).

Bat Habitat Assessment

To understand project effects to bats, surveys were conducted along the length of the ROW where Danger Trees were mapped to assess the trees for moderate-to-high bat roost potential using the following criteria: > 25 cm DBH; cracks, crevices, cavities, large sections of loose or flaking bark; deadwood in canopy or stem; and hollow stem (Parks Canada 2016a). Potential trees or clusters of trees were marked using a GPS.

Bat habitat surveys demonstrated that numerous trees, or clusters of trees, along the ROW provide moderate-to-high bat roost potential as specified by the characteristics detailed above (Appendix G). Specifically, spans 249-252, 265-270, and 276-280 have a higher density of potential roosting trees and/or areas bats potentially use to raise their pups. Note: Appendix G is based on spatial distribution modeled using Kernel Density function with a 200 m search radius.

Ultrasonic Bat Recordings

To test for the presence of bats in two wetland areas where bats were suspected based on the initial bat habitat survey, a bat detector (Wildlife Acoustics Mini Bat Recorder) was set up and programmed to record ultrasonic calls from 30 minutes before sunset to one-hour after sunset, when bats are known to emerge from roost sites and commence nocturnal activity. Data was analyzed using Kaleidoscope software.

Bat activity was confirmed at the two detector locations. At the wetland near structure 220, bats were recorded on 5 of 8 recording nights, and at the wetland near structures 313 and 314, on all 6 recording nights (Appendix G). The frequency of bat calls ranged from approximately 20Hz to 80Hz. The timing of bat calls was consistent, commencing on average 41 minutes after sunset, between 10:03 PM and 10:23 PM (Appendix G). Bat activity was comparatively higher at structures 313-314 suggesting the high potential for nearby roost sites. Lower activity at structure 220 suggests bat(s) were passing through the area (e.g., foraging) or exploring it as a potential roost site. The species of bat(s) detected is currently unknown.

5.4.3.6 Avian Species

Information on birds known or with potential to occur in the RSA including provincial and federal status was collected through a literature review (Appendix G, e.g., Rogers 2011). Of the 311 bird species with potential to occur in the study area, 58 species are listed provincially (46 = *Sensitive*, 8 = *May Be At Risk*; 4 = *At Risk*) and 22 federally (12 = *Special Concern*; 8 = *Threatened*, 2 = *Endangered*).

To assess the richness and abundance of birds in the study area, avian point count surveys were conducted in the breeding season at 51 locations and were focused on songbirds; therefore, they will be assessed as a species group. Raptors and owls will also be discussed in this section.

Songbirds

The regional migratory bird breeding season runs from April 1st to August 31st.

Bird surveys were completed on foot within the LSA on July 9 and 15, 2020, and May 24 and 25, 2023. Due to the Fairholme ESS closure in 2023, the remaining bird count surveys were completed on July 16, 19, and 24, 2023. A modified fixed-radius point count sampling procedure was used, as described in Bibby et al. (1993). Locations of circular census plots (50 m radius) were selected within and adjacent to the ROW using a stratified-random approach, to gain a representative selection of habitat types and structural stages. At each survey point, both acoustic and visual records of songbird species were recorded over a 10-minute period following an initial 2-minute quiet time upon arrival. Surveys were conducted during near-ideal conditions (i.e., minimal wind and/or precipitation) and during the optimal time of day (i.e., sunrise until approximately 10:00 am). Data recorded at each site included species, number of species detections, and approximate distance from the plot centre, and were recorded for each bird heard or observed during the 10-minute period.

Birds observed or heard outside of the census plot or during travel were recorded as incidental occurrences and excluded from calculations. Any structures that had bird cavities were also recorded during surveys (Appendix A).

Species Richness and Abundance

A total of 353 detections of 55 bird species were recorded in the 51 census plots (~40 ha; Table 4-14, Appendix H). Species richness, which is defined as the number of unique species present per hectare, was greatest in the herb/grass (< 1.5 m, logged/fuel break) and sub-xeric mixedwood (pole sapling, >10 m, <40 years) habitat types (Table 5-14). Earlier structural stages, i.e., herb/grass stage 2, conifer stage 3, mixedwood stage 3, and disturbed habitats, had comparatively lower species richness. Species abundance, which is defined as the number of avian detections per hectare, was also greatest in the herb/grass (< 1.5 m, logged/fuel break) habitat type as well as mixed-wood forests at sapling and mature forest structural stages (81-250 years; Table 5-14). Similar to species richness, earlier structural stages and disturbed habitats, had comparatively lower species abundance.

Table 5-14. Species richness and abundance by habitat type and structural stage.

Habitat Type	Structural Stage[1]	Number of plots	Hectares	Species	Richness (species/ha)	Detections	Abundance (/ha)
Disturbed	2	1	0.78	2	2.56	2	2.56
Herb/Grass	2	4	3.12	7	2.24	10	3.21
	3	1	0.78	5	6.41	6	7.69
	2L	1	0.78	9	11.54	15	19.23
Mesic Conifer	3	11	8.58	15	1.75	37	4.31
	6	20	15.6	42	2.69	169	10.83
	3L	5	3.9	20	5.13	38	9.74
Sub-xeric Mixed-wood	3	2	1.56	4	2.56	8	5.13
	4	1	0.78	8	10.26	10	12.82
	6	4	3.12	23	7.37	48	15.38
Nil/Other[2]	N/A	1	0.78	3	3.85	10	12.82
LSA Total		**51**	**39.78**	**55**	**1.38**	**353**	**8.87**

[1] Structural stage: 2: Herb/grass (<1.5 m); 2L: Herb/grass (<1.5m) logged fuel break; 3: Shrub (1.5-10 m); 3L: Shrub (1.5-10 m) logged fuel break; 4: Pole sapling (>10 m, <40 years); 6: Mature forest (81-250 years).

[2] Nil/Other refers to any areas unvegetated (e.g. roads, Johnson Lake, buildings)

Relative abundance (%) was calculated as the number of species' detections out of the total number of detections per 40 ha, the cumulative area of sampled plots. The ten most abundant species recorded included the American robin (*Turdus migratorius;* 10.2%), yellow-rumped warbler (*Dendroica coronata;* 10.2%), Swainson's thrush (*Catharus ustulatus;* 7.9%), chipping sparrow (*Spizella passerine;* 7.7%), dark-eyed junco (*Junco hyemalis*; 7.4%), mountain chickadee (*Poecile gambeli*; 5.7%), red-breasted nuthatch (*Sitta canadensis*; 4.0%), ruby-crowned kinglet (*Regulus calendula;* 4.0%), brown-headed cowbird (*Molothrus ater;* 3.7%), and warbling vireo (*Vireo gilvus;* 3.7%) (Appendix H).

Listed Species

One federally listed bird species was recorded, the olive-sided flycatcher (*Special Concern*; *Contopus cooperi*) at three locations and six provincially listed bird species were recorded either during field surveys or observed incidentally within the LSA: pileated woodpecker at two locations, and single observations of the common yellowthroat (*Geothlypis trichas*), sora (*Porzana carolina*), Northern pygmy owl (*Glaucidium gnoma*), western wood-pewee (*Contopus sordidulus),* and barred owl (*Strix varia*) (Appendix A, Table 5-15). Although the pileated woodpecker is not listed federally, their nesting cavities are protected under Schedule 1 of the Migratory Birds Regulations (2022) because they are reused not only by woodpeckers but are also an important resource for numerous other secondary cavity nesters, including species at risk (ECCC 2023b).

Table 5-15. Listed species recorded during field surveys in 2020 and 2023.

Structure Span	Listed species	Provincial ranking *	Location and habitat description
207-208	Olive-sided flycatcher	MBAR	Between structures; wetland
207-208	Northern Pygmy owl	SN	Wetland
209	Sora	SN	S of structure; wetland
211-212	Pileated woodpecker	SN	Wetland along ROW
220	Sora	SN	S of structure; wetland
231	Olive-sided flycatcher	MBAR	S of structure; mature conifer
238	Olive-sided flycatcher	MBAR	N of structure; mature conifer
250-251	Western wood pewee	MBAR	N of structure
280	Pileated woodpecker	SN	Cavity in Fortis structure adjacent to structure; ROW
313-314	Common yellowthroat	SN	W and S of structures; wetland and mature conifer
313-314	Barred owl	SN	W and S of structures; wetland and mature conifer

***** MBAR: May Be At Risk; any species that "May Be At Risk" of extinction or extirpation; SN: Sensitive; any species that is not at risk of extinction or extirpation but might need special attention or protection to prevent it from becoming at risk.

Raptors

Eighteen species of raptors (owls are discussed separately below) have the potential to occur in BNP (Appendix E), three of which are at-risk; the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), listed as *Sensitive* by the province of Alberta, and the peregrine falcon (*Falco peregrinus*), listed as *Threatened* in Alberta (Government of Alberta 2023). These raptor species are protected under the Alberta *Wildlife Act*.

Raptors have been documented using transmission lines for hunting, perching, and nesting (Guil and Perez-Garcia 2022). Some species (e.g., osprey) often build large stick nests at the top of transmission structures, causing the potential for fires and power outages. AltaLink currently installs nest deterrents and artificial nesting platforms to mitigate this risk.

The raptor breeding/nest building season takes place between approximately March and May, and the birds typically fledge by the end of August or early September.

Aerial Raptor Survey

A raptor survey was conducted by helicopter on July 17, 2023 to identify active raptor nests within or near the AltaLink ROW and assess potential impacts as a result of the 54L Rebuild Project. The survey was conducted late in the season (after breeding season and when young are leaving or potentially have left the nest) due to the Fairholme closure from April to July 15th (in 2023), during which helicopter flights were not permitted.

The aerial survey was conducted between approximately 8:30 am to 11:00 am with no precipitation and low wind. The route involved four passes of the 54L transmission line from the east park gate to the Banff industrial area. Two helicopter survey paths were flown 100 m north and south of the line and two paths were flown 300 m north and south of the line. Two experienced biologists scanned the habitat up to a distance of approximately 150 m from the flight path allowing for full coverage of the ROW to detect nests with a total surrounding buffer of ~450 m. The aerial transects were conducted in a slow and deliberate manner, moving in a consistent direction and speed (approximately 30 km/hr).

When a raptor nest was located, the UTMs, date and time, species, site description (e.g. stick nest in pine) and the reaction of its occupant was recorded (i.e. watching the aircraft, 'flattening' or 'clamping down' on nests, standing up on nests with eggs or chicks, flushed from the nest).

Two active osprey nests were detected within the ROW; one osprey pair were sighted on, and flying around, a large stick nest built on structure 222 (no young; Figure 5-10, Appendix A). The other active nest contained one adult and two young sitting on a large stick nest adjacent to structure 276 on a Fortis structure (Appendix A). A falcon *sp.* was also observed flying northeast of structure 266 during the aerial raptor survey, but no nest was located.

Figure 5-10. Osprey pair (mate is absent) with established nest on Structure 222.

Incidental Raptor Observations

A fledged red-tailed hawk nest was identified in a spruce tree located ~10 m from the ROW and ~30 m east of structure 206 (Appendix A). A fledged raven nest was identified on the water tower, ~12 m from structure 270. Both nest sites were recorded as active a few weeks before the helicopter survey in late June (Appendix A).

Owls

Thirteen species of owl have the potential to occur in BNP (Appendix E); four are considered at-risk: the barred owl (*Strix varia*; *Sensitive*), great gray owl (*Strix nebulosa*; *Sensitive*), northern pygmy owl (*Glaucidium gnoma; Sensitive*), and short-eared owl (*Asio flammeus*; *At Risk*) (Government of Alberta 2023). The short-eared owl is also listed as *Special Concern* under Schedule 1 of SARA (Government of Canada 2023a).

Owls use nest sites previously built by other birds, for example large stick nests or cavities in trees. The owl breeding/nesting season starts in winter, typically mid-February and continues to early May.

Diurnal Owl Survey and Observations

Diurnal call-playback owl surveys were conducted between May 17 and 25, 2023, at 15 locations along the transmission line ROW, spaced on average, between 400 m and 600 m apart. Due to the Fairholme closure from April to July 15th 2023, the area between structures

230 and 257 was not surveyed. At each survey plot, after two minutes of silence, a sequence of owl calls began, consisting of two broadcasts each of the northern pygmy owl (*Glaucidium gnoma*) and the northern hawk owl (*Surnia ulula).* A one-minute listening period occurred after each broadcast and the survey terminated with a two-minute listening period (Parks Canada 2021). Surveys were conducted to detect the presence of owl and/or owl nests to reduce potential project effects to owls during the breeding season.

No diurnal owl species were detected during surveys, but results must be interpreted with caution as surveys were conducted at the end of the regional breeding season (early May).

A barred owl pair (*Sensitive*, Alberta) were observed incidentally on three separate occasions within the LSA to the west of structures 313-314 (Figure 5-11). The pair were suspected to be nesting near the wetland area, south of these structures (and possibly in the forested area across the CPR tracks) due to multiple sightings and auditory records. No nest was found.

A Northern pygmy owl call was recorded incidentally near wetland 208, no nest was found.

Figure 5-11. A barred owl observed incidentally to the west of structures 313-314.

5.4.3.7 Amphibians

Three amphibian species that may occur in the Project area and are listed provincially include the long-toed salamander (*Ambystoma macodactylum; Sensitive*), the Columbia spotted frog (*Rana luteiventris; Sensitive*), and the western toad (*Anaxyrus boreas; Sensitive*) (Government of Alberta 2023). The western toad is also listed federally under schedule 1 of SARA as *Special Concern* (Government of Canada 2023a). The wood frog (*Lithobates sylvaticus*) also occurs in the area and is not listed provincially or federally.

Due to comparatively cold temperatures and varying water levels in wetlands from year to year, conditions for amphibian reproduction in the Rocky Mountains are challenging (McIvor and McIvor 2000). The amphibian breeding season typically runs from late-April to mid-June, depending on species and environmental factors (Government of Alberta 2013).

Auditory and Visual Amphibian Surveys

To determine the presence of amphibians within the study area, auditory and visual amphibian surveys were completed at nine wetlands within and/or near to the ROW. Two additional wetlands occur near or on the AltaLink ROW between structures 235-236 and 236-237 (south); however, amphibian surveys could not be completed due to the Fairholme closure from April to July 15th 2023/2024. In addition, data already existed for these locations from previous years.

Three auditory surveys, in-person and/or using a recording device (Wildlife Acoustics Song Meter Micro), were conducted at each of the wetlands in the LSA to detect species that can be identified by their call (e.g., western toad and wood frog). Auditory surveys took place between 30 minutes after sunset (~9:30 pm) and 1:00 am and in suitable weather conditions (Government of Alberta 2013). Two visual surveys were conducted at each wetland to detect species which may not be detected readily by their call using auditory surveys (e.g., long-toed salamander). Surveys were completed over two field seasons: on May 14 and June 11 in 2020, and between May 1 and 17 in 2023.

Of the seven wetlands and two wet depressions surveyed in 2020 and 2023, amphibians were recorded in three wetlands and one wet depression in the LSA, either through visual or auditory detection (Table 4-16; Appendix I). In addition, there was one incidental observation in an upland area at structure 247. Western toads, which are listed as *Sensitive*, were observed four times in various locations on the ROW in 2020 and 2023 (Table 5-16).

Table 5-16. Amphibian species detected in the LSA during field surveys in 2020 and 2023; bold indicates listed species.

Structure Span	Species[1]	Year	Habitat Description
207-209	WOFR	2023	wetland (graminoid fen)
211-212	**WETO**	2020	wet depression
220	WOFR	2023	wetland (marsh)
247	**WETO**	2023	upland
267-268	**WETO**	2023	unnamed creek/wetland north of ROW
269-270	**WETO**	2023	wetland north of ROW

[1]WOFR = wood frog, WETO = western toad

Note: the auditory and visual surveys conducted on May 14 and June 11, 2020 resulted in no observations aside from one incidental observation (as above).

Parks Canada also conducted amphibian surveys from 2016 to 2022 (excluding 2020) in wetlands within 500 m of the ROW (Appendix J). In summary, based on both 2023 field surveys and Parks Canada data, amphibians have been observed in all wetlands within 500 m of the ROW with the exception of the wetland at the west end of the line (structure 313; Appendix K). A 500 m scale was assessed as relevant because amphibians require both aquatic and terrestrial habitats to survive and may migrate large distances from breeding grounds to access hibernation sites. For example, in Alberta, the western toad was documented to overwinter up to 1.9 km from breeding grounds (ECCC 2012), and the Columbia spotted frog and long-toed salamander were found up to 1.3 km and 900 m from breeding ponds, respectively (James 1998, Government of Alberta 2016).

5.4.4 Summary of Wildlife Habitat Observations

The transmission line ROW was surveyed for wildlife habitat features such as den sites, tree cavities and stick nests which have potential to be reused annually. Numerous tree cavities (including those within transmission structures), three small mammal den sites, confirmed bat roost, and three raptor stick nests were identified (Table 5-17; Appendix A).

Table 5-17. Wildlife habitat features observed within or adjacent to the ROW.

Wildlife Feature	Location
Red-tailed hawk nest, active 2023	Tree adjacent to structure 206
Cavity	On structure 208
Cavity trees	North of ROW and structure 215
Cavity trees	Wetland south of structure 220
Raptor nest (osprey), active 2023	On structure 222
Cavity	On structure 231
Cavity trees	Trees at wetland, north of structure 235; access 3C
Cavity	On structure 236
Cavity	On structure 238
Small mammal den sites (2)	North of ROW and structures 238-239
Cavity	On structure 240
Cavity trees	North of ROW and structures 247-248
Cavity trees	North of ROW and structures 249-250
Cavity trees	North of ROW and structures 250-252
Cavity	On structure 263
Cavity trees	South of ROW and structures 268-269
Nest (raven), active 2023	Water tower adjacent to structure 270
Cavity trees	South of ROW and structures 274-275
Mammal den site	North of structures 274-275
Raptor nest (osprey), active 2023	On Fortis pole adjacent to structure 276
Large cavity and broken top tree	North of ROW and structures 277-278
Pileated woodpecker cavity, active 2023	On Fortis* structure between structures 280-281
Cavity, active 2023	Tree at forest edge NW of structure 285
Confirmed bat habitat/roost trees	Forested/wetland areas adjacent to structures 313-314

*numerous cavities in Fortis structures within ROW at Tunnel Mountain

5.5 Hydrology and Aquatic Resources

To determine the baseline hydrological and aquatic conditions, literature was reviewed including *SARA* (2013), the *Fisheries Act* (2012), DFO operational statements, best management practices for fish passage design and temporary stream crossings, an assessment of previous studies and interviews with Parks Canada biologists on the aquatic habitat and surface hydrological conditions along the Bow River and its tributaries along the 54L transmission line ROW. The MCSR (Highwood Environmental Management and AltaLink 2003 and 2009) was also reviewed to establish baseline information and to compare historical conditions with present conditions. In addition, field surveys were conducted including fish sampling, fish habitat assessments (including water quality testing), and wetland assessments.

Appendix L summarizes waterbodies on the ROW including location, winter condition and crossing method, aquatic community, aquatic habitat, and hydrological features of all wetlands and watercourses along the 54L transmission line ROW. Appendix L takes into consideration all available recent Parks Canada data as well as 2020 and 2023 field surveys completed in support of this environmental assessment.

5.5.1 Hydrology

5.5.1.1 Ground Water

Ground water levels were recorded during a geotechnical survey of the PSA in September 2023 which provides data on the presence of ground water that might impact excavations (TetraTech 2024). A total of 11 boreholes within the Project footprint were drilled to depths between 6.4 and 11.6 m below existing ground surface and depth to ground water was recorded in each borehole. All boreholes were removed after data had been collected. Ground water levels ranged from 3.1 m to 10.2 m below the existing ground surface within the project footprint and 5 out of 11 boreholes were dry. Areas with higher ground water levels (i.e. structures 303 to 313) could result in higher magnitude impacts during project activities which may be more challenging to mitigate.

In certain areas of the PSA, particularly within the town of Banff, groundwater may be contaminated and/or exceed CCME water quality thresholds for the protection of aquatic life.

Most precipitation along the ROW infiltrates into the ground following precipitation events as there is little evidence of surface water ponding or hydrophilic wetland vegetation in the low-lying drainage channels on the project site (e.g., Whiskey Creek tributary between structures 297-298 and Morrison coulee between structures 229-330).

5.5.1.2 Surface Water

The Bow River sub-basin is the largest drainage within BNP with a drainage area of 2,210 km^2, beginning at Bow Lake, feeding into the Oldman River, which ultimately forms the South Saskatchewan River (Government of Canada 2014). Within the LSA/RSA, the Bow River and its associated tributaries are generally low in turbidity (i.e., an average of 1.4 NTU above Canmore) and low in productivity due to nutrient limitation which is a common characteristic of high mountain streams fed by glaciers and springs (Glozier et al. 2004, Schindler and Pacas 1996). Water quality has been rated as “good” in the State of the Park Report (SOPR) with some nutrient loading downstream of Lake Louise. Based on the target listed in the BNPMP, by 2030, water quality in the Bow River where it flows out of the park must meet or exceed upstream reference conditions (Parks Canada 2022a).

Cascade Creek, a tributary of the Bow River occurring within the LSA from Lake Minnewanka reservoir to the Bow River, currently serves as a spillway for the TransAlta dam. Flows in the creek have been controlled by the TransAlta dam since 1941; average daily discharge is 1 m^3/s. In recent years, Parks Canada and TransAlta Utilities are working to restore natural flow and aquatic habitat in Cascade Creek such that it can support and maintain a native fish population (i.e. Westslope Cutthroat Trout *(Oncorhynchus clarkii lewisi*) and/or Bull Trout (*Salvelinus confluentus*)). Higher flows will be introduced once native fish have been released into the system, which is expected to occur in 2024.

The 54L transmission line ROW crosses six tributaries to the Bow River that range from narrow ephemeral streams (that have not had flow for 10+ years) to wide perennial watercourses and flood plains including the following (Appendix A):

- Carrot Creek (structures 216 – 217): wide, fish-bearing perennial creek (floodplain) that flows east to west and outlets into the Bow River;
- Girouard Creek (structures 250 – 251): narrow, ephemeral and intermittent channel that originates at the southeast end of Johnson Lake wetland, crosses the ROW, parallels the ROW for 2.1 km from structure 250 to 243, then flows southwest where it passes under the TCH and outlets into the Bow River (dry on the ROW since 2013 flood, currently fish-bearing ~360 m downstream of ROW);
- Anthracite creek (structures 264 and 265): narrow, fish-bearing perennial stream that originates at Johnson Lake outlet, flows south and parallels the TCH for approximately 2 km to eventually cross through a culvert under the TCH and join Cascade Creek (fish-bearing 160 m downstream of ROW);

- One unnamed creek (structures 267 and 268): narrow, non-fish-bearing perennial stream that originates from a valve in the TransAlta penstock north of the ROW, outlets into Anthracite creek which then joins Cascade Creek as described above;
- Cascade Creek (access 6 and structures 275 and 276): fish-bearing perennial creek/spillway for the TransAlta dam that originates at Lake Minnewanka reservoir, crosses under the TCH, parallels the TCH for approximately 6 km, and outlets into the Bow River (fish-bearing below barrier ~350 m downstream of ROW); and
- Whiskey Creek tributary (structures 297 and 298): narrow, ephemeral/dry channel that originates north of the TCH, meanders under the TCH, crosses the ROW, moves through residential areas of Banff into Whiskey Creek which eventually outlets into Forty Mile Creek and the Bow River (dry on the ROW for ~10 years, currently fish-bearing ~2.5 km downstream of ROW).

Out of the six channels that the 54L transmission line ROW crosses within the LSA, five have been classified as CH for Bull Trout (excluding unnamed creek strs 267-268) and four have to be crossed to complete work activities including Girouard Creek, Anthracite Creek, an unnamed creek (strs 267-268), and Cascade Creek; the other two can be accessed from both sides of the creek (i.e. Carrot Creek and Whiskey Creek tributary). See section 5.5.2.3 for more information on CH.

In addition, one watercourse that has no hydrological connection to the Bow River occurs parallel to the ROW:

- One unnamed ephemeral stream north of ROW (structures 208 and 212): flows east from a wet depression near str 208 during wet years in the spring into the large wetland between 211-212. No flow observed in 2023.

5.5.2 Fish and Fish Habitat

Prior to all field surveys including fish sampling, water quality measurements and fish habitat assessments described below, the decontamination protocol for the prevention of Whirling Disease was followed based on the *Direction for Permitted Users Conducting Water-Related Activities in BNP* (Parks Canada 2016b).

5.5.2.1 Fish Species

Historical Data

The fish species native to the Bow River system include bull trout, mountain whitefish (*Prosopium williamsoni*), longnose sucker (*Catostomus catostomus*), brook stickleback (*Culaes* *inconstans*), lake trout (*Salvelinus namaycush*), white sucker (*Catostomus commersoni*), longnose dace *(Rhinichthys cataractae),* and lake chub (*Couesius plumbeus*), and likely dominated by brook trout, mountain whitefish, and non-native brown trout (*Salmo trutta*) downstream of Bow Falls (Bow River Water Quality Council 1994, Nelson and Paetz 1992, Golder 1996, Banff Bow Valley Study 1996, Mayhood 1995).

Non-native species introduced from stocking the Bow River system include brown trout, rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), Yellowstone cutthroat trout, and a non-native population of Westslope Cutthroat Trout (*Oncorhynchus clarkii*) (Highwood Environmental Management and AltaLink 2003 and 2009). Westslope Cutthroat Trout have been outcompeted by brown trout, and have hybridized with introduced rainbow and Yellowstone cutthroat trout (Schindler and Pacas 1996). There has been a complete eradication of Westslope Cutthroat Trout (*Oncorhynchus clarkii lewisi*; genetically pure populations) from the Bow River below Lake Louise (DFO 2019).

Girouard Creek and Whiskey Creek tributary are both ephemeral within the LSA and have not had flow for a long period of time, likely more than 10 years and therefore are not fish-bearing within the LSA. Recent electrofishing surveys in Girouard Creek indicate that, although it is dry within the LSA, it contains brook trout ~350 m downstream of the ROW where the creek becomes perennial and intermittent. Similarly, historical surveys of Whiskey Creek indicate that, although it's dry within the LSA, it contains bull trout and brook trout with moderate-to-high spawning, over-wintering, and rearing habitat suitability approximately 2.5 km downstream of the ROW where it becomes perennial (Avens Consulting 2015). These two watercourses may also contain species found in the Bow River or Forty Mile Creek (in the case of Whiskey tributary) due to hydrological connectivity (e.g., Westslope Cutthroat Trout, Rocky Mountain whitefish, brown trout, and brook stickleback; Highwood Environmental Management and AltaLink 2003 and 2009, M. Taylor pers. comm. 2021).

The unnamed creek between structures 267 and 268 that is hydrologically connected to Anthracite Creek is not fish-bearing due to an artificial fish barrier at the upstream end (TransAlta penstock and hanging culvert) and a natural barrier at the downstream end just before flowing into Anthracite Creek.

The hydrological connectivity of the remaining three watercourses allow fish from the Bow River to potentially migrate upstream into these watercourses and therefore could contain Bow River species (B. Khadkar, pers. comm 2023). Current Parks Canada data from these three watercourses suggests: (1) Carrot Creek contains brown trout and brook trout; (2) Anthracite Creek is not fish bearing on the ROW but contains brown trout and brook trout below the artificial fish barrier located approximately 140 m downstream of the ROW and potentially white suckers which are known to occur in Johnsons Lake; and (3) Cascade Creek is currently not fish-bearing on the ROW due to fish barriers but approximately 350 m downstream of AltaLink ROW, it contains trout (cutthroat, bull, brook, and brown trout) and mountain whitefish. Native/listed fish are scheduled to be introduced in July 2024 or 2025 into the isolated reach where the AltaLink ROW crosses the creek.

Fish Sampling

On May 11 and July 25, 2023, fish sampling was conducted in two watercourses, Carrot Creek and Girouard Creek (respectively) to determine species inventory and composition. The dates were selected based on a minimum water temperature of 5°C and it was not possible to sample in Girouard Creek until after the Fairholme closure had ended on July 15th 2023.

Fish sampling was conducted by two certified electro-fishers using a Smith-Root Model LR-24 backpack electrofisher unit. The fish sampling effort was recorded as the number of seconds of electrofishing. The electrofisher settings were maintained at 30 Hz (frequency), 12% DC (duty cycle), and varied between 150 and 250 V depending on water conductivity. Each sampling reach was completed moving in the upstream direction and was 300 m long: Carrot Creek – from 200 m downstream of the ROW to 100 m upstream of the ROW; Girouard Creek – 300 m downstream of where surface water was first observed south of the ROW. Two passes were completed in Carrot Creek with multiple braided channels and only one pass was required for Girouard Creek due to confirmed fish presence. All captured fish were identified to species, with fork length and weight measured, and returned to the watercourse after processing.

No fish species were captured during the survey in Carrot Creek and 20 non-native brook trout were captured in Girouard Creek (Appendix M). However, numerous fish were missed during sampling in Girouard Creek due to limitations of electrofishing (i.e., deep water, large woody debris, high quantity of fish).

5.5.2.2 Fish Habitat Assessments

Fish habitat assessments were conducted to collect physical and biological parameters in each watercourse that have the potential to be impacted by project activities (section 4.5.2.). In general, habitat assessments occurred along a 300 m reach of each watercourse: 100 m upstream of the AltaLink ROW and 200 downstream of the ROW. For watercourses which were ephemeral/dry (i.e., no evidence of flow or water for long periods of time), assessments were focused on 100 m upstream from the ROW and 100 m downstream from the ROW. Transects were measured using a top-o-fill every 50 m along the reaches for a total of approximately 300 m; physical and biological habitat parameters were collected at each transect.

Physical parameters included average channel gradient, mean bankfull and wetted widths, mean water depth, and maximum water depth (results are provided in Appendix N). Average channel gradient was assessed using a GIS and 1 m LIDAR data (ArcGIS 10.8.2).

Biological parameters included fish species recorded from literature, Parks Canada aquatics specialists and electrofishing surveys, general habitat description, substrate types, instream/overhead cover types, and barriers to fish movement (summarized in Appendix L). Habitat maps were drawn to reflect specific habitat features along each reach. Hydrological connectivity was investigated by locating surface drainage channels leading into and exiting each watercourse and walking the channels to identify any distinct hydrological linkages. Potential upstream and downstream concerns (e.g., sedimentation, erosion, evidence of flooding) were also identified. Riparian areas were tracked approximately 30 m upstream and downstream of the ROW using a GPS (including the extent to which disturbance will occur) and the area was calculated in GIS software for each watercourse.

Water Quality

Water quality was measured using a YSI multi-probe meter to collect data on temperature, dissolved oxygen, pH, and conductivity. Dissolved oxygen was calibrated on the YSI meter before collecting readings as required to ensure accurate results.

Dissolved oxygen concentrations ranged between 8 and 11 mg/L, pH between 8 and 9, conductivity between 303 and 450 µs/cm, and turbidity between 0 and 4 NTU (Appendix O).

5.5.2.3 Listed Species and Critical Habitat

Bull Trout

The Saskatchewan – Nelson Rivers populations of bull trout occur within the RSA, are classified as *Threatened* under the Alberta Wildlife Act (2000) and have recently been listed as *Threatened* under Schedule 1 of *SARA* (Government of Canada 2023a). Bull trout (BLTR) in the Upper Bow River (i.e., Lake Louise to Seebee) have a relative abundance of low-to-medium with a decreasing population trajectory and a poor population status. The life history types found in the RSA are resident and fluvial (DFO 2017).

Bull trout have specific habitat requirements for cold, clean, complex, and connected waters (DFO 2017). Most populations are typically found in low turbidity streams with mean August temperatures ≤12 °C and egg incubation temperatures (Oct – May) between 1.2 – 5.4 °C (DFO 2017, Isaak et al. 2017). Ground water inflows and connectivity are also highly important to bull trout, particularly during spawning, warm summer conditions, and to maintain overwintering habitat (DFO 2017). Bull trout typically migrate to high gradient headwater streams to spawn, which occurs between late-August through September (DFO 2017).

Recently Parks Canada aquatics staff have captured and observed spawning-sized bull trout in the Bow River between Banff and Canmore (B. Hunt, pers. comm. 2019). Three Bow River tributaries within the defined study area (i.e., Carrot, Cascade and Anthracite Creeks below fish barriers) have the potential to contain bull trout due to their hydrological connectivity to the Bow River, very low sediment concentrations (the water is clear for most of the year), slightly alkaline pH, and limited nutrient concentrations.

Bull trout have been found in Whiskey Creek approximately 2.5 km downstream of where the ROW crosses Whiskey Creek tributary between structures 297 and 298 (Avens 2015). Whiskey tributary is connected to Whiskey Creek via a dry channel; during very high flood waters, there is a low possibility for these two channels to be hydrologically connected.

Critical Habitat

The upper Bow River and the following channels within the LSA, have been classified by DFO as CH for bull trout (Appendix A): Carrot Creek, Morrison Coulee, Girouard Creek, Johnsons Lake, Anthracite Creek (Johnson Outlet Creek), Cascade Creek, and Whiskey Creek tributary as well as many wetlands (structures 207-208, 219-222, 235-236, 236-237 (south of ROW)) which have no surface water connectivity with fish-bearing watercourses (Appendix A; DFO 2019).

A brief assessment of each of these watercourses is provided in Appendix P evaluating whether the stream exhibits critical habitat characteristics based on those described in the recovery strategy for bull trout (DFO 2020a; Appendix Q). One of the seven watercourses within the LSA (i.e., the lower reach of Anthracite Creek ~140 m downstream of the ROW) currently has the potential to meet the characteristics of CH for this species. If Parks Canada removes the downstream fish barrier in Cascade Creek after the population of WSCT is established, this creek would also meet the criteria for bull trout CH. For the purposes of this assessment, it was assumed that the dry channels which offer no spawning, rearing, or over-wintering habitat are not considered CH.

Due to the potential effects of Project activities on CH in the LSA, this Project requires review and/or approval by DFO; additionally, conditions and prohibitions legislated by the SARA must be applied to all Project-related activities occurring in or near critical habitat for bull trout in the Bow River (see *Information for Identification of Candidate Critical Habitat of Bull Trout, Salvelinus Confluentus (Saskatchewan-Nelson Rivers Populations;* DFO 2020b; and habitat characteristics listed in Appendix Q).

A number of the watercourses that have been mapped as CH by DFO have locational errors on the ROW including:

- Carrot Creek: actual drainage occurs 92 m southeast (SE) of where DFO has it mapped.
- Morrison Coulee: actual drainage occurs 92 m SE of where DFO has it mapped.
- Girouard Creek: actual drainage occurs 92 m SE of where DFO has it mapped.
- Cascade Creek: actual drainage occurs 55 m northeast (NE) of where DFO has it mapped.
- Whiskey Creek tributary: actual drainage occurs 71 m SE of where DFO has it mapped.

For the purposes of this assessment, CH is assumed to occur where the actual watercourse has been surveyed during field assessments.

Westslope Cutthroat Trout

The Alberta population of Westslope Cutthroat Trout *(*WSCT; *Oncorhynchus clarkii lewisi*) is listed as *Threatened* under Schedule 1 of *SARA* (Government of Canada 2023a) and are viewed as an indicator species of general ecosystem health because of their restricted habitat needs (DFO 2019). Currently, the cutthroat trout population that exists in the RSA (within the mainstem of the Bow River) is considered not to be genetically pure WSCT, but instead non-native stock (*Oncorhynchus clarkii*) (DFO 2019).

Critical Habitat

Forty Mile Creek and Whiskey Creek immediately west of the Banff substation have been mapped as WSCT CH by DFO (Appendix A; DFO 2019). WSCT have recently been reintroduced into Cascade Creek (2024); as such, Parks Canada considers Cascade Creek CH for this species.

5.5.3 Wetlands

There are six wetlands on or adjacent to the 54L transmission line ROW in the LSA (Table 5-18). Four of these are large marshes or fens and two are very small artificially created or artifact wetlands. The wetlands were delineated using a combination of soil and vegetation characteristics as per the *Alberta Wetland Identification and Delineation Directive* Pathway 4 (Government of Alberta 2015).

The four natural wetlands are dominated by obligate wetland vegetation species and all have strong soil indicators including peat development (fen) or fine textured silty clay or silty clay loam soils with redox features, gleying, or mottling (marshes). All of these wetlands have standing water in the spring following snow melt in most years. The marsh wetland north of the

ROW at structures 267-268 is a riparian stream marsh along the edge of the stream originating from the TransAlta penstock valve to the northwest of structure 269 (Appendix A). This is the only wetland in the LSA with a surface water connection.

The fen west of 264 near the Johnson Lake earthen dam is an artificially created wetland due to leakage from the dam. It has only been developing for a few decades since the dam was created so has only a few centimetres of peat formation. The small wetland near structure 269 appears to be an artifact created by previous soil compaction in this area 9 cm below the ground surface which has created an impermeable layer that water from snow melt or precipitation sits on for extended periods. This wetland does not provide ecological services and does not provide meaningful habitat for wildlife.

Table 5-18. Wetlands on or adjacent to the ROW in the LSA.

Span	Wetland Classification	Wetland Features	Surface water connection	Crossing Proposed
207-208	Rich graminoid fen (pH 7.2, conductivity 308)	Fen dominated by sedge species, willow around edges, > 40 cm peat layer in deepest part of wetland, existing trail through narrow portion at end	No	Yes
220	Seasonal freshwater marsh	Marsh dominated by sedge and bulrush species, 14-20 cm of peat over organic mineral soil, surface water through summer in wet years	No	No
235-236	Seasonal freshwater marsh	Marsh dominated by sedge and grass species, surface water all summer in wet years, 8 cm peat over organic mineral soil	No	No
264-265	Manmade graminoid fen	Wetland created by leakage from dam at Johnson Lake outlet, young fen with 2 cm peat	No	Yes
267-268	Seasonal freshwater marsh	Marsh adjacent to flowing stream originating from penstock valve, N side of ROW, fine textured SiCL soil	Yes	No
269	Wetland artifact	Weak wetland indicators in small 5 x 5m area due to subsurface soil compaction, poor drainage	No	Yes

5.6 Cultural Resources

For the following section, both pre-contact resources and post-contact resources identified by Parks Canada will be referred to as archaeological resources. Locations of the archaeological resources will be referred to as “archaeological sites.” The PSA is located within the Bow Valley of Banff National Park. Discrete portions of the Bow Valley in the park have been subject to intensive assessment, but only in concentrated areas in close proximity to urban development, tourist facilities, and parks infrastructure, especially transportation corridors. Very little assessment has been conducted outside of these areas.

Site data within one km of the proposed development was obtained from Parks Canada. The data was reviewed by an archaeologist and an AOA was completed for all sites located within 200 m of the proposed development footprint (Table 5-19) (Speargrass Historical Resource Consultants Inc. 2023). The purpose of the AOA was to outline the basic scope of the proposed Project, provide an overview of the previous research and known archaeological resources within the Project area, identify potential impacts to known archaeological resources by the proposed development, make recommendations to further assess or mitigate these impacts, and identify potential target areas for an AIA conducted under a Research and Collections permit. The AOA was reviewed by a Parks Canada archaeologist who issued official requirements in response.

Table 5-19. Archaeological resource locations and descriptions.

Str.	Site # (Borden #)	Type	Site age	Comments	Dist. from PSA (m)
264	20R (EhPu-6)	campsite	late precontact	Partially disturbed but likely presence of intact archaeological resources. Low potential of impact by 54L rebuild.	0
265	52R (EhPu-11)	mining complex	postcontact	Largely disturbed, expansive site. Potential impact to 3 site components (earthworks, cemetery, structural remains.	0
260	61R (EhPu-20)	cabin	postcontact -1910	Partially disturbed, discrete cabin site with low potential of impact by 54L rebuild.	147
273	63R (EhPv-19)	postcontact	1941	Undisturbed, existing structures. Low potential of impact by 54L rebuild.	0
276	159R (EhPv-55)	historic features	postcontact	Partially disturbed, infrastructure remains. Low potential of impact by 54L rebuild.	0
264	352R (EhPu-9)	campsite / historic scatter	unknown precontact/ postcontact	Largely disturbed but site boundary unclear, potentially intact site deposits. Potential impact to intact archaeological resources.	5
294	1194R (EhPv-112)	campsite	unknown precontact	Partially disturbed, likely presence of intact site deposits. Potential impact to intact archaeological resources.	0
259	1475R	isolated find	unknown precontact	Partially disturbed, may indicate periphery of large site. Potential impact to intact archaeological resources.	48
258	1476R	isolated find	unknown precontact	Partially disturbed, may indicate periphery of large site. Potential impact to intact archaeological resources.	77

Str.	Site # (Borden #)	Type	Site age	Comments	Dist. from PSA (m)
257	1477R	isolated find	unknown precontact	Partially disturbed, may indicate periphery of large site. Potential impact to intact archaeological resources.	70
266	1634R	burial, cemetery	1900s to 1920s	Partially disturbed, exact site location uncertain. Potential impact to intact archaeological resources.	0.5
301	1954R	habitation; depressions ; wooden structure; stone alignment	postcontact - early to mid 1900s	Largely disturbed, postcontact habitation features. Low potential of impact by 54L rebuild.	45
298	2071R	bridge and road feature	postcontact	Largely destroyed. Low potential of impact by 54L rebuild.	0
302	2072R	railway spur	postcontact - 1883 - 1889	Partially disturbed road grade. Low potential of impact by 54L rebuild.	0
279	2087R	railway platform	postcontact	Partially disturbed, railway platform. Low potential of impact by 54L rebuild.	160
305	2712R	isolated find	unknown precontact	Site destroyed. Isolated find. No impact by 54L rebuild.	11
304	2713R	historic refuse	postcontact - 1960s 70s	Site destroyed. Postcontact midden. No impact by 54L rebuild.	0
261	2745R	boat	postcontact	Mostly intact boat. No impact by 54L rebuild.	164

5.7 Aesthetics

The existing 54L transmission line and ROW has been in place for many decades and is a long-standing infrastructure component on the landscape. This section of BNP from the east boundary to the Town of Banff has high scenic values, but it is also one of the busiest and most heavily developed sections of the park.

A visibility assessment was undertaken to better understand the current conditions and expected future impacts to aesthetics and visibility of the 54L transmission line. The study area extends from the Banff National Park East Gate to the Mount Norquay Road near the Town of Banff and is entirely within Banff National Park. The study area centered on the TCH, extending as far north as Johnson Lake, and Tunnel Mountain Road and Campground to the south. A partial list of major disturbances and infrastructure in this area includes: the Town of Banff, Tunnel Mountain Campground, the TCH, wildlife highway fencing, CP Rail line, Fortis transmission and distribution lines, and TransAlta hydro-generating facilities (including the highly visible water tower).

A field survey and a GIS-based visibility assessment were undertaken to better understand and quantify the current (pre-construction) visibility and aesthetics of the transmission line. The assessment modeled the existing 54L transmission line relative to selected viewer locations. A full discussion of the data, methods, and results is presented in the attached report: *Preliminary Visibility Assessment – AltaLink 54L (updated March 2, 2025;* Appendix R*)*.

The analysis focused on the TCH corridor and the following key areas of interest: Johnson Lake, Tunnel Mountain Campground, and the Tunnel Mountain Bench/Town of Banff (Banff Ave/Compound Road/Hawk Ave area).

5.7.1 TCH Corridor (TCH and Banff Legacy Trail)

The TCH is the primary transportation corridor through the Bow Valley. It is both an important commercial route and scenic mountain drive for visitors to BNP. The TCH features several established and long-standing visual disturbances (in addition to the AltaLink 54L line). These include wildlife highway fencing along both sides of the TCH, CP railway, TransAlta hydro generating facility and water tower (the most visually prominent feature in this section) and portions of Fortis distribution lines.

The purpose of this analysis was to determine changes to potential lines of sight from the TCH in both the westbound and eastbound lanes. The model also includes the Rocky Mountain Legacy Trail which runs parallel to the TCH from the east gate to the Minnewanka interchange. The results of the visibility model identified that from the TCH corridor, there are currently 15 structures and 1,920m of the 54L line visible (some sections are partially obscured by trees) to drivers or Legacy Trail users (Appendix R).

From the Banff Park East Gate heading west to the TransAlta water tower, the 54L transmission line is almost completely obscured from view by a combination of steep topography and thick forest cover along the north side of the TCH. Brief views of the line and structures are possible up Carrot Creek, Morrison Coulee, and Anthracite Creek. To the casual observer these sections are very difficult to discern while travelling the TCH. A total of 240 m of line and one structure are currently visible up these drainages.

The most visually prominent section is where the 54L line crosses the TCH at the water tower. This open span over the TCH measures 930 m and accounts for nearly 50% of the total visible transmission line, and 5 of the 15 visible structures. This open span is clearly visible to both east and westbound TCH/Legacy Trail traffic. At this location, the water tower is the most obvious visual feature. The Fortis line, CP railway and TransAlta station are also visible.

From the water tower west towards the Minnewanka interchange, the 54L line obscured from view by heavy forest cover. The Legacy Trail diverges from the TCH at this point and parallels Banff Ave. into the Town of Banff.

Intermittent views of the 54L transmission line and structures are possible in the section between the Minnewanka Interchange and 40 Mile Creek (current structures 292-310). A total of 9 structures and 750 m of line are currently visible through this section. The existing cleared ROW and structures are visible as they descend the steep slopes off the Tunnel Mountain bench. Open areas in the forest cover near the Industrial Compound provide intermittent views of the 54L line and structures. This is a complex viewshed and the viewscape changes depending on the direction of travel (east vs. west) and as the TCH curves (providing different viewer angles).

In general, the AltaLink 54L line is not frequently visible from the TCH/Legacy Trail and does not have a significant negative impact on the aesthetics of the TCH corridor. The one exception to this is the open span crossing of the TCH where the 54L line is directly overhead.

5.7.2 Johnson Lake

Johnson Lake is a very popular location with scenic views. This area is a high priority area for understanding potential visibility impacts. The Johnson Lake area has multiple potential viewsheds with a DUA and trail network on the north and east shores of the lake. Trails also circle the lake and intersect with the cleared ROW on the south and the west sides. The lake itself is popular for swimmers and non-motorized watercraft (and ice skaters in the winter). This provides a diverse variety of possible viewer locations.

The 54L transmission line ROW approaches the lake from the southeast and is buffered from views by thick forest cover. The ROW then curves towards the lake, and the buffer of forest cover thins to a strip ~30 m wide. Due to the topography, the effective screening at the top of the forest canopy relative to the 54L line is very narrow. Although the tree buffer is narrow, the existing line is well-shielded from view by the forest cover and the current structure heights are below the top of the forest canopy (Appendix R). The existing structures and line are well aged and weathered, making them well camouflaged and difficult to discern through the trees.

From current structures 264-265 the line passes in an open span by the Johnson Lake outflow with only a few isolated trees and shrubs for visual screening. This open span and cleared ROW are in full view of the DUA, trails, and picnic sites. The Johnson Lake Loop trail passes directly under the 54L line and there are several established picnic sites on the ROW.

5.7.3 Tunnel Mountain Campground

The 54L ROW crosses Tunnel Mountain Road in an open span and then bisects the Tunnel Mountain Campground area. Through Tunnel Mountain Campground the cleared ROW is generally wide and open with clear views in both directions. Past vegetation management and Danger Tree removal has left very thin buffers of open forest, resulting in clear and unobstructed views of the AltaLink and Fortis lines from some of the adjacent campsites. Multiple trails cross or run adjacent to the ROW.

Currently there are a total of 19 structures in this section. The ROW runs through the middle of the campground and is currently very visible from a multitude of viewer angles through this entire section (Table 5 – 20).

Table 5 – 20. Existing visibility of the 54L from the Tunnel Mountain Campground loops.

Campground Area	Current Status
Tunnel Mountain Campground Village I – D	The north row of D Loop backs directly onto the 54L ROW. Existing vegetation screening is a maximum of 10 m wide and generally less. The AltaLink and Fortis lines are generally visible from the adjacent campsites.
Tunnel Mountain Campground Village I - E, F, K	The south row of E, F and K loops back directly onto the 54L ROW. Past vegetation management has removed much of the tree buffer through this area. Where tree cover still exists, it is generally less than 10 m wide. The AltaLink and Fortis lines are generally visible from the adjacent campsites.
Tunnel Mountain Trailer Court A, B, C	The closest sites in the A, B, and C loops are 60 m+ from the ROW. There is a buffer of trees, outer campground loop road, and a 2nd buffer of trees between these sites and the ROW. The AltaLink and Fortis lines are generally well screened from the trailer sites.
Tunnel Mountain Village II – oTENTik	The oTENTik sites are located in a mature forest with limited views of the AltaLink and Fortis lines. There is partial visibility of some structures and line through openings in the forest between the trees. The nearest oTENTik site is ~35m from the identified Danger Trees.
Tunnel Mountain Trails – The Spine, Campground Loop, Campground Winter Trails	Through Tunnel Mountain Campground, there are multiple trails that cross or parallel the 54L ROW. From these trails the AltaLink and Fortis lines are clearly visible.

5.7.4 Tunnel Mountain Bench/Town of Banff

From the western edge of the Tunnel Mountain bench, the 54L transmission line descends steep slopes and crosses Banff Avenue in an open span. The steep slopes of the Tunnel Mountain bench are topographically prominent relative to the valley bottom and rise to ~85m above Banff Avenue. The 54L ROW is routed on a slight ridge that descends towards Banff Avenue. Because of its topographic position, this location is potentially visible within a broad (180 degrees plus) viewshed from the Cascade Ponds to the northeast and the Town of Banff to the southwest. At this location there are numerous mature trees within the 54L transmission line ROW. These mature trees on the ROW contribute to the vegetative screening that partially obscures the transmission line from locations such as Banff Avenue, the TCH, Compound Road, and areas within the Town of Banff.

The ROW then traverses through thick forest across a decommissioned parking lot, and then over the CP Rail line. It crosses open disturbed lands and Compound Road in an open span and then traverses the Banff Industrial Compound to the end of the 54L transmission line. This is a highly developed area that with a wide array of Parks Canada, municipal, and commercial services is adjacent to the CP Rail ROW. There is little to no vegetative screening of the 54L transmission line through this section as it parallels Hawk Avenue through the Industrial Compound.

These urban and urban-fringe areas present a complex and challenging situation for viewshed modeling. With a dense and compact urban center, there are a multitude of building heights, window aspects, street views and potential viewer angles and locations. Portions of the Town of Banff higher up on the Tunnel Mountain bench (e.g., Mystic Ridge area) have existing views down towards the 54L transmission line and the Industrial Compound. Due to the complexity of structure heights, roofs, and window locations, this analysis focuses on key areas with street-level views of the 54L transmission line.

Currently, a total of 1,695 m of the 54L transmission line and 22 structures are visible in this area from street level views. Due to the complexity of the area (Appendix R) multiple streets and viewer locations), not all sections of the 54L transmission line are visible from all locations.

Overall, the 54L transmission line is very visible through many locations and viewsheds within this urban and urban-fringe landscape. It is one of many visual or aesthetic disturbances including urban areas, railway, roads, and associated infrastructure.

5.8 Public Safety

Currently, the 54L transmission line is at the end of its life span and the structures and infrastructure on them are prone to failures. Combined with high numbers of Danger Trees at the edges of the ROW that may ignite a wildfire when they contact the line, the 54L transmission line has higher risk for wildfire ignitions than a newer transmission line. Since most of the 54L transmission line ROW is also situated in HRFAs (Forsite 2019) the aging line poses a higher risk of being a source of wildfire ignitions and spread. AltaLink has increased line patrol frequency to mitigate this risk until the line rebuild is completed.

5.9 Public Facilities and Services

There are several public facilities that intersect the 54L transmission line ROW and accesses onto the ROW. There are trailheads, a day use area, and a campground that could be affected by the Project (Table 5-21). In addition, there are public trails that cross the ROW or are within the LSA (Table 5-22). In addition access to the ROW requires the use of public roads or the transmission line crosses roads including the TCH, Tunnel Mountain Road, Banff Avenue, and Hawk Avenue in the industrial park. The transmission line also crosses an access road within the Tunnel Mountain Campground.

The 54L transmission line is also a public service as it provides the only source of electricity to all users along the line from Johnson Lake to Lake Louise as it is a radial line.

Table 5-21. Public facilities on or near the 54L ROW and accesses.

Location	Str Spans on 54L	Facilities
Carrot Creek	213 - 214	Trailhead near TCH
Johnson Lake	259 - 264	Day use area, beach, trails around lake
Tunnel Mtn.	276 - 293	Campground, trails
Legacy Trail	273 -274, 297-298	Paved pathway from east park gate to Banff next to TCH, Banff Avenue.

Table 5-22. Trails that intersect the 54L ROW or are within the LSA.

Trail	Season of Use	Access/ Str. Span on 54L	On ROW	LSA	km of trail in LSA
Legacy Trail	summer	crosses ROW at strs 273-274 (TCH)and 297-298 (Banff Avenue)	x		0.43
Johnson Lake					
Johnson Lake loop	year round	260.5-264.5	x	x	0.69
Johnson Lake southside	summer	258.5-264, crosses ROW at strs 260, 264.5	x	x	0.74
Johnson Lake to TCH	summer	crosses ROW at str 264.5	x		0.24

Trail	Season of Use	Access/ Str. Span on 54L	On ROW	LSA	km of trail in LSA
Water Tower Trail	summer	follows Access 4B, crosses ROW at strs 265, 270	x	x	0.60
Tunnel Mountain Campground					
Tunnel Mountain Campground loop	summer	strs 279-280, 285-294			2.11
Tunnel Campground Winter trails	winter	strs 280-291		x	3.11
Tunnel Loop Coastline	year round	strs 288-292	x		0.32
Tunnel Loop Spine	year round	strs 275-275	x		0.73
Banff Avenue (Legacy trail)	year round	str 297	x		0.22

5.10 Indigenous Values and Rights

Information will be updated to reflect the Indigenous Engagement Process to be conducted in spring – summer 2025.

6.0 EFFECTS, MITIGATION MEASURES, AND RESIDUAL EFFECTS OF THE PROJECT ON VALUED COMPONENTS

6.1 Impact Significance Criteria

The effects of the project on the Valued Components (VCs) were evaluated using a set of criteria outlined by the Impact Assessment Agency and further refined for this project (Table 6-1).

Table 6-1. Impact significance criteria used to evaluate effects of the project on the VCs.

Criterion		Code	Definition
Direction	Negative	N	Impact has undesirable effect on VC
	Positive	P	Impact has desirable effect on VC
	Neutral	NE	Impact has no effect on VC
Magnitude	Negligible	N	No discernible change from baseline conditions
	Low	L	Change is detectable but is within normal variability of baseline conditions
	Moderate	M	Change is substantially different from baseline conditions
	High	H	Change exceeds thresholds and causes substantial alterations in VCs including loss of species or communities at risk
Geographic extent	Low	L	Effects restricted to local study area
	Moderate	M	Effects extend beyond local study area but not beyond regional study area **
	High	H	Effects extend beyond regional study area
Frequency	Once	O	Occurs one time
	Intermittent	I	Occurs periodically
	Continuous	C	Occurs continuously
Duration	Short-term	S	Effect occurs during tree clearing and construction
	Medium-term	M	Effect continues for up to 2 years after tree clearing and construction operations

	Long-term	L	Effect continues for duration of existence of transmission line
Reversibility	Reversible	R	Effect is reversible
	Irreversible	I	Effect is not reversible

**Regional study area = Bow Valley below 1800 m from the east park boundary to Banff plus 2 km on each end.

6.2 Air Quality

6.2.1 VCs

The VC for air quality is clean air with all compounds that contribute to poor air below the established thresholds which can negatively affect health outcomes for humans and wildlife.

6.2.2 Effects Analysis

There is minimal to moderate potential for impacts to air quality during vegetation removal and line replacement activities. The major source of air pollutants associated with this Project is the burning of woody debris from tree clearing operations. In poor venting conditions, this smoke has the potential to drift many kilometres and affect people that are sensitive to this pollutant in nearby communities including Banff, Harvie Heights, and Canmore.

The other main source of air pollutants on the Project is the emissions from diesel- or gas-powered machinery and vehicles. The pollutants associated with vehicle emissions are hydrocarbons, nitrogen oxides, carbon monoxide and particulate matter. There may also be dust produced by the machinery and trucks on the ROW in those sections where work is proposed during summer to fall. Impacts to air quality as a result of this Project are expected to be minimal to moderate and of short duration.

6.2.3 Mitigation Measures

- Burn woody debris piles (tree crowns) from Danger Tree clearing operations only during optimal smoke venting conditions in the winter. Clearance is required from the Parks Canada Fire Duty Officer prior to burning to ensure that weather and nearby fuel conditions permit safe pile burning. Clearance for open air burning depends on current and forecasted weather and atmospheric conditions, such as vertical mixing and winds, to ensure proper venting of smoke to minimize air quality impacts.

- Pile burning must adhere to the BFU/LLYK debris management guidelines (Parks Canada 2017). The guidelines specify proper pile placement, size, and procedures to mitigate impacts to nearby vegetation, soils, and potential for holdover.
- Where possible, debris piles will be allowed to dry for a minimum of a few months to make them more readily burnable and reduce smoke.
- Burn debris piles in a forced air open burner where possible to allow for hotter burning conditions, reduced burning time, and reduced smoke.
- Parks Canada communications staff will inform key stakeholders, including those sensitive to smoke, and park staff of Project operations and potential for smoke in the area during burning operations.
- Ensure that all machinery and equipment is in good working order and all emissions control systems are in place and functioning properly.
- Minimize unnecessary idling of all vehicles and machinery during construction and tree removal activities; motorized vehicles on site should be shut off when not in use.

Table 6-2. Summary of effects and mitigation measures for air quality VCs.

Potential Effect	**Effect Characteristics**						**Key mitigation measures**
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Air Quality							
Smoke from vegetation debris burning	N	L	L	I	S	I	Burn during good venting conditions in winter Allow debris to dry before burning Burn in forced air burner
Emissions from machinery and vehicles	N	L	L	I	S	I	Ensure emissions control systems are functional on vehicles and machinery

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Minimize idling of vehicles

6.2.4 Residual Effects

There are no anticipated residual impacts to air quality from the Project. The impacts of smoke from debris burning and emissions from equipment, machinery, vehicles, and smoke will be low, negative, intermittent, localized, short term in duration, and irreversible.

6.3 Topography and Soils

6.3.1 VCs

The VC for soil is native soil that has all the characteristics to support good vegetation growth including native soil structure and biota.

6.3.2 Effects Analysis

There is potential for scalping, rutting, compaction, pulverization of soil during logging activities and excavations for installation of the new structures. Winter snow clearing on the ROW could result in some scalping of the topsoil layers. Similarly work by excavators or logging equipment on steep slopes and uneven ground could result in tearing of the vegetation mat and scalping of topsoil. Exposed soil patches resulting from machine scalping or soil stripping for structure installation and cut and fills could lead to erosion on slopes and soil movement offsite. Eroded soil could enter nearby waterbodies resulting in siltation of surface water. Disturbed soil also provides habitat for invasive vegetation species.

Machine work in unfrozen conditions as proposed in sections 7-10 between the Cascade plant and the Banff substation could result in rutting, compaction, and loss of soil structure particularly when soils are wet. This could lead to restriction of vegetation rooting, reduced vigour of vegetation that grows in these soils, and increased risk of erosion.

Improper topsoil stripping and storage on this project may result in loss of topsoil from the site and admixing of soil layers. Most ecosites in the LSA have very thin topsoil layers (< 10 cm) and therefore, it is difficult to strip the topsoil separately and it can be difficult to respread such a small quantity it evenly on disturbed sites. Admixing or loss of topsoil during handling can result in reduced reclamation success and degraded habitat for wildlife.

There is potential for soil to be contaminated by spills of deleterious substances including fuel, oil, and hydraulic fluids during this Project. Contaminants can also enter soils from drips or leaks from machinery and enter ground water and ultimately surface water.

The project has the potential to interact with known or suspected contaminated sites in several areas near the ROW. Many historic contaminants that are bound up in soil can be remobilized when excavated and exposed to air resulting in these substances entering ground water through leaching into lower soil layers or volatilizing into the air (e.g., coal constituents, buried hydrocarbon spills).

There is potential for dust from exposed soils during dry, windy conditions.

6.3.3 Mitigation Measures

- Use low pressure machinery (<7psi) and work in frozen conditions where possible. All tree removal with logging equipment will occur in frozen conditions between December 1st and March 31st. Line rebuild activities will be done in the winter with the exception of section 7-10.
- Concentrate skidding operations for tree removal to a few primary trails.
- For winter logging and line rebuild sections, construct hard snow roads on the ROW and accesses to facilitate travel by machinery in the winter and to prevent scalping and soil compaction. All machinery and vehicles will travel on the snow road to their work sites on the ROW.
- During plowing operations in the winter on the accesses, snow roads, and work sites, a layer of snow will be left on the ground to protect the soil.
- Access to the ROW will occur on existing access trails (refer to mapped access routes, Appendix A). Traffic will be restricted within the PSA to vehicles and equipment essential for line replacement and tree removal operations. Non-essential vehicles will stay on the nearby paved roadways and equipment and workers will be brought into active work sites using smaller ATVs with low ground pressure where possible (e.g. ranger, argo, etc.).

- For line rebuild in sections 7-10 from the Cascade plant to the Banff 123 substation in unfrozen conditions, access matting will be used on the ROW where required on fine textured soils to reduce potential for compaction and rutting. In the Tunnel Mountain Campground between structures 276-294, work should be conducted in dry conditions in late summer/ early fall to reduce potential for soil compaction in these very fine textured soils.

- For work in unfrozen conditions, a wet weather protocol will be in place to preserve soils when they are saturated from precipitation. This could include temporary work shutdowns, minimizing machine movement between locations, or utilizing matting.

- All equipment and vehicles will arrive on site clean and free of soil and weed propagules.

- Erosion and sediment control measures will be used to minimize erosion and sediment movement off-site on the ROW (see Section 1.3.13). Site-specific ESC measures to address areas of concern will be detailed in annual ESC plans as was similarly done on the 551L Rebuild.

- For each structure installation and cut and fill, the topsoil will be stripped and stored separately from subsoil during construction and then replaced on each site before machines leave the sites in the spring. Topsoil will be handled minimally. In unfrozen conditions (sections 7 – 10) topsoil will not be handled when the soil is wet to preserve soil function.

- Topsoil piles will not be covered and will be windrowed where possible (long piles <1.5 m high) to keep oxygen levels in the piles as high as possible to maintain biological activity in the stored topsoil.

- Soil piles will be stored rough and loose and will contain all rock, vegetation debris, roots, naturally found in the soil to increase the surface roughness and reduce erosion potential of the piles.

- If topsoil needs to remain off for a growing season, the topsoil piles will be seeded in the spring (successfully stored and replaced topsoil for cut and fill for 2 years on 551L rebuild).

- A spill response plan will be put in place and provided to all personnel.

- All deleterious products (fuel, oil, herbicides) must be stored in 110% leakproof containment.

- Spill response kits will be on site and all workers will be trained in their use. Spill response will happen immediately in the event of a spill, including contacting the Parks Canada ESO and other appropriate authorities (phone numbers provided in the spill response plan).

- Vehicles will be checked regularly by an EM on site and any leaks will be fixed or the vehicle will be removed within 24 hours. Drip trays will be placed under vehicles and machinery on when not in use on the ROW or accesses.

- Oil changes and major machinery and vehicle repairs will be conducted off-site.

- Site-specific mitigation strategies for contaminated sites will be determined in consultation with Parks Canada to mitigate environmental risks from project activities that occur within these areas.

- If removing contaminated material from a site, it must be transported to a licensed facility outside the park as per the PCA approved soil management plan for the site (Note: if soil >10 m^3, soil will need to be tested for contamination prior to disposing at an approved facility such as Francis Cooke Landfill).

Table 6-3. Summary of impacts and mitigation measures for soil VECs.

Potential Effect	**Effect Characteristics**						**Key mitigation measures**
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Soils							
Scalping, compaction, rutting of native soil	N	L	L	I	L	I	Use low pressure machines Work in frozen conditions on hard snow roads where possible In unfrozen conditions (sec 7- 10) use matting to protect soil where required Use essential machinery on ROW only, minimize trips, travel to site from accesses on UTVs
Erosion of soils	N	L	L	I	S	I	Work in frozen conditions where possible, replace topsoil on sites before spring thaw Keep topsoil and subsoil piles “rough and loose” Make annual ESC plan, install ESC measures on exposed soils on slopes following construction
Spread of NNV	N	L	L	I	S	R	Ensure machines and vehicles arrive on site clean and free of soil
Contamination of soil (pre-existing and during construction)	N	L	L	I	S	R	Complete Phase 1 Environmental Site Assessment (ESA) <100 m of known contamination

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Test soil for contamination prior to disposing at an approved facility if soil >10 m^3 Implement Parks Canada approved Spill Response Plan Carry spill kits onsite and train all workers in their use Store all deleterious substances in 110% containment Clean up spills immediately and dispose of waste properly outside the park
Loss / admixing of native topsoil	N	L	L	O	L	I	Strip and stockpile native soil separately from subsoil and replace after construction Store native topsoil uncovered in windrows less than 1.5 m high to maintain biological activity in piles If topsoil stored through growing season seed piles with native grass seed
Dust during dry conditions	N	L	L	I	S	I	Provide dust control (water spraying) as required during construction

6.3.4 Residual Effects

If all of the mitigation described is implemented, there is still a small probability that native topsoil could be affected by this Project since it is very thin (3-8 cm) in most ecosites in the mountains and therefore challenging to avoid mixing with subsoil during stripping, handling, and replacement. This could lead to overall lower productivity of soil in some areas and reduced growth and vigour of vegetation in reclaimed areas. The residual effects of the Project on soil are expected to be negative, low magnitude, localized, occur once, be long term and irreversible.

6.4 Vegetation

6.4.1 VCs

The VCs for vegetation are healthy native plant communities that stabilize soils and filter runoff and are free of invasive plant species. Rare plants and rare plant communities are preserved and are part of the landscape level plant diversity in the park.

6.4.2 Effects Analysis

6.4.2.1 Loss or modification of native plant communities and habitat

There will be approximately 4.86 ha of Danger Tree clearing along the edges of the ROW (Table 1-7), but there should be minimal disturbance to other vegetation layers (tall and short shrub, forb). Trees are expected to re-establish in areas where Danger Trees are cleared adjacent to the ROW so this loss is not considered permanent.

There will also be approximately five hectares of vegetation loss associated with cutting of immature trees on the ROW as well as clearing and leveling sites for installation of new structures and building machine-accessible routes along the ROW. Some of the cut and fills will not be re-contoured and will be reclaimed in situ so that they can be used for emergency and maintenance access on the ROW (e.g., Access 3b in section 4). All disturbed areas with exposed soil will be reclaimed with native plant species following construction. However, the composition of the vegetation communities and associated wildlife habitat will change in the short-term with the removal of the tree and shrub layers and replacement by forb, grass, and smaller shrubs. Over time, the native plants from the surrounding undisturbed vegetation communities will reinvade the disturbed areas.

In terms of special vegetation resources this Project will result in the loss of some mature Douglas fir Danger Trees at the edge of the ROW. This Project could also result in the loss or damage of some Rocky Mountain juniper.

The incidental or indirect loss of vegetation due to the machine logging and hand falling associated with this Project could cause additional loss of vegetation on both the existing ROW and newly cleared areas including understory trees, shrubs, and forbs. There is potential for understory vegetation to be buried by woody debris during tree clearing operations. High fuel loadings of fine and medium fuels on the ground may increase the fire hazard if the crowns (branches and foliage) are left on the ground. Also, during Danger Tree clearing, adjacent uncut trees could be damaged by logging machinery such as feller-bunchers or wood processors that can cause large stem wounds or remove large branches as they maneuver between trees in dense stands.

Another possible impact is soil compaction and rutting caused by repeated passes by machinery along the ROW in areas where the topsoil layer is thin and/or fine textured (see Appendix C). Soil loss or compaction could lead to direct vegetation loss or could result in a change in the plant community composition with more invasive species that colonize the disturbed ground. Soil compaction could also result in reduced health and vigour of plant species growing in those areas. This is of particular concern in sections 7 – 10 (structures 274-313) that will be constructed during unfrozen conditions in September – October.

6.4.2.2 Rare plants and plant communities

The limber pine and rare moonwort species could be damaged or destroyed by machinery and equipment moving along the ROW or during ROW vegetation clearing operations. However, the limber pine are easily avoided if they are marked prior to construction and even at mature height are unlikely to interfere with the line.

The rare C13 grassland vegetation type on Access 3c could be damaged by machine traffic travelling on this access through scalping, soil compaction, and rutting.

In terms of identified special vegetation resources this Project will result in the loss of some mature Douglas fir Danger Trees at the edge of the ROW. This Project could also result in the loss or damage of some Rocky Mountain juniper. However, both of these species are common in the RSA and the overall populations of these species are not likely to be affected by the loss of a few individuals.

6.4.2.1 Species richness

Currently the vegetation species richness on the ROW is significantly higher than in the surrounding conifer forest matrix where there is often relatively low cover of shrubs and forbs and low numbers of species in the moss dominated understory. There were dozens of species recorded on the ROW that were not found in the surrounding mature forest stands. Removal of Danger Trees and brushing the existing ROW in preparation for the transmission line rebuild will result in an increase in sunlight reaching the lower vegetation layers and in some cases the forest floor. This could result in an increase in species richness and diversity of vegetation in the forb and graminoid layers in the cleared areas compared to before brushing and tree clearing. The ROW will continue to provide habitat and increased or alternate food sources for ungulates and small mammals (see section 3.4). The dominant vegetation types in the LSA and PSA are provided in Table 4-3 and directly relate to available wildlife habitat on the regional landscape of the Bow Valley.

6.4.2.2 Invasive non-native plants

This Project could result in an increase in the number and size of infestations of invasive non-native) species along the ROW, on the accesses to the ROW, and in laydown/staging areas. Machines could spread the plants and /or seeds to other locations on the ROW by transporting seeds, roots, or other propagules on the undercarriage or tires of the equipment as they move through existing infestations. These NNV species can then establish in new areas where the native vegetation mat is removed or disturbed by machinery during tree clearing or rebuild operations. The machines could also bring new NNV species onto the ROW from off-site locations. These plants can also be spread by people walking through infested areas and picking up seeds on their footwear and clothing. The cover and density of existing NNV infestations can also be increased in areas where there is ground disturbance from equipment.

Once they become established invasive non-native plants are challenging to control. Therefore, prevention is one of the main strategies employed and recommended by Parks Canada in their Integrated Pest Management Plan in the park (Parks Canada 2019). The ability of non-native plants to invade undisturbed densely vegetated native plant communities is quite low (Rejmanek 1989). As such, minimizing ground disturbance associated with this Project is equally important to avoiding spreading the plant propagules of NNV.

6.4.3 Mitigation Measures

- Minimize ground disturbance and loss of vegetation by working in frozen conditions with snow cover where possible, minimizing size of structure and cut and fill disturbance areas, and utilizing sod salvage where possible to minimize the amount of native vegetation that is lost on the ROW during construction.

- Mechanical tree removal operations will take place on frozen ground (December to March) to minimize potential for ground disturbance in wet sections, steep terrain, and other sensitive areas.

- For structures 273-313, where construction must occur in unfrozen conditions between September – October during low electrical loads on the line, machine and vehicle traffic on the ROW will be minimized and work activity will be curtailed during wet weather to avoid compaction and rutting.

- All equipment operators will be experienced and competent to minimize incidental loss of trees and shrubs during Danger Tree removal operations.

- Within 5 m of the HWM of all watercourses (i.e., excluding non-active drainages >10 years), where possible, top Danger Trees to maximum of one third of the total height except for hazard trees which will be removed fully; where topping is required beyond one third of total height and/or the tree is expected to die from topping, a site-specific removal plan will be completed in consultation with the ESO/EM.

- Between 5 m and 30 m of the HWM of all watercourses, remove all Danger Trees by hand; avoid removal of shrubs and forbs within 30 m of a watercourse.

- All tree crowns and fine woody debris resulting from Danger Tree clearing will be piled and burned in forced air open burners or on the ground to reduce the fire hazard posed by this material in the event of a wildfire initiated on or travelling through the ROW.

- If burning on the ground, strip topsoil and burn woody debris piles on subsoil. Replace topsoil after burning is complete and ground has cooled.

- Large diameter Douglas fir Danger Trees (>40 cm DBH) of high ecological value will be topped where possible rather than cleared. Rocky Mountain juniper will be flagged and avoided where possible.

- Flag/stake rare plants for avoidance prior to construction. Travel of machinery, vehicles and workers within these marked areas will be prohibited. For the moonwort species, if it is logistically impossible to avoid the plants due to close proximity to structure sites, then salvage and transplanting of plants and associated sods will be attempted.

- Flag and avoid rare limber pine between structures 243-244. If either of these limber pine are deemed to be hazard trees, then top the tree rather than cutting it down.

- Continue annual NNV control program initiated in 2022 on the accesses and 54L ROW prior to start of the Project using methods outlined in the AltaLink approved IPMP (AltaLink 2022) to reduce or eliminate these NNV populations in the PSA.

- Mark location of existing NNV infestations along the ROW and avoid these locations with machinery to minimize spread of non-native plants along ROW. If avoidance is not possible then work on hard snow cover.

- Where work is proceeding when there is no snow cover (structures 273-313), and NNV are not avoidable, clean access mats will be laid over the weed infestations to allow machine travel. Access mats will be thoroughly washed after use and before installation on another section of the ROW.

- All equipment will arrive on site clean prior to entry to the ROW to remove all NNV seeds and avoid introducing new infestations to the ROW.

- All areas will be thoroughly reclaimed or restored as soon as possible after construction is complete using native plants. A separate comprehensive reclamation plan will be prepared detailing methods and species to be used in different areas of the ROW depending on slope, aspect, ecosite, and vegetation community. The priorities of reclamation will be erosion control, reestablishing a native plant community, and minimizing spread of invasive non-native plants.

- A post construction reclamation monitoring program will be implemented for all disturbed and reclaimed areas on the AltaLink ROW. All reclaimed areas will be assessed each spring for NNV, and again in late summer to assess plant community composition and structure according to established reclamation criteria for a minimum of three years. Where post-construction monitoring indicates that reclamation efforts are ineffective (i.e., ineffective erosion control or introduction of invasive plants), additional measures will be implemented to address identified concerns. Monitoring results and associated action plans resulting from these follow up surveys will be reviewed with Parks Canada on a yearly basis.

Table 6-4. Summary of potential impacts and mitigation measures for vegetation VECs.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Vegetation							
Loss/ alteration of native plant communities	N	L	L	I	S	R	Minimize disturbance size for str sites and cut and fills Travel on hard snow roads where possible to minimize vegetation disturbance Reclaim ROW with native plants (incl. shrubs) in spring following construction
Increase in diversity of vegetation communities on ROW	P	L	L	O	L	R	None required
Loss of Douglas fir, Rocky Mtn juniper	N	L	L	I	S	I	Minimize removal of large diameter douglas fir Avoid juniper removal
Loss or damage to rare plant populations	N	M	L	O	L	I	Mark plants and avoid these areas with machinery and vehicles
Increased fuel loads along ROW	N	L	L	O	L	R	Burn tree crowns and other fine fuels produced as a result of tree clearing

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Increased cover and extent of invasive non-native plants	N	M	M	C	L	I	Control NNV prior to project if possible Minimize ground disturbance with machinery including cut and fill sites Clean equipment prior to arrival in park and after working in heavily infested areas on the ROW Mark and avoid existing NNV patches on ROW, if plants cannot be avoided work on snow cover or lay access mats over non-native plant patches

6.4.4 Residual Effects

Residual impacts of the proposed transmission line Project on vegetation VCs are anticipated to be low. The Project will result in the loss of mature Danger Trees along the edges of the ROW in sections where they exist, but this impact is not permanent as trees will re-establish in these areas over time. The Project could result in an increase of non-native plant cover on the ROW even after all the mitigation measures have been applied due to the aggressive nature of these plants and the difficulty in eradicating established populations on the ROW prior to start of the Project. However, there is very low probability that these plants would invade undisturbed native plant communities. Therefore, if all the mitigation outlined for vegetation is implemented the Project could cause an incremental localized increase in NNV plant infestations on the ROW. This residual effect to vegetation is expected to be negative, low magnitude, localized, intermittent, short term and reversible.

6.5 Wildlife

The BNP Management Plan (2022) has specific goals for wildlife management that are applicable to the Project and are described broadly as follows:

- Maintaining viable populations of sensitive and important species such as grizzly bears, mountain goats, wolves, cougars, and wolverine;
- Determining habitat suitability/importance for a range of sensitive or wary species in addition to grizzly bears, with consideration for season, the types/levels of disturbance, and connectivity between habitat patches;
- Improving habitat quality, security, and connectivity where possible;
- Managing human disturbance in corridors and critical habitat so that current levels of use by wary and sensitive species are maintained or improved; and
- Minimizing human-wildlife conflict.

This DIA considers these targets as outlined in the effects analysis and described in the mitigation measures below.

6.5.1 VCs

Ten wildlife species and/or groups were selected as VCs including elk, sheep, grizzly bear, wolf, cougar, marten, small mammals, bats, avian species (songbirds, raptors, owls), and amphibians. The selection criteria is detailed in Section 4.4.2.

6.5.2 Effects Analysis

The following section assesses the predicted effects of the project on the selected VCs pertaining to the five major impacts to wildlife from localized PSA and LSA scales, and in some cases (i.e., larger mammals) at the RSA scale.

6.5.2.1 Direct loss and alteration of available habitat

Removal of Danger Trees on edges of ROW

Approximately 4.86 ha of mature Danger Trees within intact forest along the edges of the ROW will be removed by hand or machine (Table 1-7). Although trees are expected to re-establish in areas where Danger Trees are cleared adjacent to the ROW, there will be medium-to-long-term habitat loss for wildlife that rely on this habitat type.

In particular, bats use mature trees as maternity or nursery roosts to raise their young, with female little brown myotis demonstrating a high degree of philopatry (ECCC 2018). Bats have a low reproductive rate as females produce only one pup annually, with low first year survival rates (ECCC 2018); therefore, bat populations are sensitive to activities that would have a negative impact on reproductive success and survival. In total, 2.63 ha (54%) of Danger Trees that have been assessed as medium-to-high potential bat roosts are proposed for removal.

Little Brown Myotis may abandon roosting areas after being excluded from roost sites. However, depending on habitat availability, bats may use another tree for roosting if a previous roosting tree is removed outside the breeding season (Silvis et al. 2015; ECCC 2018). Considering the high quantity of similar habitat available to bats along other sections of the line based on bat habitat assessments, the removal of Danger Trees along the ROW is expected to be low in magnitude, long-term and reversible.

Some Danger Trees proposed for removal contain nesting cavities which will also represent a loss of an important habitat feature. Out of the 29 tree cavities identified along the line, 22 cavities (76%) occur within Danger Tree removal areas. As these features are relatively rare within the park, tree removal would be detrimental for bird species that potentially use these trees for foraging, nesting, and/or roosting. Birds such as the listed pileated woodpecker nest and raise their young in tree cavities which are federally protected due to their importance and relative scarcity on the landscape. Other listed wildlife, such as the Northern pygmy owl and bats, can use these cavities as nesting or roosting sites.

The removal of the Danger Trees surrounding the osprey stick nest on the Fortis line near AltaLink structure 276 may negatively affect the osprey by reducing available perching habitat.

Vegetation removal will occur within the Fenlands-Indian Grounds wildlife Corridor (strs 294-313), which has already been identified as a pinch point for movement (Whittington and Peterson 2018a). The west end of this section from structures 300 to 313 occurs along the CP railway, Compound Road, and the industrial compound and therefore provides low quality habitat; however the loss of habitat between structures 294 to 300 may decrease the connectivity of this corridor, particularly for larger mammals, especially if the ROW vegetation is cleared in addition to the Danger Trees in this area.

In general, removal of Danger Trees outside of the cleared ROW will result in increased sunlight reaching the lower vegetation layers and forest floor which will increase habitat diversity for wildlife by increasing the open, shrub, forb (grass) and sapling habitat throughout the LSA which is dominated by mature spruce and pine. Ungulates and grizzly bears will directly benefit through improved forage, small mammals will have increased cover and forage opportunities, and wolves and mesocarnivores will have increased prey availability.

Vegetation debris resulting from Danger Tree clearing will be piled on the ground prior to burning; if these piles are left on the landscape for a few seasons, small mammals could get accustomed to denning in these piles (as observed in some burn piles on the 551L rebuild project). The loss of this habitat after the piles are burned would affect small mammals.

In summary, effects to wildlife from Danger Tree removal on the edge of the ROW are expected to be negative, low, localized, reversible for medium-to-long-term duration as the shrub/forb/sapling habitat is expected to proliferate after the mature trees are removed.

Removal of Immature trees, shrubs, forbs on ROW

Sections of immature tree and shrub habitat will be removed by brushing on the ROW. In addition, various off-ROW access trails require vegetation clearing and are heavily used by wildlife as movement corridors (e.g., access 1c near Carrot Creek, access 3c which is overgrown and not maintained, and access 3d).

The open cleared ROW generally supports higher habitat diversity (undergrowth including shrubs, forbs, immature trees) for wildlife than the adjacent undisturbed mature forest along the ROW edges (with the exception of structures 217 to 243 where dense lodgepole pine regeneration occupies the ROW due to a previous wildfire); therefore, the loss of this structural stage and habitat type will have a higher magnitude effect than removing Danger Trees.

The loss of shrub communities, and saplings through brushing of the ROW, as well as clearing workspaces around each structure site, would result in a significant loss of habitat complexity for wildlife, which is important to various species such as marten, ungulates, birds and small mammals. For example, mesocarnivores, such as marten, select for stands with dense, spatially extensive mature shrub cover and downed woody debris for hunting, avoiding predators, and thermal cover in the winter (Doyon et al. 2000). Lack of vegetative complexity has been identified as the single most important factor affecting songbird diversity and population density. In part, due to the decline in insect prey diversity because of a lack of suitable understory plants. For small mammals, vegetation heterogeneity, including the presence of shrubs and woody debris, increase the availability of food and shelter, contributing to reproduction success and survival. Shrub communities support the greatest songbird abundance and species richness, along with nesting waterfowl and breeding amphibians near wetlands.

The loss of available shrub habitat will be medium term as shrub and sapling vegetation is expected to re-establish within 3-5 years after clearing; forbs (grass) will be medium-term in duration as it will re-establish within 1-2 years after clearing. Furthermore, the majority of shrubs within the riparian zone of waterbodies will remain on the landscape; only a minimal area of shrub habitat will be pruned to allow equipment access across a waterbody. To limit impacts to shrub vegetation communities including riparian areas, development is planned for the winter months (October to March), when frozen conditions and snow cover will limit vegetation impacts (see section 5.5.3. Mitigation Measures).

In summary, vegetation removal on the ROW is expected to have a moderate, localized effect on wildlife for medium-to-long-term duration while the shrub/forb/sapling habitat regenerates.

Structure Replacement

Structure replacement will also result in a permanent loss of nesting habitat for birds within transmission structures by transitioning from wood to steel material as well as salvaging structures with known cavities. Seven cavities were identified within transmission structures, including an active pileated woodpecker cavity in a Fortis structure at Tunnel Mountain Campground (which will not be altered as a result of this Project; Table 4-17). However, deterring birds from nesting near live lines is a positive effect due to decreasing risk of mortality (electrocution) and increasing stability of the structure.

The osprey stick nest observed on structure 222 will be a direct loss of habitat with the replacement of the structure. The stick nest on the fortis line near structure 276 will not be relocated/destroyed, as the structure will remain intact.

6.5.2.2 Indirect loss of available habitat through sensory disturbance

Wildlife habitat use may also be influenced by noise and other sensory disturbances (e.g., light, visual human presence) associated with human activities, such as tree removal equipment, line construction, and helicopter activities. The primary potential negative effect to wildlife from sensory disturbance is “effective habitat loss” (Weaver et al. 1987, Gibeau et al. 1996), which occurs because wildlife avoid or abandon otherwise suitable or functional habitat. Secondly, repeated short- and long-term disturbances can result in behavioural changes and elevated stress levels in wildlife which can ultimately affect reproduction and survival (Weaver et al. 1987, Gibeau et al. 1996). Reaction to stimuli will vary between species (e.g., elk are relatively tolerant, grizzly bears are very sensitive), seasons (e.g., bighorn sheep more sensitive during lambing), type of stimuli (e.g., light pollution for bats), habitat, topography, and previous exposures to similar stimuli. The duration and magnitude of the human use and the behavioural response of the species in question determine whether the extent of the habitat loss will be complete, partial, temporary, or permanent (Bromley 1985).

For the portion of the transmission line from the TransAlta surge tower to the Banff 123S substation, it is expected that most wildlife currently utilizing the ROW will be accustomed to somewhat elevated levels of sensory disturbance due to high human activity in the area (i.e., TCH, CPR, roads, Tunnel Mountain Campground, various recreation trails, and the industrial compound). For the portion of the transmission line from the Banff east park gate to the

TransAlta surge tower within the Fairholme ESS, it is expected that wildlife are less habituated to sensory disturbance.

In summary, Danger Tree removal and line construction activities between TransAlta surge tower to Banff substation will result in low magnitude, intermittent, and short-term reductions of habitat availability from sensory disturbance at any given time during the Project. This effect increases to moderate between Banff east park boundary to TransAlta surge tower due to the relative lack of pre-existing human use and disturbance.

6.5.2.3 Obstruction to wildlife movement

Considering the LSA is located within or adjacent to several wildlife corridors and proximal to some wildlife underpasses, and many species use the ROW as a movement corridor, the Project has the potential to displace wildlife by obstructing their seasonal or daily movement routes (especially those sensitive to disturbance). The Fenland-Indian grounds corridor, which is already heavily impacted, narrow, and considered a pinch point for wildlife movement (Heuer 1998, Whittington and Peterson 2018a), is an important route for animals to circumvent the town of Banff. Grizzly bears are more likely to be negatively affected by Project activities here due to their demonstrated use of the area (e.g., in the forested area surrounding structures 298-300), as opposed to wolves that tend to use the area north of the industrial compound. Disturbance in locations like these, where added human activity further constricts already constrained movement routes, will have a significant impact on wildlife attempting to navigate through the area. Maintaining connectivity through these areas is critical to ecological integrity in the region.

Dry drainages and over-grown accesses also provide important movement paths for various wildlife due to the topographical variation on the landscape and ease of travel relative to the surrounding dense spruce/pine forest; several of these habitat features intercept the ROW (e.g., Girouard Creek, Morrison Coulee, access 3c). Clearing of vegetation in these locations and use of areas off the ROW (e.g., access 3c) may alter movement patterns. The increased distance between habitat patches and lack of hiding cover may deter wildlife movement across the ROW, particularly for animals that are vulnerable to predation, such as mesocarnivores (e.g., marten) and small mammals.

The movement of songbirds across forest gaps has been studied, demonstrating that birds will travel extensive distances through forest cover to avoid crossing canopy gaps. Studies show that there is a range in the tolerance of clearing widths (e.g., ~25-85 m), which is largely species-specific (St. Clair et al. 1998, Desrochers and Hannon 1997; Belisle and Desrochers 2002, Robertson and Radford 2009). Disruption of movement between patches of high-quality habitat can lead to reduced access to important food and reproductive resources.

In summary, general effects to wildlife movement are expected to be moderate in magnitude, for medium to long-term duration, as wide-open areas lacking shrub cover may cause habitat avoidance due to the perceived risk of predation (e.g., in Tunnel Mountain Campground). Effects from line construction activities are expected to be short-term in duration and low-to-moderate in magnitude.

6.5.2.4 Direct Mortality

Direct mortality may occur from machine/vehicle collisions, vegetation removal, avian collisions/electrocutions with the line, as well as entrapment of small mammals and amphibians during line construction (i.e. in the 42" steel pipes).

The use of vehicles or machines for line construction during September and October between the TransAlta surge tower and Banff 123S substation (i.e., structures 274 to 313) has the potential to cause mortality of small mammals such as ground squirrels, voles, mice as well as amphibians; however, this effect would be negligible-to-low (higher for amphibians).

Considering tree removal is proposed to occur by hand between September 1st and March 31st, bats are still using roosting habitat at this time and, therefore, mortality of bats during tree removal is possible.

There is also potential for direct wildlife mortality of birds and their flightless young/eggs and amphibians associated with crossing wetlands with machinery and equipment or working in riparian areas of waterbodies. Over-wintering and/or breeding amphibians and bird eggs/young may be run over with equipment. Amphibian survival can also be impacted indirectly by the introduction of non-native species of vegetation, along with aquatic organisms and pathogens attached to equipment and/or vehicles. Particles or liquids released from the equipment and or vehicles (fuel, oil, grease) can decrease water quality and lead to a toxic environment. Mortality of amphibians and birds is expected to be low considering work around waterbodies and excavations in wetlands will be conducted during the winter months on packed snow, when amphibians are hibernating and birds are not nesting (see section 3.6.3 Mitigation Measures).

Mortality can also occur when birds collide with transmission lines. The risk to bird mortality is expected to decrease as a result of AltaLink's avian safe structure design. The new transmission structures will be an average of 3 to 5 m higher than the current structures which may increase the number of avian collisions. In addition, the new transmission line will have an OPGW, which have been found to increase collision rates (Rioux et. al. 2013). Bird markers may be installed on the OPGW on certain spans to make the wire more visible as determined by

AltaLink biologists. Given the above, overall, this impact is expected to be negligible-to-low in magnitude and short-to-long term.

During a similar project between Banff and Lake Louise (551L rebuild), amphibians and small mammals (e.g., marten, mice, ground squirrels) were found trapped and/or dead inside standing culverts that were installed prior to structure replacement. A few culverts contained up to 25 long-toed salamanders. Similarly, there is potential for entrapment and mortality during this Project after the steel pipes are installed if the transmission structures are not installed immediately following the steel pipes. The potential is higher from structure 274 to 313 due to the time of year proposed for construction (fall season). Long-toed salamanders and mice can access through tiny holes and therefore simply capping the pipes will not be effective at preventing entrapment. The effect is rated as low-to-moderate and short-term.

In addition, rust from barrel piles can leech into the water in wetlands up to 10 m radius (as observed during the first three years after installation of culverts in wetlands during the 551L Rebuild), which could adversely effect growth and survival for amphibians.

In summary, the effects analysis for mortality is rated differently for different species. Overall, effects are anticipated to be negligible-to-moderate, short-term, and irreversible (long-term for bird electrocutions during the life of the line).

6.5.2.5 Wildlife habituation and indirect mortality

Indirect effects to wildlife survival may be caused by increased energy expenditure during sensitive wildlife periods (e.g., elk rutting, grizzly bear hyperphagia, bat roosting, raptor breeding/nesting).

Other effects include increased human-wildlife conflict or wildlife habituation because of inappropriate storage and disposal of garbage and wildlife attractants during all stages of the Project. Habituated wildlife may require relocation or euthanization because they have become a public safety hazard. Recently a wolf pack was euthanized in BNP because they were observed eating garbage from bins and became increasingly aggressive towards people.

Indirect mortality of small mammals, amphibians, and prey species may also occur as line-of-sight improves from ROW vegetation removal combined with Danger Tree clearing; however, this is predicted to be low in magnitude and medium-to-long term in duration (3-5 years for shrub regeneration and 1-2 years for grasses).

6.5.3 Mitigation Measures

- One of the primary mitigation measures to address many of the identified wildlife effects above is to avoid work activities during the following RAPs:
    - Elk calving activity from May 1 to June 30
    - Elk rut during August and September
    - Bighorn sheep lambing from May 1 to June 30
    - Bighorn sheep winter foraging from January 1 to April 30
    - Grizzly bear hypophagia (low food intake) from May 1 to June 30 (weather dependent)
    - Grizzly bear hyperphagia (high food intake) August 1 to September 30 (berry dependent)
    - Wolf denning from April 1 to July 30
    - Bat roosting April 15 to October 15
    - Songbird nesting from April 1 to August 31
    - Raptor breeding/nesting from March to early September
    - Owl breeding nesting from February 15 to May 15
    - Amphibian breeding and migration April 1 to May 30 and September
- Work activities have been proposed to occur between September 1 and March 31; therefore, most RAPs will be adhered to except for bat roosting, amphibian migration, bear hyperphagia, sheep winter foraging, as well as owl and raptor nesting. Annual EPPs will address additional mitigations required to work within the RAPs; at a minimum, the following measures must be followed:
    - If work is required during elk rut or bear hyperphagia (Aug/Sept) contact Parks Canada to confirm recent species activity in the area. If elk are observed bugling or individual bears are observed, stop work and contact Parks Canada on how to proceed.
    - If helicopter flights occur during sheep winter foraging (Jan 1-April 30), contact Parks Canada to confirm recent sheep activity in the area. If bighorn sheep are in the area, stop work and contact Parks Canada on how to proceed; adjustments to flight paths may be required. Details regarding flight paths/timing will be identified more thoroughly in a BNP approved annual EPP.

- In areas where tree removal will occur within the bat roosting season (April 15 to October 15), conduct an ultrasonic and visual emergence bat survey using recording devices. If bats are detected, postpone tree removal until after the bat window.
- If work is required during the owl or raptor nesting season (starting mid-February and mid-March, respectively), conduct a survey and if nests are located, establish buffers in which no or limited work activity can occur; keep buffers in place until the young have fledged.

- If possible, avoid use of access 1c (use access 1b and 2 instead) and access 3c (use access 3b instead) to avoid impacts to wildlife using these areas as a travel corridor.
- Conduct a Pileated Woodpecker nesting cavity survey for the removal of trees >25 cm DBH; if any are found and topping/removing is required, a permit to destroy or relocate the cavities will be required before work can proceed. The known nesting cavity in the Fortis pole near structure 280 will not need to be altered in anyway as part of this Project.
- Within 5 m of the riparian areas, top or hand-fall individual Danger Trees (site-specific); within 5-30 m, hand-fall all Danger Trees. This will limit impacts to sensitive riparian habitats, specifically harlequin duck, waterfowl, shorebird, songbird, and amphibian breeding habitat and will assist in maintaining ROW crossing opportunities for birds, small mammals, and mesocarnivores.
- Top or hand-fall Danger Trees for: trees containing cavities (pileated woodpecker nesting cavities are not permitted to be modified in any way, see above); and wildlife movement areas (structures 216-217, 229-230, 243-251, and 297.75-299.5). This will maintain cavity nesting habitat and limit impacts to wildlife whose movements may be inhibited by wide linear disturbances.
- Retain saplings, forbs, and grass on ROW for wildlife movement areas listed above.
- Wherever possible, avoid destruction of the shrub/forb layer during Danger Tree removal and work in frozen conditions with snow cover.
- Any wildlife features that will be topped or retained will be clearly flagged and/or staked prior to construction (e.g., all cavity trees, wildlife movement features, 5 m, and 30 m riparian zones).
- Consider retaining ROW vegetation within the Fenlands-Indian Grounds wildlife corridor between structures 294 to 300 to maintain connectivity of this corridor.
- Replace the osprey stick nest observed on structure 222 after the structure has been replaced or construct a nesting platform nearby.

- Burn vegetation debris piles as soon as is feasible to reduce the risk of small mammals denning in the piles.
- Reclaim with native vegetation as soon as construction has been completed in each section of the line.
- Confine work activities in town to hours set out in town of Banff Community Standards Bylaw 260 to avoid disturbing wildlife at night; and to crepuscular hours (i.e., 1 hour after sunrise to 1 hour before sunset) outside the town of Banff.
- Any wildlife encountered on or near the Project footprint during construction will be allowed to passively disperse from the site.
- Reduce speeds while travelling on ROW to avoid driving over wildlife, particularly in sections where work will occur in September or October.
- Work on frozen ground with snow cover around waterbodies and when excavating in wetlands to decrease effects to wildlife using this habitat type.
- Carry spill kits and ensure crews are trained in their use.
- Securely fence or cover all excavations to prevent access by wildlife; build ramps at the ends of the excavations to allow wildlife to escape in the event they are trapped.
- To prevent wildlife entrapment and mortality in the steel piles, adhere to the following:
    - Completely seal all openings in the steel piles (with no small openings) immediately after installation; the method should be tested and monitored prior to using in all sections to ensure effectiveness;
    - Where possible, minimize time between installing the piles and installing structures into the piles (i.e., same day install);
    - Ensure piles are checked by the project EM or ESO for trapped animals prior to structure installation and if animals are trapped, they must be removed and relocated by a qualified biologist prior to installing the structure;
    - Consider using textured surface on the inner lining of the pile to allow animals to escape.
- Remove litter from the site daily and store food, garbage and other wildlife attractants in vehicles and/or dispose of trash in secure facilities.
- Do not plant palatable species in areas of high human use (e.g., campground).
- Contact Parks Canada non-emergency dispatch with any carnivore sightings within the LSA.

Table 6-5. Summary of potential effects and mitigation measures for wildlife VECs.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Elk, sheep, grizzly bear, wolf, cougar, marten, small mammal, birds							
Direct loss and alteration	N	L-M	L	O	M-L	R	Avoid use of access 1c/3c. Top/hand-fall Danger Trees within: wildlife movement features; 5 m and 30 m riparian areas; consult ESO/EM. Top cavity trees; avoid any alteration to PIWO nest cavities. Retain shrub/forb/saplings where possible. Replace raptor stick nests on new structures or platforms. Reclaim asap in each section.
Indirect loss (sensory disturbance)	N	L-M	L	I	S	R	Adhere to RAPs, seasonal wildlife closures; when not possible, conduct surveys and adhere to buffers. Allow wildlife to passively disperse. Work during crepuscular hours: 1 hour after sunrise to 1 hour before sunset.
Obstruction to movement	N	L-M	L	I	M-L	R	Top/hand-fall Danger Trees within: wildlife movement features; 5 m and 30 m riparian areas; consult ESO/EM.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Adhere to restricted activity periods.
Direct mortality	N	L	L	I	S	I	Reduce speeds. Work on frozen ground with snow cover. Work on frozen ground and snow cover outside of bird window. Devise and test method to effectively seal holes in piles; minimize time between steel pile and structure installations; EM to inspect each pile prior to structure install.
Indirect mortality	N	L	L	I	M-L	I	Store attractants in vehicles, remove garbage. Do not plant palatable species around human use areas.
Bats							
Direct loss and alteration	N	L	L	O	L	R	None.
Indirect loss (sensory disturbance)	N	L	L	I	S	R	Work during crepuscular hours: 1 hour after sunrise to 1 hour before sunset.
Obstruction to movement	Ne	N	NA	NA	NA	NA	N/A

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Direct mortality	N	L	L	O	S	I	Conduct ultrasonic bat surveys prior to tree removal; postpone tree removal if bats detected.
Indirect mortality	N	L	L	O	S	I	Work during crepuscular hours: 1 hour after sunrise to 1 hour before sunset and avoid roosting season.
Amphibians							
Direct loss and alteration	N	L	L	O	M-L	R	Top or hand-fall only within 5 m of wetlands. Work on hard snow roads near wetlands.
Indirect loss (sensory disturbance)	Ne	N	NA	NA	NA	NA	N/A
Obstruction to movement	N	L	L	I	S	R	Adhere to restricted activity periods.
Direct mortality	N	L-M	L	I	S	I	Work on frozen ground with snow cover. Carry spill kits. Devise and test method to effectively seal holes in piles; minimize time between steel pile and structure installations; EM to

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							inspect each pile prior to structure install.
Indirect mortality	N	L	L	I	M-L	I	Avoid sensitive amphibian breeding and migration periods. Top or hand-fall only within 5 m of wetlands; consult ESO/EM.

6.5.4 Residual Effects

If all the mitigation measures outlined above are implemented, there should be minimal remaining residual effects to wildlife VCs from the proposed line construction and vegetation management.

The loss of mature trees will remove habitat for various species, e.g., birds, bats, prey species, carnivores; however, the understory species are expected to thrive in the absence of the canopy cover over the long-term (5-10 years) and bat habitat trees occur in alternate locations along the ROW. This impact is considered to be both negative (removing overstory habitat) and positive (increasing understory habitat), low in magnitude, localized, long-term, occurs once, and reversible.

Danger Trees surrounding known bird cavities will be removed and it is unknown if the removal of neighbouring trees may lessen the likelihood of cavity reuse due to the lack of surrounding protective cover. Similarly, Danger Trees removed near the osprey nest on the Fortis structure (near structure 276) will reduce perch habitat near the stick nest. Residual effects are expected to be negative, low in magnitude, localized, long-term, occur once, and reversible (irreversible if destroying or relocating the PIWO cavities).

Removal of the six wooden transmission structures that contain cavities will result in a low magnitude, long-term, and irreversible residual effect. Switching from wood to steel structures will also result in a residual loss of nest cavity habitat for birds, but on the other hand, with fewer birds nesting in structures, mortality risk from electrocution will be reduced.

Topping cavity trees, rather than removing, will preserve these important habitat features on the landscape in the short-term; however, it is expected that the decay process will accelerate once the trees are topped, ultimately shortening the lifespan of the trees/cavities. Topping aspen trees is expected to lead to abundant suckering from the root systems which will lead to dense thickets of aspen saplings in the short term and more cavity trees in the long-term. Residual effects are expected to be negative, low in magnitude, localized, long-term, occur once, and irreversible (for existing cavity trees).

Excavations in or near wetlands as well as use of barrel piles may result in residual effects to amphibian and small mammal survival. Mortality of amphibians is expected to be low in magnitude given winter/frozen work conditions. If the capping method on the barrel piles does not work effectively as observed during the 551L Rebuild, there will be moderate magnitude residual effects due to entrapment/mortality. Furthermore, if barrel piles are left permanently in wetlands, there is potential for rust from the piles to leach into the water, which could adversely effect growth and survival for amphibian and fish species leading to moderate effects. These effects are expected to be localized, short-to-medium-term, occur once, and irreversible.

6.6 Hydrology and Aquatic Resources

6.6.1 VCs

The VCs for hydrology and aquatic resources are continued natural hydrological flows and functions, high quality fish habitat that supports healthy native fish populations, and continued presence of wetlands that provide a full range of natural hydrological and ecological functions.

6.6.2 Effects Analysis

6.6.2.1 Hydrology

Impacts on the hydrological regime resulting from crossing structure installations, transmission line structure replacement, and vegetation management include possible changes to surface water runoff volumes, drainage patterns, instream flow levels, and discharge to downstream systems. Excavations can also affect groundwater discharge and recharge rates (e.g., water infiltration rates).

Tree removal along riparian areas can cause bank erosion if the trees anchored the soil in place on the banks. If there is inadequate understory to absorb influxes of precipitation, water retention will decrease, and possible runoff and siltation will occur. Removing large overstory Danger Trees in general can impact the ground and surface hydrology of the area. Loss of trees will result in less overall water uptake from the remaining vegetation possibly leading to increased potential for surface run-off and erosion in the first few years after tree removal. Higher ground water levels could result in higher flows in the streams and higher water levels in the wetlands in the first few years after overstory tree removal.

Fording of watercourses (e.g., to install bridges at Johnson’s outlet and Cascade Creek) can cause temporary physical impediment of the water flow. Eroded banks may increase flooding from the waterbody onto the landscape or into waterbodies from the surrounding landscape. Bridge installation at Johnson’s outlet will also result in a positive effect as it would eliminate future fording requirements for maintenance of the line; the hard ford installation in Cascade Creek will result in a reduced risk of rutting in the creek bed during fording for maintenance activities in the future.

There is also potential for short-term effects to water quality during work activities from spills or leaks from equipment. Pre-existing contaminants in soil could also be remobilized during excavations, causing leaching into groundwater and eventually discharging into nearby surface water.

With the proper mitigation measures, effects are expected to be negative in direction, low in magnitude and short-term in duration; effects of bridge installation is assessed as positive in direction and long-term.

6.6.2.2 Fish and Fish Habitat

Construction activities associated with structure replacement, and vegetation management in proximity to surface water have the potential to cause effects including (Government of Canada 2023a):

- sediment loading;
- alteration and removal of fish habitat, including streambank, streambed, and riparian vegetation;
- release of deleterious substances into the watercourse;
- direct or indirect mortality or harm; and
- the introduction of aquatic invasive species.

Sediment Loading

Construction activities associated with this project have the potential to increase sediment loading in a watercourse which can have detrimental effects on fish and fish habitat; activities include temporary and permanent bridge installations at two locations; temporary bridge removal; one-time fords with heavy equipment; erosion from steep or wet approach slopes and disturbed/exposed areas on the ROW; riparian vegetation removal; and run-off from stored piles of soil.

Sediments, which contain nutrifying elements and can capture or absorb contaminants, are suspended or are deposited in waterways. Elevated concentrations of suspended sediment can reduce light penetration for aquatic plant growth, increase drift of benthic invertebrates, alter habitat use by fish, reduce visibility for fish foraging ability, increase physiological stress responses, damage gills and erode fins, and increase fish mortality. Increased sediment deposition can change habitat suitability for benthic invertebrate and fish species, reduce productivity of benthic invertebrate communities, cause pool habitat infilling, reduce availability of over-wintering habitat, smother aquatic vegetation, and cover spawning substrate, decrease water flow and oxygenation through gravels, and cover developing fish eggs.

The installation of temporary and permanent bridges across Anthracite and Cascade Creeks may introduce sediment in the waterbody during prep work in the riparian area, and one-time fords with heavy machinery to install bridges and remove temporary bridges. Fording can cause siltation and a decrease in water quality when soil enters a watercourse from mud on tires/tracks or from erosions on disturbed approach slopes (e.g., Anthracite Creek). Plants and organic debris that fall into a waterway can cause an increase or decrease in the quantity or composition of the food supply, therefore compromising the productivity of the creek. Anthracite and Cascade Creeks are only fish-bearing downstream of ROW below the fish-barriers (160 m and 350 m, respectively), and they do not contain listed species based on Parks Canada data.

Anthracite contains more fine substrate than Cascade Creek and, therefore, fording or disturbance near the banks may result in higher magnitude effects in the short-term. In the long-term, however, the installation of the permanent bridge on Anthracite Creek is expected to be a positive effect. For the past 60 years, AltaLink has been fording Anthracite Creek with machinery just below the proposed crossing site to service 34 spans of transmission line (e.g., regular patrolling of the line, replacing ageing and failing components, removing hazard trees, and treating weeds in both spring and fall). This has caused release of sediment to the downstream reach which contains fish and has also caused rutting in the wetland on the southwest approach slope of the crossing site, adding to intermittent sediment release into the downstream system during rain events and run-off.

Similarly, the installation of the temporary bridge followed by the permanent hard-ford crossing installation on Cascade Creek is expected to be a net positive effect in the short-term during the Project and in the long-term during maintenance of the line. The temporary bridge installation should only cause short-term release of sediment during the one-time fords to install and remove the bridge. The installation of the permanent hard-ford crossing after the Project has concluded will reduce the risk of work vehicles getting stuck in the streambed during regular maintenance of the line, due to the improved compacted surface (i.e., rock mattress); therefore, sediment release will be lower compared to a traditional ford of the creek across native substrate.

Sediment loading may also be caused by cleaning snow off a temporary clear-span bridge to transport machinery across the structure, or water drainage off a clear-span bridge. This effect is assessed as low magnitude, short-term and intermittent if regular maintenance activities using BMPs and other measures are preformed.

Increased sediment loading in active watercourses within the LSA can also be caused by erosion on steep slopes and exposed soils from grading (work areas), logging activities, and excavation (mainline and bypass structure and anchor holes), runoff from stored soil piles, and riparian vegetation removal (e.g. Carrot Creek, Unnamed/Anthracite Creek near structure 265).

The maintenance requirements of the new transmission line are expected to decrease as a result of the Project, therefore, effectively reducing impacts to the aquatic environment during the long-term operation of the utility line.

In summary, with the use of bridges to cross Cascade Creek and Johnson Outlet (and protecting the banks with access mats and lock blocks), effective sediment control methods, as well as the open screw pile method for mainline structures, effects to fish and fish habitat caused by sediment loading from the Project are expected to range from negligible-to-low in magnitude, localized, intermittent, short-term and reversible (the permanent crossing installation on Johnson's Outlet and Cascade Creek is rated as a positive effect for the long-term).

Alteration and removal of fish habitat, including streambank, streambed, and riparian vegetation

In total 45 m^2 (0.1%) of Danger Trees will be removed or topped within 0-5 m of the HWM of watercourses, and 1930 m^2 (4%) of Danger Trees within 5-30 m of the HWM will be hand-felled (Table 1-7). Additional minimal topping or removal will be required in the riparian areas to construct the temporary clear span bridge across Anthracite Creek and the temporary bypass line (e.g., Girouard Creek, unnamed creek near structures 267-268, Cascade Creek near structures 275-276, and Whiskey tributary).

Topping of pine trees within 5 m of HWM may result in the loss of the upper canopy and therefore, important shade habitat for fish species. Riparian vegetation is an important habitat feature because it provides leaf litter and terrestrial insects which fall into the watercourse and provide food for fish and the organisms that fish prey on. Considering the small percentage of Danger Trees within 5 m of watercourses this effect will be negligible.

The temporary clear span bridge as well as the permanent hard-ford crossing proposed for Cascade Creek would result in a slight alteration of the area of fish habitat covered by the structure. Parks Canada plans to release native fish in this reach of Cascade Creek in 2024 or 2025 and, therefore, it may contain fish at the time of the Project. In general, shallow areas along the shore are important habitat for many fry and juvenile fish, which use these highly productive areas for feeding and protection from predation by large fish. The riparian area on Cascade Creek at the crossing location is highly disturbed from the previous Fortis crossing; riparian vegetation is lacking and provides no shade habitat. There will be no work below the high-water mark to install the temporary bridge and no damage to the banks is anticipated for either the temporary bridge or the permanent bridge.

The crossing site on Johnson Lake outlet (Anthracite Creek) where a permanent widening of the pre-existing pedestrian bridge is proposed, does not contain fish (except for potential white suckers that are known to still occur in Johnson Lake) and riparian vegetation will not be affected; therefore, there will be no loss to fish habitat.

In summary, effects from habitat loss and alteration including riparian vegetation removal will be negligible-to-low in magnitude, localized, medium-term, reversible.

Deleterious Substances

There is potential for releasing deleterious substances into the watercourse during construction, thereby contaminating the water in a watercourse and affecting habitat for fish spawning, rearing, and foraging. This generally includes hydrocarbons (grease, oil and gas) entering the water as a result of spills, and improper handling and/or containment techniques. Spills or leaks have the potential to physically harm or kill stream invertebrates and aquatic mammals. Pre-existing contaminants in soil could also be remobilized during excavations, causing leaching into groundwater and eventually discharging into nearby surface water.

Non-native aquatic organisms, seeds and pathogens can attach to equipment and or vehicles and change the health, populations, and dynamics of the aquatic community. The west bank of Cascade Creek is heavily infested with yellow toadflax and dog mustard so improper washing protocols could lead to weed spread to downstream sections of Cascade Creek. NNV control using herbicides is another activity that may introduce toxic substances into streams, either directly or through runoff. Depending on the product used, these substances may kill or harm fish directly, inhibit them from reproducing, adversely affect the development of eggs and young, or reduce the amount of food available for fish. However, the herbicides applied by AltaLink in the park have all been thoroughly assessed for human and ecological risk by Parks Canada and have all low-risk profiles for effects to aquatic life and human health and have been approved for use under the AltaLink IPMP (AltaLink 2023a). These impacts to fish and fish habitat are expected to be rare and low in magnitude if appropriate mitigation measures are followed.

Removal of wooden structures that contain toxic preservatives and switching to steel structures will have a positive effect on fish and fish habitat. The compounds including PCP have been shown to leach out of the wooden structures into the surrounding soil over time (Matrix Solutions 2010). PCP is highly toxic to aquatic organisms (Johnson and Finley 1980) and a risk analysis indicates that the risk to these organisms can be characterized as moderate for 50-year-old poles inserted into wet soil within 10 m of a wetland (Matrix Solutions 2010). This impact to fish and fish habitat can be characterized as positive in direction and low in magnitude.

Direct or Indirect Mortality or Harm

Riparian vegetation removal has the potential to increase predation from raptors, mustelids, and other predators (DFO 2009). Direct injury or mortality of fish can also result from a one-time ford event across Cascade Creek (if the reach is stocked by the time of the Project). This effect is expected to be negligible in magnitude, short-term, intermittent, and irreversible.

6.6.2.3 Aquatic invasive species

Whirling disease effects salmonid fish species that can have high mortality. The first case of whirling disease in Canada was confirmed in Johnson Lake, located in the PSA where the proposed bridge will be installed. It is spread through two hosts: salmonid fish species and an aquatic worm species. The Project has the potential to spread the disease through mud or sediment (stuck to construction equipment or bridge components), or from water containing infected aquatic worms.

If the appropriate decontamination measures are followed, this effect is expected to be negligible or low in magnitude, intermittent and short-term.

6.6.2.4 Wetlands

Removal of riparian vegetation around wetlands can negatively affect the hydrological function of wetlands resulting in effects to water storage capacity and water quality in wetlands which can in turn negatively effect plants and wildlife in the wetlands; however, there are very few Danger Trees surrounding wetlands so the effect is negligible. If accessed by machines in unfrozen conditions wetlands can have soil compaction and rutting which in turn can negatively affect the growth of wetland vegetation. These soil and vegetation effects are discussed generally in the soil and vegetation sections above.

Wetlands can be negatively affected by deleterious substances similar to streams. Spills in wetlands can result in mortality of wetland plants, invertebrates, and amphibians (see wildlife above). In addition, rust from barrel piles can leech into the water in wetlands up to 10 m radius (as observed during the first three years after installation of culverts in wetlands during the 551L Rebuild).

There will also be a loss of habitat in wetlands where structures are being installed.

6.6.3 Mitigation Measures

The following mitigations include those described in the "Guide to the Code of Practice for Watercourse Crossings, including Guidelines for Complying with the Code of Practice" (AENV 2000). DFO Codes of Practice for clear span bridges and temporary fords were also considered in development of these mitigations.

- When working within 30 m of water, follow all relevant DFO mitigations (including Measures to Protect Fish and Fish Habitat and relevant Code of Practice) (https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html). If not possible, Parks Canada will coordinate review with DFO and determine SARA permit requirements. At a minimum, a DFO review is required prior to installing the crossing structures at Anthracite and Cascade Creeks which are both listed as CH for BLTR; Parks Canada also considers Cascade Creek CH for WSCT. Parks Canada's approval under the SARA is also required if an activity affects an aquatic species at risk.
- In riparian areas within 5 m of the HWM of all watercourses (i.e., excluding non-active drainages >10 years) and wetlands, where possible top Danger Trees to a maximum of one third of the total height except for hazard trees which will be removed fully; where

topping is required beyond one third of total height and/or the tree are expected to die from topping, complete a site-specific removal plan in consultation with the ESO

- In riparian areas between 5 m and 30 m of the HWM, remove Danger Trees by hand; avoid removal of shrubs, forbs, or saplings less than 3 m tall within 30 m of a watercourse to reduce surface runoff and siltation and maintain existing fish habitat.
- Pile vegetation debris from site clearing activities at least 30 m away from waterbodies on flat ground; stockpile topsoil outside floodplain and cover with breathable geotextile if necessary.
- For structure installations within 5 m of an active watercourse, limit vegetation removal to only what is essential for installation of the structure, use access mats if required, work in frozen conditions, keep equipment as far back from the HWM as possible, install ESC prior to excavations (applies to Carrot Creek, Girouard Creek, Anthracite Creek, unnamed creek near structure 265).
- For structures that are being salvaged (mainline and bypass) within 5 m of an active watercourse, cut the structure off at the butt rather than pulling it out of the ground to prevent erosion and siltation of the watercourse (applies to unnamed creek near structure 265 and Girouard Creek near structure 251).
- Complete activities in frozen conditions and/or use access mats to avoid compaction and protect riparian vegetation in streams and wetlands.
- Install and maintain biodegradable ESC measures on disturbed slopes above waterbodies or in close proximity to a waterbody before work begins if possible; inspect and repair ESC measures regularly.
- Restore banks and approaches of waterbodies immediately after disturbance (first priority in reclamation). If construction is completed in the winter when soils are frozen and there is high snow cover, other interim erosion control measures may be implemented on the site until the disturbed area can be reclaimed the following spring.
- Avoid placing any deleterious material within 30 m of any waterbody, storm sewers or sanitary systems (i.e., within the Banff townsite near structures 303-313).
- Fuel vehicles and equipment on hardened surfaces at least 30 m from surface water and store fuel in 110% containment.
- Ensure machinery is free of leaks and is clean and in good working order.
- Maintain spill kits (including surface water booms) on construction site at all times and ensure all workers are trained in their use.

- In the event of a spill, notify regulatory agencies in accordance with standard reporting requirements.
- Follow herbicide labels for required setbacks from waterbodies for spraying or as per Project -specific NNV control plan and/or any applicable IPMP.
- Follow the decontamination protocol for the prevention of Whirling Disease based on the *Direction for Permitted Users Conducting Water-Related Activities in BNP* (2016).

Watercourse Crossings (three active and one inactive channel)

- Adhere to all mitigations included in the DFO review process of fish-bearing stream crossings.
- Provide detailed construction plans for all crossings to PCA for review as part of the annual EPPs.
- Do not enter a watercourse within the LSA with equipment and machinery at any time during the Project (except to install the bridges/crossings at Anthracite and Cascade Creeks).
- Design the bridge so that storm water runoff from the bridge deck, side slopes and approaches run-off into a vegetated area.
- Plan bridge/crossing installations to respect fish protection timing windows; Anthracite contains fall spawners downstream of the barrier so avoid instream and riparian work between October 1st and April 15th if possible; Cascade Creek contains spring spawners so avoid instream and riparian work between October 1st and April 15th if possible.
- Avoid damage to riparian vegetation during construction, operation, and removal of the bridges;
- Implement turbidity monitoring for all watercourse crossing activities that may cause sedimentation (i.e., during installation and removal of crossing structures); use turbidity threshold values established by the *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CCME 2002) and Parks Canada protocols.
- Install rubber access mats in the wetland on the south approach slope of Anthracite Creek prior to fording to prevent ground disturbance and associated sedimentation in the creek.
- Avoid sediment or deleterious substances from entering the water while cleaning off bridge decks and when equipment and machinery is transported across the clear-span bridge.

- Develop and implement a Water Management Plan for stream isolation on Cascade Creek during hard-ford installation, which must be approved by Parks Canada (see DFO *Code of Practice for In-water site isolation*). At a minimum, the plan must include water quality monitoring and fish salvage (if applicable at the time of construction).
- Adhere to fish timing windows when working instream (see BNP fish chart timing windows; (i.e., if all spring and fall spawners are present, the only allowable timing window is August 16-31.
- Submit a notification form to DFO regional office 10 working days before installing any crossing structure including clear span bridges and adhere to any additional mitigations from DFO.

Table 6-6. Summary of effects and mitigation measures for aquatic VCs.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Hydrology							
Disruption of hydrological regime	N (P)	L	M	O	S (L)	R	Provide detailed construction plans for stream crossings for PCA review; adhere to mitigations in annual EPPs. Avoid use of heavy machinery within 5 m of creeks. Keep root systems intact in riparian area; top or hand-fall Danger Trees within 30 m of HWM; consult ESO/EM. Work in riparian areas in frozen conditions. Use access mats to protect banks when installing temporary crossing structures or fording. Avoid any disturbance below the HWM for clear-span bridge installation. Follow *DFO Code of Practice for Fording* and *In-Water Site Isolation.*
Water quality (spills/leaks, pre-existing contamination)	N	L	L	I	S	R	Avoid use of heavy machinery within 5 m of creeks; minimize fording of watercourse.

Potential Effect	**Effect Characteristics**						**Key mitigation measures**
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Keep staging areas <30 m from waterbodies; keep equipment regularly maintained.
Fish and Fish Habitat							
Sediment loading	N (P)	L	M	I	S (L)	R	Provide detailed construction plans for stream crossings for PCA review; adhere to mitigations in annual EPPs. Maintain ESC on slopes above creeks. Pile debris away from creeks on flat ground; stockpile topsoil outside floodplain and cover with geotextile. Keep root systems intact in riparian area; top or hand-fall Danger Trees within 30 m of HWM; consult ESO/EM. Salvage structures near water by cutting off at base rather than pulling out of ground. Design bridges to direct run-off into vegetated area and clean off bridge deck away from surface water. Avoid sensitive timing windows when installing bridges and monitor turbidity. Install rubber access mats on south approach slope of Anthracite Creek before fording.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Follow *DFO Code of Practice for Fording* and *In-Water Site Isolation*; and any mitigations from DFO review. Implement a Water Management Plan including fish salvage and water quality monitoring for in-stream activities.
Alteration/ removal of fish habitat (bank, riparian)	N/ Ne	L	L	O	M	R	Hand-fall/top within 5 m of HWM and consult with ESO/EM; no machine access within 5 m HWM; hand-fall 5- 30 m. Work in riparian areas during frozen conditions. If topping pine trees (i.e. removing canopy) or removing trees within 5 m of HWM, consider planting taller shrub species >1 m to provide shade habitat.
Deleterious substances (streams and wetlands)	N (P)	L	L	I	S	R	Avoid storing deleterious substances <30 m from waterbodies, sewer, and sanitary systems (within Town of Banff). Keep staging and fuel areas >30 m from waterbodies; keep equipment regularly maintained. Supply vehicles with spill kits. Avoid deleterious substances from entering water when cleaning off bridge decks.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
							Follow herbicide labels for setback distances from waterbodies (MSDS, IPMP).
Mortality/harm (direct)	N	Ne	L	I	S	I	Limit fording with low pressure vehicle; avoid known spawning areas.
Mortality/harm (indirect)	N	Ne	L	O	S	I	Hand-fall/top within 5m of HWM and consult with ESO/EM; no machine access within 5m of HWM; hand-fall 5-30 m of HWM. Avoid deleterious substances and siltation within watercourse. If topping pine trees (i.e. removing canopy) or removing trees within 5 m of HWM, consider planting taller shrub species >1 m to provide cover habitat.
Aquatic invasive species	N	Ne	L	O	L	I	Follow decontamination protocol for the prevention of Whirling Disease.
Wetlands							
Alteration of hydrology and water quality	N	L	L	O	S	I	Hand-fall/top within 5 m of HWM and consult with ESO/EM; no machine access within 5 m of HWM; hand-fall 5-30 m of HWM (and retain shrubs).
Compaction and rutting	N	L	L	O	S	I	Work in wetlands during frozen conditions.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Deleterious substances							See streams above.

6.6.4 Residual Effects

Provided that all the mitigations described in this document are employed, residual effects of the proposed transmission line rebuild project on aquatic and hydrology VCs are anticipated to be negligible-to-low.

Due to the proximity of some structures (temporary and permanent) within 5 m of creek banks of Critical Habitat as well as bridge installations and frequent crossings on Johnson and Cascade Creeks, there may be introductions of small amounts of sediment and/or vegetation debris into watercourses as well as potential fuel spills and/or leaks. The permanent bridge installation at Johnson's Outlet is considered a net positive residual effect.

In addition, the immediate loss of large over-story vegetation within 5 m of the HWM (through topping or hand-removal of Danger Trees) will temporarily affect fish including eggs and habitat until the reclaimed line-compatible vegetation is fully grown (i.e., up to 10 years from the time of reclamation). These potential residual effects to fish and fish habitat are expected to be localized (confined to Danger Tree areas and a short distance downstream), medium-to-long-term (~10 years after construction), very low in magnitude and reversible.

Removal or topping trees along the edges of wetlands may result in a negative effect to the water table (potential to increase or decrease depending on how much water the trees at the edge of the wetland take up), and/or habitat in the wetland (loss of shade, drawdown of water, over-wintering upland amphibian habitat). These effects are expected to gradually lessen over time as trees re-establish in riparian areas at the edge of the wetlands. This effect is expected to be negative, negligible in magnitude as there are very few Danger Trees, continuous, long-term, and reversible.

In addition, installing structures in wetlands (i.e., four bypass structures and one mainline structure) will reduce available habitat for amphibians, may cause mortality to over-wintering amphibians, and cause sedimentation during winter construction. This effect is expected to be negative, very low in magnitude, continuous, long-term, and irreversible.

6.7 Cultural Resources

6.7.1 VCs

The following items are the archaeological resource VECs for this Project:

- Previously identified archaeological resources;
- Currently unidentified archaeological resources.

6.7.2 Effects Analysis

Ground disturbance associated with structure installation will vary from a footprint of 5 m by 5 m if installed by an excavator, or 2 m by 2 m if open piles are screwed in. Log anchors may be required for some structures (associated ground disturbance footprint of 5 m by 3 m). In some cases, structures will be placed within the same footprint as the existing tower structures, but in other cases new locations will be utilized. Tree removal and cut and fill activity on slopes could result in additional ground disturbance. Any of these activities may potentially impact archaeological resources; damage caused to archaeological resources can vary from disturbance of a small portion of a large site to entire destruction of a small site. Effects are also possible from ancillary components of the Project such as increased vehicle traffic, increased erosion through vegetation loss or water diversion or accidental impact by construction activity.

A potential positive impact of the Project is the additional field assessment conducted as part of the Project approvals process. AIAs represent a concentrated effort to conduct surface and subsurface testing in order to confirm the presence of archaeological resources. These assessments require significant resources and large projects by proponents represent one of the best opportunities for sponsorship of the work. BNP contains rugged and inaccessible topography and linear projects such as the proposed 54L transmission line rebuild represents an excellent opportunity for the assessment of a variety of areas that would otherwise not receive attention by professional archaeologists.

6.7.3 Mitigation Measures

- There may be cultural resources present in the Project area that have not yet been discovered (even after an archaeological assessment has been carried out). If workers observe any significant cultural resources while working, they should STOP WORK in the immediate area, and contact the project manager who will contact a Parks Canada archaeologist or cultural resource advisor, to discuss any protective measures that might be needed. Significant resources that could be considered grounds for work stoppage include, but are not limited to, human remains, unique or diagnostic archaeological artifacts, and/or artifacts directly associated with known sites and/or unidentified sites in the area.

- Prior to construction start up, a meeting will be held with the construction contractors to discuss the potential for encountering archaeological resources and the appropriate actions to take if they are encountered as per the AltaLink Historical Resources Awareness and Stop Work Procedure (AltaLink 2022) which will be included in the annual EPPs for tree clearing and line construction.
- For any tree clearing operations, the potential for ground disturbance should be reduced by the use of low ground pressure logging equipment that is operated in frozen conditions only. A short wood processor / forwarder combination is recommended over a feller buncher / skidder to reduce the potential for ground disturbance.
- Access routes to the ROW and on the ROW should be restricted to existing trails and roadbeds where possible. Vehicles and equipment must stay on the designated access routes during operations.
- The AOA identified 20 known historic resources and 12 areas to be targeted by an AIA including surface and subsurface assessment (Speargrass Historical Resources 2023). This work occurred in the summer of 2024 and will be summarized in an AIA. Any required site-specific mitigation to protect these sites will be outlined in the annual EPPs. Current recommendations for each known site and target area are provided in Table 6-7 and Table 6-8, respectively.

Table 6-7. Recommendations to protect known archaeological sites in the LSA.

Str	Site	Type	Recommendations
264	20R	campsite	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 20R.
265	52R	mining complex	Archaeological impact assessment (AIA) within the AltaLink 54L ROW in proximity the “building platforms” of 52R in order to ensure avoidance of site features.

260	61R	cabin	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 61R.
273	63R	postcontact	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 1954R.
276	159R	historic features	If ground disturbance/access preparation activities may impact historic features at 159R, it is recommended that the site is relocated and features are fenced during construction. If no ground disturbance/access preparation activities then AltaLink Stop Work procedure in conjunction with the Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to historic features at 159R.
264	352R	campsite / historic scatter	Conduct AIA within the AltaLink 54L ROW in proximity to the site boundary of 352R.
294	1194R	campsite	Conduct AIA of the AltaLink 54L ROW within the site boundary of 1194R.
259	1475R	isolated find	Conduct AIA within the AltaLink 54L ROW in proximity to the site boundaries of 1475R.
258	1476R	isolated find	Conduct AIA within the proposed AltaLink 54L ROW in proximity to the site boundaries of 1476R.
257	1477R	isolated find	Conduct AIA within the proposed AltaLink 54L ROW in proximity to the site boundaries of 1477R.
266	1634R	burial, cemetery	Erect temporary fencing along the north boundary of the road in the vicinity of 1634R during construction activity. It is further recommended that no road improvements, widening, etc., are permitted adjacent to the site boundary.
301	1954R	habitation; depressions; wooden structure; stone alignment	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 1954R.
298	2071R	bridge and road feature	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 2071R.

302	2072R	railway spur	AltaLink Stop Work procedure in conjunction with the Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to historic features at 2072R unless significant ground disturbance is anticipated in the vicinity of the 2072R rail grade.
279	2087R	railway platform	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 2087R.
305	2712R	isolated find	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 2712R.
304	2713R	historic refuse	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 2713R.
261	2745R	boat	Low potential for impact to undisturbed archaeological resources, AltaLink Stop Work procedure and Parks Canada Accidental Finds and Change of Scope protocols sufficient to prevent accidental impact to 2745R.

Table 6-8. Location of additional archaeological target areas that were assessed in 2024 (see Speargrass Historical Resources 2023 for additional information).

Str Span	AIA target	Rationale
213 - 216	T1	Carrot Creek valley
219 - 220	T2	Terrace above Carrot Creek
229 - 234	T3	Valley of drainage within moraine, new access route and associated landform
244 - 248	T4	Terrace above Girouard Creek
250 - 252	T5	Terrace above Girouard Creek
258 - 259	T6	Promontory near known sites, near to Johnson Lake
260 - 263	T7	Terrace above Johnson Lake
264 - 267	T8	Potential components of 52R (building platforms) and 352R (prehistoric campsite)
268 - 269	T9	Terrace above Cascade Creek valley
273 - 275	T10	Cascade creek valley
276 - 294	T11	Elevated moraine between glaciofluvial channel, lack of previous assessment
298 - 301	T12	Assess any intact terraces of Whiskey Creek

Table 6-9. Summary of effects and mitigation measures for cultural VCs.

Potential Effect	Effect Characteristics						Key mitigation measures
	Direction	Magnitude	Geographic	Frequency	Duration	Reversibility	
Archaeological resources							
Loss or degradation of archaeological resources	N	L	L	O	L	I	Follow site specific mitigation to avoid archaeological sites Follow AltaLink Heritage Resource Stop Work and Parks Canda Accidental Finds Protocol Minimize ground disturbance on ROW
Identification of previously unknown archaeological resources	P						No mitigation required

6.7.4 Residual Effects

If all of the above mitigation to protect cultural resources is applied, there is low potential for loss or damage to archaeological resources as part of this Project. However, as archaeological assessments are designed as samples of sites/target areas and not complete recovery, it is not possible to assess all areas on the ROW. As such, there is always potential for unrecorded archaeological resources to be disturbed or destroyed during construction activities. This potential residual effect is negative, variable in magnitude, localized, occurs once, is long term in duration, and irreversible. However, the AltaLink Stop Work protocol and the Parks Canada

Accidental Finds and Change of Scope protocols further mitigate this risk by continuing vigilance for unrecorded archaeological resources even after preliminary assessment has completed.

The Project represents a moderate to high potential for the identification and preservation of archaeological resources that would otherwise not receive assessment. The potential increase in knowledge regarding the culture history of BNP as a result of this Project is positive, moderate in magnitude, localized, occurs once, is long term in duration, and irreversible.

6.8 Aesthetics

6.8.1 VCs

The VC for aesthetics is retention or improvement of existing viewscapes.

6.8.2 Effects Analysis

6.8.2.1 TCH Corridor (TCH and Banff Legacy Trail)

Based on the visibility modeling, an additional 10 structures (for a total of 25) and an additional 885 m of line (for a total of 2,805m) are anticipated to be visible from the TCH/Legacy Trail (Table 6-10). These effects are anticipated to be concentrated at the west end of the study area from the Minnewanka interchange to 40-Mile Creek.

Table 6-10. Summary of changes in visibility of the 54L line following construction.

54L Visibility Results – Summary	TCH Corridor (TCH and Banff Legacy Trail)
Total Length of 54L Line (m)	15,392
Current Visibility (m)	1,920
Future Visibility (m)	2,805
Change (m)	885
Current Visibility (%)	12.5%
Future Visibility (%)	18.2%
Current Visibility (# Structures)	15
Future Visibility (# Structures)	25

From the Banff Park Gate to the Minnewanka interchange the future impacts on visibility are predicted to be incremental in nature. They are not anticipated to cause substantial negative impacts to existing viewsheds from the TCH and Banff Legacy Trail. Long viewer distances and/or narrow angled viewer windows through the roadside trees and drainages limit both visibility and total viewer time available (with brief viewing times at 90 km/h).

The visibility model did not predict any impacts on visibility from the Banff National Park East Gate or the Valleyview DUA. Steep topography and thick forest cover shields both of these from views of the 54L line. Similarly, the Carrot Creek DUA/parking area is well screened from the 54L transmission line. Public access beyond the fence at Carrot Creek is discouraged. There are no official maintained trails, and there is a voluntary access restriction for the Fairholme Range ESS.

The visual impacts at Carrot Creek, Morrison Coulee, and Anthracite Creek are expected to be limited due to the narrow viewer windows. The total number of visible structures is predicted to increase from two to four, and the total length of line visible to increase from 240 m to 480 m. The actual visibility of the structures and line up these drainages partially obscured by vegetative cover and is only partially visible even to a stationary viewer.

The open span crossing of the TCH (structures 273-274) is fully visible to east and westbound traffic on the TCH and Legacy Trail. This open span adjacent to other highly visible infrastructure (e.g., the water tower) which results in a viewshed that is already highly impacted. Due to the existing conditions, there are limited future visual impacts expected at this location. The visibility model indicates that there may be one additional structure visible and a slight increase in the visible length of line (930 m, increasing to 1,085m). This increase is expected at either end of the section, on the bluffs high above the TCH corridor.

The primary increases in visibility are expected to occur between the Minnewanka interchange and Forty Mile Creek. This curving section of the TCH presents changing viewer angles towards the steep slopes above Banff Avenue and the open forest near Compound Road. The 54L line is already visible in whole or in part through this section; however, increased structure height will result in more visibility of the line and an increase in the number of visible structures (Map 5, Appendix R). The sections on the Tunnel Mountain bench above Banff Avenue will become more visible and the cleared and widened ROW will be more visually obvious from the TCH. Overall, the total number of structures visible through this section is expected to increase from 9 to 15, with the visible length of line increasing from 750 m to 1,240 m. This is related to a combination of vegetation management and increased structure heights near Compound Road and the industrial compound.

6.8.2.2 Johnson Lake

The removal of Danger Trees and increase in structure heights is expected to increase the currently intermittent views of the 54L line from structures 261-264 (Map 2, Appendix R; Viewpoints 3, 4, Appendix S). The visibility of the proposed line through this section will potentially increase from 275 m to 335 m total. Three structures will be partially visible through or just above the forest canopy (up from two structures). As the existing vegetative screening is thin at this location, the upper portions of the forest canopy would only provide intermittent visual screening of the taller structures. The net effect is that this section of the line will be more visible than the current situation, particularly to viewers with a viewpoint such as the upper trails and the Douglas Fir bench on the northeast shore.

The replacement for existing structure 264 will be relocated 39 m to the southeast and will increase in height by 8.8 m. With the combination of the height increase and danger tree removal, the structure will be partially concealed but still visible from the DUA and beach area. Currently, structure 264 is clearly visible.

A new structure will be placed between the Johnson Lake outflow and creek. This location is off to the side and partially obscured from view by existing trees. This span of line is currently visible from some angles, but no structure is currently located here. This structure will be partially obscured by trees, with the upper sections visible to viewers at the main beach area and along the north shore of the lake. The total length of visible line through this open span section will increase from 240 m to 290 m.

Please see Viewpoints 3 and 4 for photo simulations of existing and proposed conditions.

6.8.2.3 Tunnel Mountain Campground

The potential visibility impacts in this location are localized to the adjacent campsites and trails. Segments of the local trail network cross or travel parallel to the ROW, these will retain their direct views of the 54L structures and line (Table 6-11). The removal of danger trees and/or shrubs would create more open views from the adjacent campgrounds (including the oTENTiks) and trails. The rebuild design proposes to increase the number of structures in this section from 19 to 27 structures total between current structures 276-294 (Maps 3-4, Appendix R; Viewpoint 2, Appendix S).

Because the ROW and AltaLink/Fortis lines are visible from adjacent areas in the campgrounds and trails, the visual impact of new structure/line designs and materials will be clearly visible to campground guests and trail users within visual proximity of the ROW.

Table 6-11. Changes in visibility of the 54L following Danger Tree Removal.

Campground Area	Future Status
Tunnel Mtn Campground Village I – D loop	Danger Tree removal will further expose these sites to views of the AltaLink and Fortis lines.
Tunnel Mtn Campground Village I - E, F, K loops	Minimal Danger Trees were identified in this section due to past vegetation management activities.
Tunnel Mtn Trailer Court A, B, C	Overall, there would still be 30 m+ of vegetative screening buffer remaining between these sites and the ROW after Danger Tree removal. Visibility impacts are not anticipated to change substantially.
Tunnel Mtn Village II – oTENTik	The removal of Danger Trees would retain a minimum of 35 m of mature forest between the oTENTik sites and the AltaLink and Fortis lines. It is anticipated that views through the trees may become slightly more open, but generally still well screened. Visibility impacts are not anticipated to change substantially..
Tunnel Mtn Trails – The Spine, Campground Loop, Campground Winter Trails	Danger Tree removal will open up views for some viewer angles. AltaLink and Fortis lines will be visible.

6.8.2.4 Tunnel Mountain Bench/Town of Banff

The 54L transmission line is currently visible in the section around and adjacent to the Town of Banff from various locations and angles. As an urban and urban-fringe area there are numerous other roads, buildings, infrastructure, and the CP railway line. Viewshed modeling indicates that total visible length of the 54L line may increase by 105 m to 1,800 m from the existing 1,695 m (Map 6, Appendix R; Viewpoint 1, Appendix S). The total number of structures visible from street level is predicted to remain at 22 structures total. It is important to note that increased heights of some structures may result in these structures being more clearly visible from more locations. The increased future visibility is incremental over the current visibility primarily due to a combination of increased structure height and Danger Tree removal.

The increase in structure heights combined with vegetation management and Danger Tree removal is anticipated to increase the visibility of the structures on the Tunnel Mountain bench and steep slopes above Banff Avenue (height increases of 3.3 m to 5.0 m). As Banff Avenue has several curves through this section, street level views are somewhat variable depending on the viewer position in the arc of the curve. Visibility modeling does not show continuous visibility at street level, suggesting that views may be intermittent and at least partially interrupted by buildings, landscaping trees, and urban infrastructure.

From Compound Road along Hawk Avenue, the proposed rebuilt 54L transmission line will remain fully visible, the primary changes will be an increase in structure heights and a change in the design of the structures and materials. While this is an industrial area with existing views of the 54L line it is important to note that substantial structure height increases are proposed for some of the structures in this area (9.7 m higher for current structure 307). This will change the local viewscape and the new structures will be much more visually prominent than the existing structures. The increased structure heights are required to meet standards for mandatory vertical and horizontal clearances for both Hawk Avenue and the adjacent buildings. It is also important to note that the new 54L structure design will be a larger diameter and visually different from the old existing structures along Hawk Avenue.

6.8.3 Mitigation Measures

- The engineered design of the line minimizes both the height and number of structures while still maintaining required ground clearances (an important safety consideration). Reducing the number of structures would require an additional height increase, thereby increasing visibility concerns. Alternatively, lower structures heights would require additional structures to reduce sag and maintain required ground clearances. This would create additional visibility concerns due to the number of visible structures.
- The retention of 20-year Danger Trees for the purpose of visibility screening is not a proposed mitigation for this Project as this would not reduce the risk posed by these trees to the 54L transmission line both in terms of fire hazard and outage risk reduction.

6.8.4 Residual Effects

The existing transmission line and ROW has been in place for many decades and is a long-standing infrastructure component on the landscape. This section of BNP from the east boundary to the Town of Banff is one of the busiest and most heavily developed sections of the park. A partial list of additional disturbances and infrastructure in this area includes: the Town of Banff, Tunnel Mountain Campground, the TCH, wildlife highway fencing, CP Rail line, Fortis transmission and distribution lines, and TransAlta hydro-generating facilities (including the highly visible water tower).

Based on the proposed design and mitigation measures, there are expected to be some negative long-term impact on aesthetics due to the Project. The increase in structure heights (mean=5.7 m), number of structures (114 to 134), and danger tree removal will increase the visibility of the 54L transmission line in several locations. Key locations identified for visibility impacts are: Johnson Lake, Tunnel Mountain Campground, and Tunnel Mountain (west) bench above Banff Ave. There will also be visibility impacts due to a change in structure design and height along Hawk Avenue in the Industrial Compound (maximum height increase of 9.7 m) due to changing the new structure configuration to vertical to allow for future development of exiting buildings and provide line maintenance access from road.

The removal of Danger Trees will reduce visual screening of the 54L transmission line and will increase the cleared width of the ROW. The initial visual impacts of vegetation removal, construction disturbance, and new structures will fade with time due to vegetation regrowth and the weathering of materials and structures.

6.9 Public Safety

6.9.1 Effects Analysis

The potential for trees falling on the line and potential wildfire ignitions originating from the transmission line will be dramatically reduced by clearing Danger Trees at the edges of the ROW, rebuilding the line with metal structures, and increasing the height of the structures. Therefore, this Project will have a positive effect on public safety overall.

There is potential risk to the public during tree removal and construction activities if the public is on the ROW when work is actively occurring. The potential for this should be very minimal as there is currently minimal public use on the ROW from structures 200-260 on the eastern end and the high use areas that intersect the ROW near Johnson Lake and the Tunnel Mountain. The campground will be closed during construction and off limits to the public.

6.9.2 Mitigation Measures

- Access points and recreational trails along the ROW will be closed using a physical barrier and clearly signed to prevent the public from accessing areas where construction and tree removal activities are occurring.

6.9.3 Residual Effects

If the mitigation for public safety is applied, the 54L rebuild will have a net positive effect on public safety by reducing the risk of wildfire ignitions on the transmission line.

6.10 Facilities and Services

6.10.1 VCs

The VCs for facilities and services are continued access to nearby public facilities and services by public users during and following tree clearing and line construction activities.

6.10.2 Effects Analysis

6.10.2.1 Trails and day use areas

The Johnson Lake area trails that intersect the ROW or the LSA will have intermittent closures during tree clearing and line construction activities. As this effects only the span between structures 260-264 and access 4b and the work in this section will be from December to March, this effect on trail users is expected to be low magnitude. The Johnson Lake day use area will not be affected by closures during the Project, but trail users in the area may hear construction noise or smell the burning debris piles.

In the Tunnel Mountain Campground, the trails that intersect the ROW and the LSA will require intermittent closures or detours in the December – March window and the September-October window. The effect on trail users will be greater in the fall when the campground is open than in the winter when it is closed and overall use on the trails is low.

The Legacy Trail will require a closure near the TCH and beside Banff Ave. when the conductor is being strung across the road and trail in these areas in the September – October window. These closures are expected to last 6 hours. Intermittent short closures of the Legacy Trail near Banff Avenue will also be required to unload/load equipment that is working on the steep slope on the south side of the road between structures 297-298.

6.10.2.2 Tunnel Mountain Campground

With Danger Tree clearing and burning there is not expected to be any disruption to use of the Village I or Village II campground loops as they are closed during the winter when tree clearing will occur. The Trailer Court is open in the winter, but there is minimum of ~50 m between the closest campsites and the outside Danger Trees so a closure of these outer sites is not likely to be required. For line construction in September – October, the campground will be open so campers may be affected by construction noise, but no closures of campsites are anticipated.

6.10.2.3 Roads

Roads that will be impacted by this Project include the TCH, Tunnel Mountain Road, small access road in the Tunnel Mountain Village I campground loop, Banff Avenue, Compound Road, and Hawk Avenue in the Banff industrial area. There may be limited single lane short term (e.g., 15 min) disruption of traffic on all of these roads to unload machinery at the accesses. There will be full closures for up to two hours required on Tunnel Mountain Road, Banff Avenue, and Compound Road to string the conductor on the rebuilt transmission line. For stringing across the TCH it is anticipated that a one hour closure will be required. No road closure is anticipated for stringing conductor across the Tunnel Village I campground loop road as this work will be done when the campground loop is closed in mid-October.

For construction and stringing of the line along Hawk Avenue, it is expected that one lane closures will be required intermittently along this road but access to businesses and offices will be maintained during construction. The effect of these road closures to the public will be low in magnitude as they will be infrequent, short-term in duration, and majority of the transmission line rebuild activities will occur during shoulder season (September- October) or during the winter (December – March), when there is less traffic on most roads.

6.10.2.4 Transmission line

There is expected to be only minimal outages on the 54L transmission line during the line rebuild Project as there will be either a temporary bypass line built for sections 3-6 or the electrical load will be transferred to the Fortis distribution line from the Cascade plant to the Banff 123S substation during construction of the line. Brief outages will be required for the cutover to the new line in this area. Overall this rebuild Project will improve the reliability of the transmission line for end users.

6.10.3 Mitigation Measures

- All trail closure requirements will be communicated to Parks Canada in advance of the closure being implemented so that information can be communicated to the public.
- Trails will be closed or have detours in place only in the vicinity of active work within one span at Johnson Lake and in the Tunnel Mountain Campground to ensure public safety. Closures will move as the tree clearing or line construction proceeds down the ROW.
- Signage and barricades will be used to inform public of closures and detours.
- Work in the campground will be planned to minimize disruptions to campers.
- Road closures for stringing will be scheduled to have the least impact on road users including early morning, or other times when traffic is light.
- A TAS will be designed and provided to Parks Canada and Town of Banff (where applicable) for approval in advance of all road closures, single lane traffic

accommodations, and reduced speed zones required throughout the project. A minimal traffic disruption strategy will be employed to minimize inconvenience to the public.

- The TAS will be implemented at each site by a professional traffic management company.
- On Hawk Avenue, efforts will be made to keep at least one lane open to provide access to businesses and residences during line construction. The road may be closed for 10 - 15 min intervals during salvage of existing structures, installation of new structures, and stringing.
- At the Johnson Lake parking lot, a TAS will be implemented for equipment entering the ROW from the parking lot to minimise disruption to the public. Equipment unloading and loading will be timed during minimal traffic windows. The effect on the public is expected to be minimal in this location as work from the Johnson Lake access will occur from December to March when public use is lower.

Table 6-12. Summary of potential effects and mitigation measures for facilities and services.

Potential Effect	**Effect Characteristics**						**Key mitigation measures**
	Direction	Magnitude	Geographic extent	Frequency	Duration	Reversibility	
Trail closures or detours	N	L	L	I	S	R	Minimize area of trail closures, detours, move closures with work down line Communicate trail closures to trail users through Parks Canada channels (i.e., website) Use signage and barricades to inform trail users of closures and detours
Full road closures	N	L	L	I	S	R	Design and implement TAS to minimise length of closures and provide detours Time full road closures for light traffic periods
Single lane road closures	N	L	L	I	S	R	Design and implement TAS for all single lane closures or reduced speed zones

6.10.4 Residual Effects

If all of the above mitigation is implemented for public facilities and services, then there is expected to be no residual effects of this project to public facilities and services.

6.11 Indigenous Values and Rights

6.11.1 VCs

Section to be completed following Indigenous engagement process in summer of 2025.

6.11.2 Effects Analysis

6.11.3 Mitigation Measures

6.11.4 Residual Effects

7.0 Cumulative Environmental Effects

Under the IAA, s.22(1)(a) specifies that an impact assessment must take into account effects that are likely to be caused by the carrying out of a designated project. This includes any cumulative effects that are likely to result from a designated project in combination with other physical activities that have been or will be carried out.

Under the *IAA* cumulative effects are defined as:

"changes to the environment, health, social, cultural, and economic conditions, as a result of the project's residual effects combined with the effects of other past, existing and reasonably foreseeable projects and physical activities. Cumulative effects may result if:

- the implementation of the project may cause residual adverse effects to the VC; and
- the same VC has been or can be affected by other past, existing or future projects or physical activities."

(Impact Assessment Agency; Government of Canada 2023b)

The other past, present and future, projects in the RSA that were assessed in the context of cumulative effects for the 54L transmission line are as follows:

- Past and present - CP railway through Banff National Park; TCH construction and twinning; Carrot Creek fuel break; all Parks Canada facilities along the ROW including Johnson Lake day use are and trails, Tunnel Mountain Campground and trails; TransAlta penstock, surge tower, and power generation facility; Fortis distribution line; Banff Industrial area buildings and roads; and the Legacy Trail.
- Future - ongoing maintenance and renovations to the railway, TCH, Parks Canada facilities, TransAlta facilities, Banff Industrial area, Fortis distribution line and Legacy Trail as required over the lifetime of the rebuilt powerline.

Cumulative effects were assessed for the RSA, which is comprised of the valley bottom terrain in the montane and lower subalpine ecoregions below 1800 m within the Bow Valley from Lake Louise to Banff within BNP (Figure 1-1).

7.1 Soil

The potential for cumulative environmental effects to geography and soil are predicted to be negligible and restricted to the PSA. The Project will not likely contribute significantly to cumulative effects to soils due to operations proceeding mainly in frozen conditions and with low ground pressure equipment. Any disturbed ground will be promptly reclaimed with native plants so subsequently loss of topsoil, erosion and loss of soil productivity is also expected to be minimal.

7.2 Vegetation

The residual effects as a result of the Project include removal of the mature tree layer from the edges of the ROW during Danger Tree clearing. There is also low to moderate probability of spreading existing invasive NNV plant species down the ROW and introducing new NNV to the ROW. Introduction of NNV is a risk with every project that results in ground disturbance and involves bringing machinery onto an undisturbed site. It is difficult to keep machinery free of seeds or other propagules at all times during a project and these non-native plants, once introduced to a disturbed area, are often aggressive colonizers of sites where the native vegetation mat has been removed.

Past projects including the CP railway, TCH, and Parks Canada and Town of Banff infrastructure and facilities in the RSA have resulted in a permanent loss of native vegetation under permanent infrastructure (e.g., railway ballast, roads, and buildings, campsites, trails) or replacement of native vegetation communities with non-native agronomic species in previously disturbed areas (e.g., the ditches and ROW of the TCH, ROW of Banff Avenue, Compound Road, and Hawk Avenue). Establishing fire fuel breaks within the Bow Valley including the Carrot Creek fuel break has resulted in a modification of the vegetation community to an earlier seral stage with the loss of the mature trees in these areas (several hundred hectares in the RSA).

These projects have also resulted in the introduction and spread of many invasive NNV including several noxious weeds. The rights-of-way of the CP rail, TCH, secondary roads have frequent patches or continuous infestations of exotic species with high cover including Canada thistle, common toadflax, oxeye daisy, perennial sow-thistle and tall buttercup. There are also patches of these NNV in Parks Canada facilities including campgrounds and day use areas and other previously disturbed areas within the RSA. In addition, Parks Canada has recorded some NNV in existing fuel breaks. Given the area of disturbed and seeded areas along the rights-of-way alone, these populations of NNV cover in the order of dozens of hectares within the RSA.

The potential proposed projects which may happen in the near future (within 5 years) to upgrade infrastructure and facilities in the RSA could contribute incrementally to the loss of native vegetation communities in the RSA should the footprint of permanent infrastructure increase. Similarly, if there is an increase in disturbed and seeded areas as a result of these potential projects this may result in an incremental increase in the cover of NNV species of concern within the RSA.

There has been moderate permanent loss of native plant communities to date within the Bow Valley given all the major transportation rights-of-way and existing infrastructure. Currently, the strategies in place to deal with these cumulative effects to vegetation include limiting the area of new disturbance to native vegetation communities through park-wide planning mechanisms. Furthermore, the designation of DWAs in BNP has severely limited the amount of future development that can occur in these designated areas outside of the main transportation and visitor use facilities in the park (Parks Canada 2022a).

There has also been an increasing amount of land in the RSA over the last century that has become occupied with invasive non-native plants in areas that were disturbed and insufficiently reclaimed which has allowed these exotic species to increase in extent and density (Parks Canada 2008). Currently, Parks Canada has NNV control programs in place for BNP under an IPMP (Parks Canada 2019) for land managed by Parks Canada. The Town of Banff is actively managing NNV as well on town property and has requirements imbedded into the PRIA (Avens Consulting, in progress) for all project proponents to prevent spread and establishment of NNV.

With increased monitoring, treatment, and tracking of NNV by Parks Canada in the past few years, there has been some success in reducing infestations of some species in the RSA, particularly those that are small or new to the park (Parks Canada 2019). There is also increasing effort to treat existing NNV populations in linear disturbances to reduce the spread from these high-density areas (Yakiwchuk 2018). In addition, there is currently a requirement that all project proponents within BNP control or eliminate all NNV infestations for a minimum of 3-5 years (longer if required) following the completion of a project involving ground disturbance in the park. Many of the operators of large-scale infrastructure in the park (e.g., utilities companies) also have long-term agreements in place with Parks Canada to control non-native vegetation as part of their regular maintenance of their infrastructure. These measures are having a positive effect on the rate of new introductions of non-native plant infestations in the park.

Similarly, on the AltaLink 551L ROW between Banff and Lake Louise, which was rebuilt between 2016 – 2020, there has been ongoing NNV monitoring and treatment between 2016 – 2023. Annual tracking of NNV patches on the ROW has indicated that although the number of NNV infestations increased in disturbed areas one to two years following construction, these new NNV patches were successfully treated and eliminated from the ROW with 3 -5 years of careful tracking and treatment (e.g., Avens Consulting 2023, 2022, 2021). NNV treatment was initiated as part of required post-construction treatment and is continuing under the recently approved AltaLink IPMP (AltaLink 2023b). In addition, there is an overall downward trend of size and density of pre-existing NNV patches on the ROW that were present for years or decades prior to the rebuild project as a whole within the same timeframe. This indicates that NNV spread following these linear transmission line projects can be successfully minimized.

In the context of these existing cumulative effects to vegetation within the RSA, the rebuild of the 54L transmission line is expected to have a negligible effect on native plant communities as only one layer of vegetation will be lost for the near future (e.g., mature trees) and this will regrow over time.

The Project could add incrementally to the extent and cover of non-native plants in the RSA, but given the extensive planned mitigation to avoid NNV spread, the comprehensive plan to immediately reclaim areas with native vegetation, and ongoing NNV treatment before and after construction this project may result in a very small incremental increase in existing NNV populations in the RSA if any.

7.3 Wildlife

Residual wildlife effects resulting from the Project are anticipated to be low in magnitude and long-term due to vegetation regeneration periods (Table 7-13).

Table 7-13. Summary of residual impacts for wildlife VCs

Effect Category to VCs	Residual Effect
Direct habitat loss	Low, medium-to-long term: Danger Tree removal and vegetation loss from brushing immature trees results in loss of wildlife habitat (e.g. cover habitat, topping of cavity trees (increase rate of decay); removal of cavities within structures; removal/relocation of osprey stick nest).
Indirect habitat loss/ sensory disturbance	Short-term effects so no residual effect.
Obstruction to wildlife movement	Low, medium-to-long term: brushing may alter movement patterns but understory expected to regenerate over-time.
Direct mortality	Moderate, short-to-medium term: Excavations in wetland (over-wintering amphibians), wildlife entrapment in steel piles, rust from barrel piles.

Indirect mortality/ habituation	Low, medium-to-long term: ROW clearing combined with Danger Tree clearing results in improved line-of-sight, thereby changing predator/prey dynamics.

Major infrastructure within the RSA includes the TCH, CP Railway, and the Banff townsite, all of which have resulted in adverse impacts to wildlife habitat availability, wildlife movement, and wildlife survival. Tourism has grown 30% over the last decade, with more than 4 million people visiting Banff National Park annually (Parks Canada 2022a), further impacting wildlife in the region.

The potential proposed projects within the RSA include general upgrades to infrastructure and facilities along the TCH. These activities, depending upon their nature, extent and location could contribute to incremental losses of habitat availability. Although future projects are not currently well-defined, it is anticipated that careful project planning, including required environmental analyses and associated mitigation, will limit the contributions of any future projects to cumulative effects on wildlife.

There has been a permanent loss of wildlife habitat availability to date within the Bow Valley given the variety of major transportation rights-of-way and existing infrastructure. These features occur in the valley bottom, the montane ecoregion, which provides significant wildlife habitat, and contains vital wildlife corridors (Norquay-Cascade, Fenlands-Indian Grounds, Penstock). Currently, the strategies in place to deal with these cumulative effects to habitat availability include the designation of Fairholme ESS (e.g., Fairholme-Carrot Creek Benchlands) and the DWA, which has limited the amount of future development that can occur outside of the main transportation and visitor use facilities in the park (Parks Canada 2022a). Parks Canada is also actively working on restoring vegetation age class and structural diversity using prescribed burns which contributes to wildlife habitat diversity and availability on the landscape.

Development and human use within the Bow Valley, in combination with the surrounding steep mountain terrain, has greatly constrained regional wildlife movement. This can become even more apparent where two or more ROWs parallel one another (i.e., TCH and CPR). To help mitigate these effects, the Park began the construction of wildlife underpasses and overpasses in the 1980s to connect vital habitats, encourage wildlife movement, and sustain healthy wildlife populations. To date, the Park has a total of 44 wildlife crossing structures (six overpasses and 38 underpasses). In addition, the voluntary access closure within the Fairholme-Carrot Creek Benchlands and the mandatory Fairholme ESS closure between structures 230 and 257 from April to July 15th (extended to August 31st in 2025), has a positive impact on wildlife movement in the area.

In the context of existing cumulative effects to wildlife within the RSA, the rebuild of the AltaLink 54L transmission line is expected to add incrementally to the observed effects. It is important to acknowledge that the 54L transmission line currently exists within the Bow Valley corridor. Because of its historic presence, wildlife has, to some extent, adapted to it utilizing it as a movement corridor (e.g., wolves) and taking advantage of its provision of shrub and forb communities (e.g., grizzly bear, elk, songbirds). Decreases in some tree/shrub/forb habitat will temporarily occur, however relatively quick regeneration will benefit numerous species and species groups in the long term, including ungulates and large carnivores. Similarly, with the application of identified mitigation measures such as: avoidance of identified restricted activity periods; providing ROW crossing opportunities through shrub retention; reduced vegetation removal in important habitat features; and reducing human-wildlife conflict and habituation through waste management, cumulative impacts to wildlife habitat, movement and survival are anticipated to be low.

The frequency of maintenance requirements on the new transmission line are expected to be very low due to the removal of the primary factors that have caused previous power-outages (i.e., Danger Trees, reliability of the transmission line). During the operation of the line, mitigations described in the PRIA will be followed to prevent any implications to wildlife movement, mortality, and habitat requirements.

As such, cumulative effects to wildlife from construction activities associated with the Project as well as long-term operation of the line will be negligible-to-low.

7.4 Hydrology and Aquatic Resources

With the application of identified mitigation measures, many of which address issues regarding erosion and sediment control, riparian habitat, and bank stability, there will be minimal residual effects arising from the Project.

An effect that is not mitigable but is short-term includes a temporary decline in water quality (e.g., influx of sediment during restricted activity periods or in a watercourse that contains listed species, and/or fuel spills into or adjacent to watercourses). The effects of sediment entrainment and deposition are expected to be low in concentrations (lower than annual spring freshet releases), confined to crossing sites and a short distance downstream, and are only expected to occur in greater quantities during installation and removal of the two waterbody crossing structures. One watercourse is not fish-bearing at the crossing site but is fish-bearing 140 m downstream of the crossing site which will likely allow the sediment to settle before reaching and affecting the downstream fish. A turbidity monitoring protocol will be included in the annual EPPs and will be strictly adhered to in the event of turbidity exceedances. These effects are expected to be very brief and negligible-to-low in magnitude, therefore will not contribute to past, present or future cumulative effects and therefore will not be assessed further.

There will be a very minor loss of riparian habitat associated with Danger Tree removal and topping around waterbodies. The shrub layer is expected to proliferate with the loss of the upper canopy and therefore there will be no cumulative effects.

There will be a very minor residual loss of habitat within wetlands from structure replacement. The new transmission line was designed to limit the number of structures required within waterbodies as much as possible; however, due to the size of some of the wetlands and new design, it was not possible to completely span wetlands and avoid disturbance. This residual impact is low in magnitude (effecting two wetlands: near structures 207-208, 220-221), long-term, and localized. One positive effect of the Project is installing steel structures rather than treated wood structures near wetlands or in wetlands which will eliminate contamination from the wood structures.

Past projects including the BVP, TCH, CP rail, and infrastructure and facilities along the BVP have altered wetland habitat through construction of permanent infrastructure such as roads and the rail line through wetlands (Banff Bow Valley Study 1996, Paul 1994). In this context, the rebuild of the 54L transmission line is expected to have a negligible cumulative impact.

If future maintenance procedures follow similar mitigations outlined in this document, the effects to aquatic resources in the LSA in the future will remain low. The frequency of maintenance requirements on the new transmission line are expected to be very low due to the removal of the primary factors that have caused previous power-outages (i.e., Danger Trees, reliability of the transmission line). During the operation of the line, any required watercourse crossings will be made during fisheries timing windows if possible and will follow mitigations described in the PRIA to prevent any short term, long term, or downstream watershed implications. The two new crossing structures on Johnson's outlet and Cascade Creek will be a net positive effect by reducing effects to the creek banks and sedimentation release. As such, the Projects' long-term contributions to cumulative impacts in the RSA will remain negligible.

8.0 DECOMMISSIONING PLAN

The only facility or area that will require decommissioning as part of the Project immediately following construction is the removal of the AltaLink laydown yard in Mannix pit. A comprehensive decommissioning plan was written and submitted to Parks Canada in the fall of 2022 and is currently under final review (Avens Consulting 2023). AltaLink will work with Parks Canada to determine a suitable restoration goal and methods for reclaiming the AltaLink Mannix yard which may include decompaction, hydromulching or soil imports, plantings, and ongoing NNV control.

All of the other staging areas will be only used to store materials during the project and to stage helicopter operations for longlining structures to the ROW during construction. These areas will be reclaimed as required but will not require decommissioning of the site.

9.0 RECLAMATION PLAN

All required reclamation will be initiated as soon as possible after the construction is complete in each section. Reclamation work will be carried out in the spring each year between the end of April and the end of June following winter construction when soil moisture conditions are high and weather is conducive to good plant germination and establishment. Any reclamation not completed in that timeframe will be done in September- October the same year. There will be a detailed site-specific reclamation plan written each year and submitted to Parks Canada for approval prior to the initiation of reclamation activities.

This section outlines the reclamation objectives and methods that will be incorporated into the detailed plan. The ultimate goal of reclamation in this project is to restore a functional ecosystem that is comprised of native species and is self-sustaining to the same degree as an undisturbed reference ecosystem.

9.1 Reclamation Objectives

The specific objectives of reclamation on this project will be:

1. To stabilize slopes, prevent erosion of exposed soils and prevent sediment from moving off-site.
2. To re-establish pre-disturbance hydrological patterns on disturbed project areas including ground water and surface water movement, discharge, and recharge.
3. To restore abiotic (e.g., subsoil, rock, course woody debris) and biotic components of the ecosystem (e.g., soil bacteria and other microorganisms) which are crucial to and support the establishment and growth of diverse native plant communities.

4. To re-establish a native plant community with the composition, structure and ecological function that is equivalent to or is on a trajectory toward becoming equivalent to an adjacent reference ecosystem on the ROW.
5. To control or eliminate all invasive non-native plants in the newly reclaimed ecosystem that negatively affect the composition, structure, or ecological function of the ecosystem.

9.2 Reclamation Strategies

There will be four main reclamation strategies used on the Project depending on terrain, extent and degree of ground disturbance and visibility of the site to the public and park users.

9.2.1 Natural Recovery

Natural recovery involves very little intervention, but if successful will lead to a native plant community that closely resembles the surrounding vegetation community. Natural recovery will be used in wet ecosites with negligible probability of erosion and no invasive species in the surrounding area. This strategy involves burying any intact vegetation sods so that they are even with the surrounding vegetation and not sitting on top of the exposed soil. The area will then be left to recover and revegetate naturally. Under the right conditions, native early seral species will rapidly recolonize disturbed areas and should have high cover of plants and plant litter that resembles that in the surrounding community within 2-3 years. Natural recovery areas will be monitored annually for invasive species and native plant community composition and structure. This strategy was employed very successfully in wet graminoid and shrubby fens on the 551L Rebuild project and will be used in similar ecosites on the 54L.

9.2.2 Sod salvage and replacement

Where possible, sod (including the vegetation root mat and low-growing forbs and shrubs), will be salvaged for later replacement. Vegetation sods will be lifted using an excavator and stored in piles during the winter construction season. Sod size will range from 0.3 m^2 to 8.0 m^2 which is dictated by the size of the excavator bucket, bucket type (i.e., tilting or standard), and the course fragment content of the soil which affects what can be lifted as an intact sod. Sods will be salvaged when vegetation is dormant and will be stored in piles in frozen conditions through the winter and replaced on disturbed areas prior to the end of the construction season in March each year. In the spring when the sods are thawed, they will be keyed into the soil by the reclamation contractor using hand tools so they are flush with the surrounding vegetation.

Sod salvage and replacement was used very successfully on the 551L Rebuild Project in a variety of ecosites from moist to mesic vegetation communities (Avens Consulting 2022). Salvaged and keyed in sods have re-established native plant communities on disturbed sites and in many cases the edges of the disturbed areas are indiscernible from adjacent undisturbed plant communities on the ROW.

9.2.3 Live staking

In riparian areas with shrubs that can root from cuttings, including willow species and dogwood, live staking is an ideal reclamation method. This technique is suited to wet areas with deep soils and high cover of suitable donor shrubs from which to cut the stakes. Live staking involves cutting willow stems and other suitable shrubs when they are dormant and planting them in the ground when soils are thawed. The stakes then sprout roots along the entire buried portion of the branch and a new shrub will become established from this stake.

This technique has proven to be very successful in many ecosites and is ideal for wet riparian areas along the transmission line ROW that are inaccessible by large machines in the growing season due to saturated soils. Also this technique uses local native material growing in adjacent areas, often within a few hundred meters of the planting site, which is well adapted to the local conditions. Live staking can be used to stabilize slopes provided there is sufficient soil moisture. On the 54L transmission line this technique could be used to re-establish shrub species in riparian areas surrounding wetlands and streams following Danger Tree removal or brushing of immature ROW trees.

9.2.4 Hydromulching

Areas with a high level of disturbance associated with access trails and cut and fill on slopes need to be stabilized in the short-term to prevent soil erosion and movement of soil offsite into surrounding vegetation or waterbodies. On machine accessible sites with fine textured soils and/or slopes of greater than 50% disturbed sites may be hydromulched with an engineered mulch which contains a strong tackifier. This mulch will be hydraulically applied over erosion prone slopes to cover and bind the soil to effectively eliminate erosion until vegetation is re-established on the site. The mulch will provide erosion control for the first 12-18 months after application and help to keep the soil moisture high to aid in seed germination and plant establishment. On the 551L ROW a steep slope with very fine textured soil that had a large cut and fill was successfully stabilized and vegetated within one year of being hydromulched. Many accesses on the 551L transmission line that had poor soil were successfully revegetated by decompacting and hydromulching them.

9.2.5 Seeding and planting

In machine accessible terrain, stored topsoil will be replaced on disturbed areas under frozen conditions before machines leave the ROW at the end March. When sites are thawed in the spring or fall, reclamation workers will replant any rooted vegetation in the spread topsoil and then seed and plant these areas with native plant material.

Disturbed areas will be planted with plugs of native grasses, forbs, and shrubs grown from seed collected on the ROW. Planting densities will vary according to level of disturbance and site conditions, but generally there will be higher density of plants as area and degree of disturbance increases. Species to be planted in each area will be determined by referencing the Reclamation Plant Database created for the Project that lists dominant plant species recorded in each ecosite on the ROW (Avens Consulting 2022 – reclamation plant database).

All disturbed areas will also be broadcast seeded or drill seeded (accesses) with native grass species that occur naturally on the ROW. Seed in broadcast areas will be applied by hand using a seed spreader at the rate specified in the reclamation plan and raked into the soil. Seeding rates will vary from 10kg/ ha to 25 kg/ ha. Seed grass species will be a mixture of early and late seral species with varying heights that will contribute to overall species and structural diversity on the ROW.

All bare areas under burn piles will be seeded and planted promptly in the season following burning to stabilize soil, occupy the site with native vegetation and prevent the establishment of invasive non-native species in these areas. Some scarification or addition of weed-free soil amendments such as peat moss may be necessary prior to seeding to counter loss of organic matter and altered soil chemistry in these burned areas.

10.0 ENVIRONMENTAL PROTECTION PLANS

An EPP containing the mitigation measures specified in Section 5 above will be required and must be submitted to Parks Canada for approval at least one month prior to construction start each year. The EPP will include work activities, construction schedule, and general mitigation measures to limit effects on all relevant VCs. It will also have detailed site-specific environmental constraints and mitigations for each structure span similar to EPPs used from 2016-2020 on the 551L transmission line rebuild.

Specifically, the EPP will include mitigations for the following:

- **Spill Response:** spill kits and materials required on construction sites, cleanup, and notification procedures in the event of any type of spill (i.e., oil and fuels).

- **Soil Management and Erosion and Sediment Control (ESC):** topsoil/subsoil salvage, storage, and replacement methods on project sites; measures to prevent or limit erosion of soils; and sedimentation of adjacent waterbodies both pre- and post-construction (e.g., ditching and surface water management, installation of ESC materials including sediment fencing, ESC logs, ESC blankets, etc.).
- **Vegetation Management**: methods to prevent ground disturbance, damage to vegetation resources including rare plants, and the spread of weeds.
- **Wildlife Management (**if work must occur during restricted activity periods for wildlife): habitat availability, sensitive species present, life requisites affected, and site-specific mitigation/monitoring actions required to limit wildlife impacts.
- **Aquatic Resources:** watercourse crossing installation, maintenance, and removal; turbidity and water quality monitoring protocols; fish salvage prior to instream work if required; riparian vegetation management along waterbodies; whirling disease decontamination protocol.
- **Archaeology Resources:** methods to prevent damage to all sensitive archaeology areas.
- **Indigenous Resources:** mitigation to prevent damage to identified Indigenous resources.

11.0 SURVEILLANCE AND MONITORING REQUIREMENTS

A designated Parks Canada ESO will be on-site at the start-up of the Project and on a regular basis as the Project proceeds to ensure that mitigation measures are being followed. In addition, AltaLink will have an independent environmental monitor on site as required during construction who will provide a brief written summary report of all monitoring activities and required remedial action to Parks Canada on a weekly basis. The environmental monitor will work with equipment operators and fallers at the start of this Project to ensure that methods are employed to minimize ground disturbance and loss or damage to remaining vegetation. Surveillance will be crucial in those areas that are deemed to be sensitive due to vegetation, wildlife, and/or aquatic resources to ensure that vegetation is retained in management areas and that prohibited areas are not being accessed.

In general, a QAES is required on-site during installation, operation and removal of a watercourse crossing to assess immediate effects on the aquatic environment, the condition of the crossing structure and site, and effectiveness of mitigation measures associated with each crossing. Assessments and monitoring completed by the QAES will follow the guidelines provided in Schedules 2 and 4 of the Code of Practice for Watercourse Crossings unless otherwise directed by Parks Canada (Government of Alberta 2019b). Weekly monitoring reports of the crossing structures will be submitted to Parks Canada, details of which will be in the annual EPPs.

Specific activities that require monitoring by a QAES include:

- When a crossing results in a disruption or alteration of the bed or banks of a fish bearing waterbody;
- When there are potential concerns for fish passage with the proposed crossing design;
- When work activities near a watercourse are planned during the restricted timing windows for spawning fish or within CH for a listed fish species;
- When activities have the potential to cause sediment release in a watercourse.

Requirements for the protection of aquatic resources during construction and operation should include monitoring of:

- water quality during activities near watercourses (e.g., installing bridges, one-time fords, stream isolation);
- equipment washing, inspection of hydraulic, fuel and lubricating systems, equipment servicing operations;
- turbidity levels and sediment deposition downstream of crossings;
- fish passage success;
- bank stability and revegetation success after structure is removed;
- ESC and determining whether additional measures of ESC are required after crossing structures are removed.

A post-construction reclamation monitoring program will be implemented for all disturbed and reclaimed areas on the AltaLink ROW for three years post-construction. The reclaimed areas will be assessed each spring for NNV and again in late summer to assess plant community composition and structure according to established reclamation criteria over a three-year period. The criteria used to determine reclamation success will include landscape assessment (drainage, soil erosion and soil stability), vegetation assessment (desirable species cover, plant community structure and layers, cover of weeds/undesirable plants, and litter quality and quantity) and soil assessment (soil structure and rooting restrictions) compared to an undisturbed reference site or number of sites on the ROW that capture the variability of the ROW plan communities. Where post-construction monitoring discovers that reclamation efforts are ineffective (i.e., ineffective erosion control or introduction of invasive plants), additional measures will be implemented to address identified concerns. Monitoring results and associated action plans resulting from these follow up surveys will be summarized in annual monitoring reports and submitted to Parks Canada for review on a yearly basis. This could include ESC measures, NNV control, ripping compacted areas with a machine, reseeding areas, and planting additional plants or different species if initial survival is low.

12.0 KNOWLEDGE DEFICIENCIES

The AltaLink 551L Rebuild project that occurred between 2016 and 2023 between Banff and Lake Louise was completed with most of the same methods for construction and reclamation proposed for the Project. Therefore, all of the knowledge and learnings gained from the 551L rebuild will be applied to the Project to reduce the environmental effects of the Project.

The installation of structures in open steel piles that are screwed into the ground is a new technique that has not been employed in the park to date. This technique has been used on other AltaLink projects successfully (e.g., 113L near Canmore), but the overall ground disturbance and success of reclamation of these sites, which have increased compaction immediately surrounding the structures, is unknown.

Generally, GPS data, although a very powerful tool for studying wildlife, has several weaknesses that should be considered – primarily, small samples sizes can bias results to a few individuals and therefore not accurately represent the larger population in terms of habitat selection and movement. Further, the GPS location of individuals can be inaccurate due to error inherent in the calculated position. For winter animal tracking, track data could represent several animals or show several tracks from few animals. Taking the abovementioned into account, there is potential that habitats/locations and seasons of use are under- or over-represented. Data should therefore be interpreted with caution and used in combination with other data and knowledge sources.

In addition to the above, existing information related to the occurrence of owls, bats, and amphibians is limited for much of BNP. Specific to the 54L transmission line, owl data collected may not reflect true habitat use and occupancy. Diurnal owl surveys were conducted late in the breeding season (early May) and no nocturnal owl surveys were conducted; therefore, it is likely that owls were misrepresented within the LSA. Due to the existence of numerous cavity trees within the LSA, it is very possible that cavity-nesting owls are present in the area. Prior to any tree removal activities within the owl nesting window (February 15th to May 15th), it is recommended to conduct diurnal and nocturnal broadcast owl surveys.

Similarly, bat habitat use within the LSA may not have been reflected. No emergence surveys were conducted along the ROW, however numerous potential habitat trees were identified. It is unknown if these trees actually contain bat roosts. At two locations where an ultrasonic recorder was placed, bats were detected, so it is likely that bats may be using the ROW and associated habitat more than the limited data captured. Prior to tree removal within the bat window (i.e., April 15th to October 15th), it would be imperative to conduct ultrasonic and visual emergence surveys to avoid effects to bats including listed species. Several amphibian observations were detected incidentally near to where a previous auditory or visual survey was conducted with no detection results, suggesting that amphibian occupancy may have been missed during some auditory and visual surveys.

As such, a precautionary principle should be applied in assumptions of nesting/roosting/ breeding habitat use for owls, bats, and amphibians (i.e., that bats and owls could occur in all adjacent forest cover and that amphibians could occur in all wetlands that cross or are in proximity to the ROW). This may be an over-estimation of habitat use, but by doing so, and establishing restrictive activity periods associated with these species (i.e., owl breeding from Feb 15th to May 15th, bat roosting from April 15th to Oct 15th, and amphibian breeding and migration from April 1st to May 30th and September, respectively), ensures that these species are not impacted. If work is required within these restricted activity periods, pre-work surveys are required to provide evidence that bats/owls are not present in the Danger Trees to be removed and/or amphibians are not present in wetlands that will be disturbed.

The PIWO is non-migratory and is the largest woodpecker species in the Canadian Rockies. Although not a protected species provincially or federally, pileated woodpecker nesting cavities are listed under Schedule 1 of the *Migratory Birds Regulations* (2022) because they are reused not only by woodpeckers but are also an important resource for numerous other secondary cavity nesters, including species at risk (ECCC 2023). It is unknown if PIWO will have nesting cavities on the ROW at the time of the Project; therefore, PIWO specific surveys will be required prior to falling trees with DBH greater than 25 cm.

Due to the lack of field verification, DFO has erroneously assessed several channels within the LSA as CH for bull trout (i.e., DFO mapping exhibits locational and descriptive inaccuracies). Based on the assessment in this DIA, only one of those channels currently exhibit characteristics of CH. Without a review by DFO, it is uncertain if mitigation will have to be followed for these CH areas given that the field-based data is contradictory to DFO mapping and classification efforts. For the purposes of this assessment, it was assumed that the dry channels which offer no spawning, rearing, or over-wintering habitat are not considered CH and therefore mitigations to protect the 30 m CCH buffer do not apply. If this changes after DFO review, changes to the effects rating and the mitigations in this DIA will be required to adhere to the *SARA*.

Cascade Creek has recently been stocked with SARA listed Westslope cutthroat trout; therefore redd surveys should be conducted prior to construction in June to determine current year spawning locations that could be affected by the watercourse crossing.

13.0 INDIGENOUS ENGAGEMENT

AltaLink will submit a Communications & Consultation Plan to Parks Canada in 2025 to outline the proposed Indigenous and public engagement activities to be undertaken between 2025 and 2026. This section will be completed after AltaLink's public engagement process has concluded.

14.0 PUBLIC AND STAKEHOLDER ENGAGEMENT

AltaLink will submit a Communications & Consultation Plan to Parks Canada in May 2025 to outline the proposed public and Indigenous engagement activities to be undertaken between March 2024 and March 2025. This section will be completed after AltaLink's public engagement process has concluded.

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16.0 APPENDICES

See separate document.