

APPENDIX A
EDITH CAVELL REHABILITATION
BASIC IMPACT ASSESSMENT

REPORT

Parks Canada Agency Jasper National Park of Canada

Edith Cavell Rehabilitation Basic Impact Analysis (BIA)

Parks Canada File: **J15-094**



April 2016

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List of Abbreviations

ACIMS	Alberta Conservation Information Management System
BIA	Basic Impact Analysis
CA	Cavell ecosection
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
EG	Egypt ecosection
EIA	Environmental Impact Analysis
ESC	Erosion and Sediment Control
ESO	Environmental Surveillance Officer
HC	Hector ecosection
JNP	Jasper National Park
MBCA	<i>Migratory Birds Convention Act, 1994</i>
SARA	<i>Species At Risk Act</i>
VEC	Valuable Ecosystem Component

Project Information

1. PROJECT TITLE

Mount Edith Cavell Rehabilitation

2. PROJECT LOCATION

Edith Cavell is located in Jasper National Park (JNP) south of the Jasper town site on Highway 93A and is accessed using Cavell Road (14 km).

3. PROJECT SITE

The “project area” is depicted in Figures 1 through 4 of Appendix A and encompasses the following:

- the existing Edith Cavell parking lot;
- the proposed parking lot expansion area approximately 100 m north of the existing parking lot;
- the existing trail head area immediately south of the parking lot;
- the area proposed for the new day use area, which stretches from the south pedestrian bridge to the existing Cavell Meadows Trail;
- portions of the existing trail network that require rehabilitation;
- a proposed new trail loop on the south-eastern edge of the trail network, extending from the existing lookout east to the Cavell Meadows Trail; and
- a new lookout near the new trail and Cavell Meadows Trail.

4. PROPONENT

Andrew Oosting, Project Manager, Parks Canada

5. PROPONENT CONTACT INFORMATION

Parks Canada, Jasper National Park of Canada

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6. PROJECT DATES

Planned commencement: Fall 2016
Planned completion: Spring 2018

Note: these dates are subject to funding, and will be confirmed prior to finalization and approval of the Basic Impact Analysis (BIA).

Project Scheduling Restrictions and Requirements

The construction schedule requires careful integration with critical environmental sensitivity periods for woodland caribou and migratory birds known to the project area, and needs to consider scheduling for the visitor open season (as summarized in Table 1 and Table 2 below). It is important to Parks Canada that the planned construction does not reduce the visitor experience or jeopardize visitor safety while visiting the park.

Construction is proposed to begin in fall 2016 with vegetation clearing (outside of the migratory bird nesting window set out by Environment Canada), some rough grading of trails and parking lot, and transportation of material to the project area. This will occur before with the Edith Cavell Delayed Access Period from November 2016 to mid-February 2017 for the protection of woodland caribou (as discussed further in this BIA).

Construction of the parking lot expansion is anticipated to begin in 2017 after the ground has sufficiently thawed for construction. The contractor will plow Cavell Road as necessary. Edith Cavell experiences peak public visitation from mid-June to mid-September. Construction will focus on the new parking lot, roadway, and necessary trail work during this time to limit the effects to the visiting public. Construction will expand to encompass a larger area (day use area and trails) in early-July 2017. Trail work will be phased to minimize trail closures and visitors will be detoured around construction areas using existing trails. Construction at the upper portions of Cavell Meadows Trail will not occur before July 15 (to accommodate a seasonal trail closure).

Following the 2017/2018 Delayed Access Period for protection of woodland caribou, any final construction will be completed in May and June 2018, with another construction period from mid-September to mid-October 2018 if necessary. The sensitive periods identified in this section will be discussed in detail throughout this BIA.

Although the available construction season spans from early-May to the end of October, it is recognized that winter conditions may persist at the Edith Cavell elevation. The Parks Canada Highways Service Centre does not plow Cavell Road before June 15, or after October 15; construction before or after these dates may require snow clearing by the project.

The planned construction schedule and associated timing restrictions are summarized in Table 2.

Table 1. Environmentally Sensitive Periods and Parks Canada Restrictions

Sensitive Feature	Timing Window	Construction
Woodland caribou overwintering (Tonquin herd)	November 1 to February 15 ¹ (delayed access period)	Access prohibited to Tonquin Valley area (including Edith Cavell) as part of a regional caribou protection measure. No construction will take place at Edith Cavell during this time.
Woodland caribou move to lower elevations and may be present at the project site.	March 1 to early May ¹	Generally, no construction at this time; construction to begin in early May when suitable ground conditions exist, and the snowpack is reduced to manageable levels.
Woodland caribou calving	June 1 - 15 (specific to Jasper National Park). Caribou are not known to calve at Edith Cavell ¹	Construction will occur during this period, because the project area is not considered to be typical calving habitat ¹ .
Migratory Birds	April 17 to August 31	Tree clearing will take place in fall 2016 outside of the MBCA window (but also prior to onset of the Tonquin herd access prohibition).
Visitor Open Season	Mid-June to mid-October (or first significant snowfall)	Construction will not take place in areas accessed by the public during the visitor open season, except trail work that is required; visitors will be detoured around these work areas. Construction will be limited to the new parking lot and access road to avoid impacts to the visiting public.

¹ L. Neufeld, personal communication, 2016

Table 2a. Potential work schedule and environmentally sensitive time periods for 2016.

2016		January	February	March	April	May	June	July	August	Sept.	October	November	December
	Caribou												
	Migratory Birds												
	Park visitors												
	Construction												

Table 2b. Potential work schedule and environmentally sensitive time periods for 2017.

2017		January	February	March	April	May	June	July	August	Sept.	October	November	December
	Caribou												
	Migratory Birds												
	Park visitors												
	Willows ⁴												
	Construction												

Table 2c. Potential work schedule and environmentally sensitive time periods for 2018.

2018		January	February	March	April	May	June	July	August	Sept.	October	November	December
	Caribou												
	Migratory Birds												
	Park visitors												
	Willows ⁴												
	Construction												

- 1 Pre-work consisting of transport of material, rough grading of trails and parking lot.
- 2 Trail surfacing will occur in summer/ fall and will be prioritized to avoid impacts to sensitive plants over impacts to tourists (i.e. construction on trails will occur only after soil has completely thawed from winter and mitigation measures for sensitive plants can be appropriately implemented, which is during the active tourist season, given that the tourist season extends to October 15, or to the first significant snowfall).
- 3 It is noted that Parks Canada Highways Service Centre does not normally plow the road to Edith Cavell area before June 15 or after October 15. However, if conditions are favourable, and for the sake of extending the construction season, the project may arrange for this road to be ploughed for construction by early May and in late October.
- 4 Willow cuttings will be sourced from either the Edith Cavell area or a similar ecosite (ie. the icefields area); it is noted that the Edith Cavell area may not be accessible by road during the sourcing window. For late season planting, willow cuttings should be propagated into plugs in a nursery.

LEGEND

Delayed access period to woodland caribou critical habitat (including Edith Cavell day use area)

General woodland caribou calving in Jasper National Park (not at Edith Cavell)

Potential for woodland caribou at Edith Cavell day use area elevation (including project area)

Migratory birds protection period (no vegetation clearing at this time)

Open season for tourists (no construction at existing visitation area; Jun. 15 to Oct. 15 or first significant snowfall)

Optimal willow collection period after the Delayed Access Period and prior to bud break

Optimal willow planting period

Proposed construction activities

Optimal period for proposed construction activities to avoid woodland caribou and Edith Cavell visitors

Required vegetation clearing must be completed during this period to avoid migratory birds.

Early season rare plants survey, including whitebark pine survey, to be conducted after snow melt and bud/leaf/flowering period of target rare species.

7. INTERNAL FILE PROJECT NUMBER

Parks Canada Environmental Impact Assessment Project Number: **J15-094**
Associated Environmental Consultants Inc. Project Number: **2015-3498.00.S.06.02.**

8. PROJECT OVERVIEW

Infrastructure at Edith Cavell was damaged in 2012 by a tidal wave created by the calving of Ghost Glacier into Cavell Tarn below. Damaged infrastructure includes the parking lot, access road, and lower (south) trails. The tidal wave scoured and deposited significant quantities of rock till in the lower portions of the parking lot and access road, causing a 2-week closure of the site to the public. Although the area re-opened after the depositional till was cleared, a portion of the parking lot and access road had washed away.

With the planned rehabilitation, several long-term upgrades to the area are proposed to be completed. All new infrastructures are planned to be located outside of the local geohazard zone and outside of Cavell Tarn Creek, which flows past the existing parking lot.

The following upgrades are proposed:

- Expand the parking area by constructing a parking lot north of the existing parking lot.
- Re-route Cavell Road near the parking lot to avoid the geohazard zone to the west and abandon the portion of road in the geohazard zone; culverts will be required for water drainage.
- Construct a new trail connecting to the existing Cavell Meadows Trail.
- Repairing the existing trail network.
- Construct a new scenic viewpoint and access trail.
- Establish a day use area with site furniture, gravel/concrete pads, and trail connections.
- Install barricades and site furniture at the existing lookout.
- Construct two to three outhouses at the parking lot.

Figures 1 through 4 in Appendix A show the planned upgrades described above, within the Edith Cavell Area.

Parks Canada reviewed the Project Description for the proposed work prepared by Associated Environmental Consultants Inc. (Associated Environmental), and determined that the project will be assessed through a BIA pathway under *Parks Canada Directive on Impact Assessment, 2015*. In addition, this BIA addresses the requirements of the federal *Species At Risk Act (SARA)*, *Fisheries Act*, and *Migratory Birds Convention Act, 1994*, and considers the requirements of the provincial *Wildlife Act* where required by SARA.

Valued Ecosystem Components

9. VALUED ECOSYSTEM COMPONENTS LIKELY TO BE AFFECTED

Valued Ecosystem Components (VECs) are aspects of the environment that have scientific, economic, social, or cultural significance. VECs include those selected to evaluate the potential implications to ecological integrity, cultural values, and visitor experience. The Effects Identification Matrix (Appendix B) was used to identify the VECs associated with Edith Cavell. The project falls within **JNP's Land Use Zone II – Wilderness, and Zone IV – Outdoor Recreation**.

In the sections below, baseline information for each of the potential VECs is discussed along with a determination on whether the VEC is likely to be affected by the project as proposed. Impacts to those VECs that are deemed likely to be affected are discussed in the effects analysis section.

9.1 PROJECT SETTING

The project is located in the Subalpine Ecoregion (Holland & Coen 1982), more specifically, within the lower and upper subalpine. Three specific ecosites and one miscellaneous landscape are present: HC1, CA2, and EG1 ecosites; M and GL landscapes.

- **HC1 ecosite** falls within the Hector ecosection and is characterized by fluvial or fluviolacustrine soils with slopes ranging from 0 – 9%, moist Engelmann spruce forest, wet Engelmann spruce-subalpine fir open forest, wet shrubby meadow, or birch fen occurring within the lower subalpine region.
- **CA2 ecosite** falls within the Cavell ecosection and is characterized by non-calcareous till soils with slopes ranging from 15 – 70%, and Engelmann spruce or subalpine fir forest occurring within the lower subalpine region.
- **EG1 ecosite** falls within the Egypt ecosection and is characterized by non-calcareous till soils with slopes ranging from 15 – 70% and Engelmann spruce or subalpine fir forest within the upper subalpine region.
- **M and GL** (recent moraine and glacier) landscapes fall within the upper subalpine and alpine and are formed by the deposition of till by receding glaciers. They are generally unvegetated and without soils (Holland and Coen 1982).

The proposed parking lot expansion area is located in a heavily forested area. The trail network and day use area are on the lateral moraine of Angel and Ghost Glaciers. The open forest in the day use area is in an early seral stage with many saplings and small trees.

9.2 VEGETATION AND RARE SPECIES

Desktop Survey Results

A number of sensitive and non-sensitive environmental occurrences have been documented in the Alberta Conservation Information Management System (ACIMS) database throughout Edith Cavell (Appendix C; Government of Alberta 2015a). In a personal communication to M. Saunders, Dr. Rene Belland (Bryologist at the University of Alberta) flagged *Oligotrichum hercynicum* (no common name; listed as S2 imperiled on

NatureServe) as being particularly sensitive, among numerous other S1 and S2 species. Prior to the field survey, JNP biologists identified Haller's apple moss (*Bartramia halleriana*) and whitebark pine as potential species of concern to be investigated in the field survey (B. Shepherd, personal communication, 2015).

In addition, a previous report (Belland et al. 2001) noted 73 rare plant taxa at Edith Cavell, and many were observed along the margins of the existing trails. Habitat for *O. hercynicum* is typically found in montane areas on acidic mineral soils and is characteristically found on paths (Lamarck & de Candolle 1805). This species was found in 2001 at two locations within the project area (NatureServe 2015a; M. Saunders, personal communication, 2015). Belland et al. note that trail improvements may have a significant effect on rare plant species' populations along existing trails, but construction of new trails may promote an increase in these populations. It is possible that the temporary loss of habitat along trail margins may be offset by the habitat gained through the construction of new trails where trail margins provide colonization areas for rare plants. *Oligotrichum hercynicum* is considered a VEC likely to be affected.

Field Survey Results

A field survey of the project area was completed on August 5 and 21, 2015 by Associated Environmental Consultants environmental scientists Joël Gervais (B.Sc.) and Molly Penzes (B.Sc., A.I.T.). The dominant species in the dense forested area of the proposed parking lot expansion area are Engelmann spruce (*Picea engelmannii*) and white spruce (*Picea glauca*), while the understorey is made up of willow (*Salix* species) with heavy regeneration by tree saplings. The day use area has open forest dominated by similar species to the proposed parking lot area; lodgepole pine (*Pinus contorta*) and whitebark pine (*Pinus albicaulis*) also occur in the day use area. The trail is located on a lateral moraine with little vegetation (mostly trees); however, mosses and lichens are present (Associated Environmental 2015). A comprehensive list of vegetation observed in the general project area (specific areas had not been determined at the time of the field survey) on August 5, 2015 is available in Appendix C).

Ten whitebark pine trees were located within the proposed new day use area; individual locations are provided in Appendix A, Figure 5. Whitebark pine is protected federally by SARA (Schedule 1 – Endangered) and provincially under the *Wildlife Act* Regulations (Schedule 6 - Endangered Species). This species may be affected by the project, and measures will be employed to ensure each tree is protected or relocated to a suitable area.

Sitka columbine (*Aquilegia formosa*) was identified near the parking lot expansion area. Sitka columbine is listed as S3 vulnerable by NatureServe as its range is limited only to the Jasper area (NatureServe 2015b). However, this species does not have a federal or provincial conservation listing (i.e. under SARA or the *Wildlife Act*) and Parks Canada does not require any special provisions for this species (Parks Canada 2016a).

The August 5, 2015 field assessment determined that habitat for Haller's apple moss was not present in the project area. Furthermore, discussion with a moss and lichen expert (R. Belland, personal communication, 2015) confirmed that Haller's apple moss is not likely present in the forested portion of the project area.

Projects in the subalpine are normally required to conduct intact sod mat salvage as part of restoration activities. However, the scheduling of construction activities on this project would result in long-term, over summer storage of sod mats. They are unlikely to survive a period of this length in storage. As such, sod mat salvage is not required for the parking lot area. Where sod mats exist near the trail construction activities, sod mat salvage will be used as part of restoration efforts in these areas (M. Saunders, personal communication, 2016).

9.3 WILDLIFE AND WILDLIFE HABITAT

All wildlife present at Edith Cavell are considered VECs. Some wildlife (federally listed), such as woodland caribou, are especially sensitive to human activities and could be affected. Other non-listed wildlife species (such as gray jay [*Perisoreus canadensis*]) may also be present at Edith Cavell. The mitigation measures applied to the entire project should accommodate all wildlife during the temporary disturbance caused by construction.

Bears

Suitable habitat for grizzly bear (*Ursus arctos*) and black bear (*Ursus americanus*) occurs in JNP. Grizzly bears are known to frequent nearby areas (B. Shepherd, personal communication, 2015). Grizzly bear has been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of special concern. The species currently has no federal status under SARA. Provincially, grizzly bear is listed as threatened under Schedule 6 of the *Wildlife Act* Regulations. Black bear is designated secure in Alberta. Habitat at Edith Cavell is abundant and not unique in JNP. Construction activities may attract and impact local bears; the increase in disturbance footprint is not expected to impact local bears. Because grizzly bear is a species of concern in JNP and has potential to be present during project activities, the species is considered a VEC likely to be affected.

Woodland caribou

Woodland caribou (*Rangifer tarandus caribou*, boreal population) is protected federally by SARA (Schedule 1 – Threatened) and provincially under the *Wildlife Act* Regulations (Schedule 6 - Threatened). In May 2014, COSEWIC completed an assessment of the southern mountain population, listing them as Endangered. Additionally, the entire day use area is located in core critical habitat for woodland caribou (Recovery Strategy for Woodland Caribou (*Rangifer tarandus caribou*), Boreal Population, in Canada, Government of Canada 2012). Project activities are not anticipated to affect woodland caribou during their most sensitive reproduction period (i.e., calving in May and early June) because the project area is not considered typical calving habitat (L. Neufeld, personal communication, 2016). However, measures for mitigation of effects to the species will be incorporated into the project schedule (Tables 1 and 2) and woodland caribou are considered a VEC likely to be affected due to its federal and provincial status as a threatened species

Small mammals

Parks Canada Environmental Assessment Specialist, M. Saunders, indicated the area also provides habitat for marmot (*Marmota* spp.), pika (*Ochotona princeps*), and golden mantled ground squirrel (*Spermophilus lateralis*); therefore, a survey will be conducted by qualified Parks Canada staff prior to construction to

provide information on the presence of these species (Parks Canada 2014). All three species are designated secure in Alberta and not expected to be directly impacted by the project activities. Whether small mammals will be affected remains unknown until a survey can be conducted. This survey is discussed in the mitigation section of this BIA.

Birds

The presence of whitebark pine at the treeline suggests potential habitat for Clark's nutcracker (*Nucifraga columbiana*). A decline in the population of whitebark pine has consequently resulted in a decline in the population of Clark's nutcracker (Government of Alberta 2015b). Clark's nutcracker is not provincially or federally listed under SARA or the *Wildlife Act* Regulations; however, provincial management documents describe this species as "Sensitive" (Government of Alberta 2010). Clark's nutcracker is not considered a VEC likely to be affected because its presence is reliant on whitebark pine trees which will be protected.

Migratory birds have the potential to nest within the project area; nesting areas are considered VECs that could be affected by vegetation clearing during sensitive breeding and nesting periods. This is primarily a concern for the parking lot expansion area and access road.

9.4 SOILS AND LANDFORMS

Site leveling, excavating, and stockpiling will be required, thus there is potential for soils to be mobilized by wind and water. Soils contain the local seedbank that may be altered or affected during construction. Mitigation measures will be implemented to avoid loss of soils and the seedbanks that they contain.

The glacial moraine at Edith Cavell will not be affected aside from the construction, and upgrades to the trail network. Minor site levelling and contouring will be required for the parking lot expansion area and access road; however, drainage will be maintained through the area.

9.5 AQUATIC RESOURCES

There are several waterbodies within the project area. At the base of Angel Glacier, and below Ghost Glacier, lies the Cavell Tarn. Cavell Tarn Creek originates at the tarn and flows north past the project area. Cavell Tarn Creek is, at its nearest, 12 m from the project area. Teahouse Creek, a tributary to Cavell Tarn Creek, flows from the east through the project area under two clear span pedestrian crossings. Teahouse Creek and Cavell Tarn Creek join and flow north past the parking lot and along Cavell Road, into Cavell Lake. Beyond Cavell Lake, the creeks join the Astoria River and eventually reach the Athabasca River.

Fish are not expected to be present in the Cavell Tarn Creek; however, this waterbody is connected by surface flow to known fish-bearing waters downstream of the project area, including Cavell Lake (approximately 850 m downstream from the project area), Astoria River, and Athabasca River.

During the field survey, two drainage channels were observed flowing into a wet area near the existing parking lot. These drainages flow underneath rocks and boulders sporadically coming to the surface in several locations. No defined stream channels were observed. These drainages are likely run-off from the

slopes to the east. Additional information on the drainages is provided in the project survey memo (Associated Environmental 2015).

While no instream work is proposed as part of the project, drainage of the parking lot area will need to be accommodated in the design which will require installation of culverts or similar structures. There is potential for sediment laden water and pollution from spills to enter these watercourses and drainages during construction; therefore the introduction of deleterious substances into these features may impact downstream fish and fish habitat.

9.6 CULTURAL AND HISTORICAL RESOURCES

There are no buildings, aside from the outhouse facilities in the parking lot. An old tea house was once located in the area but was previously removed. A trail head staging area constructed of concrete, stone, and metal, is located adjacent to the southeast corner of the parking lot. This trailhead contains historical information on nurse Edith Cavell, Mount Edith Cavell, and the alpinists who first ascended the mountain.

A Historical Resources Impact Assessment was completed in October and November 2015, which determined there were no further historical resources or ceremonial sites at Edith Cavell (Circle CRM Group 2015).

9.7 AIR

Minor effects on air and air quality are expected from the release of carbon emissions from construction equipment. These effects are expected to be temporary and readily dissipate provided that the mitigation measures recommended in this BIA are employed. As such, air is not considered a VEC likely to be affected.

Dust generated from air borne particles from excavating and re-grading may adversely affect air quality and potentially, nearby surface water. In the dry summer, and early fall months, mitigation for dust control (i.e. applying water to the work area) may be required until vegetation is established.

9.8 VISITOR EXPERIENCE

Edith Cavell is open to visitors during the summer months and is mostly accessed by vehicle using Cavell Road. The project area falls within the area of delayed access from November 1 to February 15 (Parks Canada 2013) for protection of caribou core critical habitat. Construction will be phased from early-May to the end of October (depending on persistent or early-season snow) to avoid the delayed access period (November 1 to February 15). Construction of the parking lot expansion, trail upgrades, and the day use area will be planned while the Edith Cavell area is open to the public. However, components such as the parking lot expansion are located outside of the existing area accessible by the public and therefore minimal impacts to visitor experience are expected and can be mitigated through project scheduling discussed throughout this BIA. Trail work and construction of the day use area is considered to be of minimal disturbance to the public relative to the parking lot expansion. Work areas along the trails will be

closed during construction and the public will be safely detoured around construction sites. Public access will be available to the remaining Edith Cavell area during construction.

Because the laydown area may be located in the existing parking lot, there will be a temporary loss of parking spaces in the existing parking lot. However, there will be no overall loss of parking at project completion. Additionally, the expanded parking lot will result in a net gain of parking spots and a positive effect for visitor experience.

Access to the project area will be via Cavell Road, which may cause minor traffic delays on Highway 93A during equipment transport. Construction traffic is not expected to significantly impact users of the nearby Edith Cavell Hostel, which is located approximately 1.7 km north of the project area along Cavell Road and is open year-round (though access by vehicle is limited to the summer months only).

Construction of the parking lot and access road will be completed during the visitor period, in areas not presently accessed by the public. As such, this work is not expected to impact recreation opportunities.

Rehabilitation work will involve the use of large and small machinery that may produce temporary negative visual and auditory effects for the duration of the work. Visual and auditory effects are considered a VEC likely to be affected.

Access to the construction sites will be restricted to project and Parks Canada staff only. Due to schedule overlap between the open season for visitors and the proposed construction, some project areas will be fenced for visitor safety. Appropriate signage will be posted at potential access points to inform passers-by of the work and prohibited access of the site. Provided that these measures are employed, visitor safety is not a concern.

Due to the temporary effects of parking lot and trail construction, Edith Cavell's essence of place is not considered a VEC likely to be affected.

Effects Analysis, Mitigation Measures, and Significance Determination

Using the Effects Identification Matrix (completed Matrix in Appendix B), the following potential adverse effects may be associated with the parking lot expansion, trail enhancements, and day use area construction at Edith Cavell. The effects analysis was completed considering the VECs likely to be affected by the project; however, it is expected that general mitigation measures identified in Section 11 can be implemented to minimize any short and long term effects that the project may have on the environment.

10. EFFECTS ANALYSIS

Vegetation and Rare Plant Species

- tree and shrub removal for parking lot expansion area and access road;
- potential disturbance to whitebark pine, in the day use area; and
- potential disturbance to *Oligotrichum hercynicum*, a rare plant noted along trail margins at Edith Cavell.

Wildlife and Wildlife Habitat

- potential attraction of wildlife due to food and/or food odours, garbage, or human presence;
- potential habituation of wildlife due to human presence and activities;
- potential disturbance of wildlife including small mammals due to construction activities and noise;
- potential negative human / bear encounters resulting in habituation of the bear, the need to relocate the bear, and/or localized closure of Edith Cavell to the public; and
- potential disturbance to woodland caribou due to human presence and fragmentation of their habitat due to fences and/or handrails.

Soils

- potential soil compaction resulting from machinery use;
- potential erosion of disturbed areas by wind or rain;
- potential soil contamination from accidental spill/leak of a deleterious substance; and
- potential disturbance of the seedbank.

Aquatic Resources

While no instream work will occur as part of the project, the access to work areas will require the crossing of either pedestrian structure by labourers and equipment. Additionally, the creek flows very close (approximately 12 m) to the project area for a short distance and could be negatively affected by project activities.

- potential for contamination from accidental spill/leak of a deleterious substance;
- potential for temporary decrease in water quality due to mobilization of sediments from construction activities; and
- loss of wet areas by modifications to the drainages passing through the new parking lot.

Cultural Resources

Effects analysis was not completed for ceremonial or historic sites because none were identified at Edith Cavell and as such neither components are considered a VEC likely to be affected (Circle CRM Group 2015). Nonetheless, site signage displaying the history of nurse Edith Cavell, Mount Edith Cavell, and the alpinists who have ascended the mountain, and the stonework in the area could be damaged during the rehabilitation. The existing stonework, signage, and trailhead infrastructure may be accidentally damaged by construction; as such, construction equipment and personnel will not enter these areas. 'Off-the-clock' construction personnel may pass through as tourists only and no equipment will enter this area.

Air Quality

- greenhouse gas emissions from machinery and equipment;
- increased dust due to construction activities.

Recreational Use and Aesthetics Concerns

- potential disruption to visitors due to construction activities and noise;
- temporary aesthetic impact during rehabilitation activities.

Summary of Effects Analysis

VECs likely to be affected by the project that were further considered in the Effects Identification Matrix are:

1. vegetation (including rare species),
2. wildlife and wildlife habitat,
3. soils, and
4. aquatic resources (specifically Teahouse Creek and Cavell Tarn Creek).

11. MITIGATION MEASURES

This section identifies technically sound and economically feasible measures that will mitigate the identified potential adverse effects on VECs associated with the project. It is expected that some temporary effects to VECs will result from the construction activities, but VECs at Edith Cavell are expected to recover within a short period provided all of the mitigation measures are implemented.

A. PRE-CONSTRUCTION REQUIREMENTS

Prior to construction, the following must be completed,

1. The Departmental Representative (or Project Manager) will contact the *Environmental Surveillance Officer (ESO)* – Jurgén Deagle (780.883.0794 and Jurgén.Deagle@pc.gc.ca) **two weeks (or as soon as possible) prior to commencement of work.**
 - a. The ESO or designate will schedule an on-site environmental briefing with all construction personnel, arrange site surveillance, and will issue applicable Special Activity Permits.
 - b. The ESO or designate will ensure all project operations are conducted in accordance with all identified environmental protection measures.
 - c. The ESO or designate will ensure that workspaces and limits of clearing comply with those in the design drawings. Changes to workspaces or limits after tendering will be done in consultation with the ESO and Departmental Representative (or Project Manager).

- d. The ESO or designate may require additional mitigations in response to any unforeseen environmental impacts.
2. An early-season rare plant survey will be conducted by the consultant, Associated Environmental, for the parking lot expansion area, access road, day use area, and the potential trail alignment. This survey will follow the Alberta Native Plant Council's Guidelines for Rare Plant Surveys and will be conducted when the entire area is snow-free. The survey will be to identify any early-flowering rare plants to supplement the plant survey conducted in August 2015.
 3. Prior to trail construction, a qualified specialist will survey the trail area for *Oligotrichum hercynicum*. The survey will be conducted at a suitable time to ensure maximum probability of plant detection. If possible, the alignment will be adjusted to avoid this moss. If present (and suitable) the specialist will facilitate the relocation of individuals to suitable areas, and at a suitable time when the soil matrix is thawed and the plant can be moved without harm.
 4. Prior to day use area construction, a final survey for whitebark pine will be conducted in and near the construction area by the Consultant. All whitebark pine trees found in this area will be protected by establishing a 5.0 m radius buffer around each tree using temporary fencing, as directed by Parks Canada; construction equipment and personnel will not enter these buffers. Seedlings and saplings may be transplanted from the work area by Parks Canada staff. Following consultation with Parks Canada National Species Conservation, the Jasper field Unit will apply for authorization to proceed with these mitigation measures (M. Saunders, personal communication, 2016).
 5. Parks Canada biologists will conduct a survey for rodents and lagomorphs prior to tendering to determine if and how these animals could be affected by construction.
 6. The Consultant will prepare an Erosion and Sediment Control (ESC) plan that considers both the temporary and permanent ESC strategies and devices that will be installed. The ESC plan will be reviewed and approved by Parks Canada before rehabilitation work begins.
 7. The Consultant will prepare a Restoration Plan in consultation with the Parks Canada Vegetation Restoration Specialist (Landon Shepherd; 780-883-0473 or Landon.Shepherd@pc.gc.ca). The Restoration Plan will be reviewed and approved by Parks Canada.
 8. The Contractor will prepare and submit to Parks Canada for review and approval, a Hazardous Spill Response Plan prior to starting work.
 9. All necessary permits will be obtained prior to the commencement of construction activities.
 10. The Contractor must adhere to the ESC Plan, Restoration Plan, Hazardous Spill Response Plan, and the mitigations listed in this BIA. Any changes or deviations from these plans will be approved by the ESO.
 11. The Contractor must ensure that all work is performed in accordance with the ordinances, laws, rules and regulations set out in the *Canada National Parks Act and Regulations*.

B. SITE-SPECIFIC MITIGATION MEASURES

Vegetation and Rare Species

1. The Departmental Representative (or Project Manager) in consultation with the ESO will clearly mark the work area and laydown area boundaries prior to on-site activities. There will be no removal of trees or other vegetation outside of these boundaries. Root systems of surrounding trees will be left intact whenever possible.
2. For vegetation clearing:
 - a. All trees to be removed will be marked prior to removal.
 - b. Larger wood debris will be stockpiled on site for JNP's use as firewood.
3. Vegetation clearing will be subject to restrictions under the MBCA, SARA, and *Wildlife Act*. Clearing will be completed outside of the migratory bird nesting window, which is between April 17 and August 31, annually (in the A4 bird conservation region as provided by Environment Canada; Government of Canada 2014).
4. Prior to trail work, care will be taken to remove and store intact sod / vegetation mats. Work to the sod / vegetation mats will only occur in late spring once the soil is sufficiently thawed to avoid harm to sensitive plants, or late summer / early fall. These sod / vegetation mats will be used as the initial groundcover in the reclamation phase as is recommended by Parks Canada reclamation specialists (L. Shepherd, personal communication, 2015). Sod removal and similar trail work may commence in the spring provided that the ground is sufficiently thawed to accommodate sod removal. If unable to complete trail works in the spring, the tasks will be completed in the fall (M. Saunders, personal communication, 2016). The following measures apply to sod salvage:
 - a. Maximize sod salvage.
 - b. Clearly mark areas for sod salvage.
 - c. Sods should be comprised of 50% or more vascular plant species and established root structures before vegetation sod salvage and transplantation should be attempted.
 - d. Remove sods in square cornered blocks, hand cut by shovel or with clean-up bucket of excavator, on a level plane below the root, and maintain a consistent depth of 10 to 15cm.
 - e. Use hand crews to assist the excavator to remove sod blocks with cutting and storage of sods. Gather loose soil and root material to be retained with sod.
 - f. Do not bend or roll sod blocks and minimize the amount of handling.
 - g. Store sod on flat ground or on a conveyance apparatus (pallet, wood sheeting).
 - h. Cover salvaged sod with a white, breathable geo-textile fabric to protect from precipitation and sun. Store sod mats in the shade. Sod mats will be stacked to a maximum of 5 high; vegetation to vegetation and soil to soil.
 - i. Removal of sods by hand in the alpine is preferred, to better protect sensitive plant communities and to maximize reclamation success in alpine areas.
 - j. Keep stockpiles moist in dry weather without over-watering, otherwise wet sod may compost.
 - k. Sod will be stored for a maximum of three days during active growth season (i.e., June and July) and up to two weeks during August. Storage is unrestricted from September to June, when sods are dormant.
5. Any whitebark pine that fall within the proposed disturbance area and cannot be retained in that area will be relocated under the direction of Parks Canada. Changes to

construction design will be considered to avoid individual whitebark pine prior to relocation. Relocation is to be considered as a last measure to prevent harm.

6. Whitebark pine (*Pinus albicaulis*) is federally listed as “threatened” under the federal *Species At Risk Act* and the Alberta *Wildlife Act*. Individuals must not be disturbed, harmed or killed in any way.
7. The boundaries of all vegetation clearing areas will be well marked. Roots systems will be left intact when possible to assist with ESC.
8. Willow stakes (cut locally or from a similar ecosite) will be used for restoration activities. Cuttings will be made during the dormant season (after leaf fall and before bud break). No more than 10% of a plant, and no more than 10% of the willows in an area will be harvested (L. Shepherd, personal communication, 2015). Willow stakes will be planted during early spring for the best chance of survival, prior to budding, in thawed soil that remains moist. If cuttings cannot be planted immediately, stakes will be propagated into plugs immediately following collection.
9. A seed certificate must be presented to Parks Canada for approval prior to seeding.
10. All disturbed areas will be restored using the methods above (topsoil salvage, sod mat salvage along trails, seeding and willow cuttings), as well as a seed mix approved by Parks Canada from a local supplier to ensure seed provenance (Appendix D).
11. Seeded areas and willow cuttings will be monitored and watered as required to ensure proper site reclamation.
12. New trails will be constructed using hand tools only and will not require the use of mechanized machinery.
13. Machinery required for trail widening activities will remain within the trail footprint.
14. Where trail widening activities require grading:
 - a. Asphalt will be collected and disposed of as specified in the Laydown Area and Hazardous Materials mitigation section,
 - b. Cut material from the trail will be used to widen the trail and will be placed on the slopes beside the trail, and
 - c. Slope cutting activities will be preceded by surveys for whitebark pine on either side of the trail and the mitigation measures as per the Pre-construction Requirements section; if there is potential for fill material to be deposited within 5 m of a whitebark pine, the whitebark pine will be barricaded, and the fill moved around and away from the tree.
15. Trail construction will also not occur when snow is present on the trail.
16. Rig mats will be put down where machinery is required to operate on vegetated areas that are to remain undisturbed.
17. The Contractor will ensure that the restoration mitigations are completed to the satisfaction of the Departmental Representative.

Wildlife and Wildlife Habitat

1. Work will not occur during the delayed access period for woodland caribou as specified by Parks Canada (i.e., the delayed access period from November 1 to February 15; B. Shepherd, personal communication, 2015).

2. To avoid “fencing” effects on woodland caribou, which could result from handrails, handrails will be restricted to viewpoints and areas where visitor safety is a concern. Handrails will be limited to short lengths on trails, and only installed where necessary.
3. Any observations (sightings, signs) of caribou in the project area will be reported to the Parks Canada biologists through the Jasper Dispatch contact (780-852-6155).
4. All food and garbage will be stored and handled in accordance with the *National Parks of Canada Garbage Regulations* (SOR/80-217).
5. At all times, food, cookware, garbage, and other attractants will be stored in wildlife-proof containers or vehicles, or removed from the site.
6. Nuisance wildlife and any incidents involving wildlife attempting to access garbage or attractants will be immediately reported to Jasper Dispatch (780-852-6155).
7. Feeding, harassment, or destruction of any wildlife is strictly prohibited. Wildlife encountered at or near the project location will be allowed to passively disperse without undue harassment.
8. To reduce noise and emissions, machinery and equipment will be turned off when not in use and only operated during daylight hours.
9. Woodland caribou (*Rangifer tarandus caribou*) is listed as “threatened” under the federal *Species At Risk Act* and the *Alberta Wildlife Act*. Individuals must not be disturbed, harmed or killed in any way.

Soils

1. Topsoil and the upper organic layer will be salvaged and used for restoration activities in the parking lot area.
2. The ESO and the Parks Canada Wildlife Biologist (Mark.Bradley@pc.gc.ca, 780-883-0003) will be notified prior to ground disturbance activities.
3. The Contractor will be responsible for topsoil protection within the construction limits. Methods for topsoil protection will be reviewed and approved by Parks Canada prior to construction.
4. Excess topsoil will be stockpiled under Parks Canada direction for future use.
5. Excavations deeper than 1.2 m deep will be fenced or covered when left unattended.
6. Sod mats present next to trail construction activities will be salvaged (as intact pieces wherever possible) for use in reclamation.
7. All imported material must be certified weed-free.

Aquatic Resources

1. All hazardous materials will have primary and secondary containment when outside of the laydown area.
2. Equipment will not enter any waterbody.
3. Concrete will be mixed at least 30 m from a watercourse.
4. Concrete wash-out must be completely contained and removed from site. There will be no runoff of concrete washout at the site.
5. Water that comes into contact with curing concrete must not come into contact with any waterbody.
6. Sediment-laden water will not be allowed to enter into any waterbody and will instead be directed into vegetated areas selected as appropriate by the Departmental Representative.

Cultural Resources and Visitor Experience

1. In the event that cultural or historical artifacts are observed, all construction activities will stop immediately at that location and the Parks Canada Cultural Resource Specialist (Mike Dillon; 780-852-6164), ESO (Jurgen Deagle; 780-883-0794), or Jasper Dispatch (780-852-6155) will be notified.
2. The public will be notified of the Edith Cavell rehabilitation project, including any trail closures, access restrictions, and timelines, using:
 - a. Appropriate signage at the Edith Cavell trailhead and at the junction of Cavell Road and Hwy 93A, and
 - b. A public notice posted by Parks Canada online and in the JNP Visitor Information Center.
3. The Contractor will ensure that all existing infrastructure, including historical information signage, the existing stonework, signage, and trailhead is protected from damage during construction activities.
4. Remove fences upon completion of construction (leave only fences around reclaimed areas if necessary to limit foot traffic in reclaimed areas).

C. STANDARD MITIGATION MEASURES

Standard mitigation measures are intended to be implemented throughout the project area, under all applicable scenarios.

Erosion and Sediment Control

1. The Contractor will adhere to the ESC Plan prepared by the Consultant, and reviewed and approved by Parks Canada.
2. All ESC measures will be free of hay and straw to prevent the spread of non-native seeds and to prevent attracting wildlife.
3. Aside from the required components, the ESC plan will address slopes where (a) ground disturbance occurs, and (b) waterbodies are present at the toe of slopes.
4. All applicable erosion and sediment control measures will be in place before the first snow fall to ensure that spring melt conditions do not result in significant erosion.
5. Sections of the trail that are frequently wet will have water conveyance structures under or through the trail, and features to ensure public users are directed away from erosion prone areas.
6. Erosion and sediment control measures will be designed to facilitate restoration efforts, inspected and monitored for their required lifetime.

Laydown Area and Hazardous Materials

1. Laydown areas will be located in previously disturbed areas.
2. All machinery and equipment will be clean of soil/clay and vegetative debris prior to entering and departing Jasper National Park.
3. All refuelling and minor servicing of heavy machinery will take place in the laydown area.
4. All small machinery (e.g., generators, light stands, etc.) will be placed on spill pans or have another form of secondary containment.
5. Equipment will be transported away from the site if general maintenance or repairs are required.

6. All heavy equipment, bulk supply fuel trucks, company pickup trucks, and trucks with a slip tanks will be equipped with spill kits capable of handling 110% of the largest possible spill on-site; operators will be familiar with the location and use of spill kits.
7. Any detected leaks must be addressed immediately with absorbent pads and the faulty equipment either removed from site or repaired immediately. Equipment stored overnight must be stored on tarps (or approved equivalent) with appropriate containment as required. Secondary containment (ie. drip trays) must be used under all stationary equipment (ie. generators).
8. Additional spill kits will be maintained in the laydown area to replace used materials.
9. All liquid hazardous materials (e.g., fuels, oils, lubricants, hydraulic fluids, solvents, paints, etc.) will be stored in approved containers and located in the laydown area.
10. The laydown area will be located at least 30 m from the high-water level of Cavell Tarn Creek.
11. Paved surfaces will be protected from damage by heavy machinery using street pads, tires, or similar material.
12. Refueling must occur on tarps or other impervious barrier. Refueling of the equipment must occur on land at least 30 m from any watercourse.
13. The Contractor will be responsible for immediate spill response for spills of all volumes. In the event of any fluid spills or leaks exceeding 1 L or any spill quantity into water, notify Parks Canada Dispatch (780-852-6155) and the ESO (780-883-0794) immediately. Any absorbent materials used in the clean up or soils contaminated by the spill must be disposed at an appropriate facility.
14. The contractor will notify the ESO (Jurgen Deagle; 780-883-0794), or Jasper Dispatch (780-852-6155) immediately upon discovery of any spills or leaks that exceed 1 litre, or spill into a waterbody.
15. All waste will be stored and handled in accordance with the National Parks of Canada Garbage Regulations (SOR/80-217), source separated and disposed of as follows:
 - a. **Sorted materials:** clean wood, glass, metal, concrete and clean fill shall be disposed of separately.
 - b. **Cardboard** will be recycled.
 - c. **Unsorted waste:** including drywall, carpets, treated or painted wood, asphalt, tar paper, tar and gravel shingles and other mixed construction debris must be disposed of at an approved landfill site.
 - d. **Hazardous waste:** such as contaminated soil, fuel tanks, asbestos, materials treated with lead paint, mercury switches and light ballasts, must be disposed of at an approved landfill site. Contact with the facility in advance is required for the delivery and acceptance of these materials. Parks Canada must be provided with a receipt from the landfill facility documenting the amount and type of hazardous materials accepted.
16. Shut off vehicle engines and machinery when not in use and to reduce dust, avoid unnecessary driving.
17. Fence the laydown area and any open excavations to reduce risks to public safety.
18. Equipment must remain on ground within the grading and construction work limits.
19. The Contractor is responsible for public and site safety at all times

Excavated Material Storage

1. Allow space for separate storage of sods, topsoil and spoil. Topsoil may be stored on hardened surface, geo-textile material or directly on undisturbed vegetation. If storage occurs on vegetation, material recovery by hand may be required.
2. Cover all stockpiled material with heavy-duty plastic or filter cloth for protection from erosion during precipitation events.

12. CONSIDERATION FOR THE NEED FOR PUBLIC PARTICIPATION & INDIGENOUS CONSULTATION

FOR PARKS CANADA USE ONLY

12 a) Indicate whether opportunity for public notification should be offered:

☐ No ☐ Yes

12 b) Indicate whether there is a requirement for Indigenous notification in relation to project impacts:

☐ No ☐ Yes

13. EFFECTS SIGNIFICANCE

Temporary Effects

Temporary effects of the project may include:

- temporary loss of rare plant habitat along margins of existing trails: rare plant species may recolonize these areas, or margins of new trails in the future after trail upgrades are completed;
- disturbance to local wildlife caused by construction activities and sounds; and
- risks of spills and leaks from equipment, with risk of overland flow to nearby streams.

Minimal temporary effects are expected provided the mitigation measures outlined in Section 11 are properly implemented.

Residual Effects

No significant adverse environmental effects are anticipated to result from proposed project activities provided that all mitigation measures discussed in this report are followed. Furthermore, no significant adverse effects are anticipated for the identified VECs.

Cumulative Effects

Cumulative effects result from the proposed project in combination with other projects or activities that have been or will be carried out in the project area. This includes consideration of the effects of existing developments, projects that have been (or will be) proposed and have a reasonable likelihood of being carried out, provided they have the potential to act in combination with the effects of the project (Parks Canada 2016b).

At this time there are no projects planned in JNP that combined with the proposed upgrades to Edith Cavell would result in cumulative effects. Use of the park will be restricted to the infrastructure proposed (i.e. parking only within the designated parking area, foot traffic on walking trails only, day use in designated areas). The overall project is expected to contribute to minimize long-term or cumulative impacts to the environment in an area that is historically frequented by visitors. Additionally, the park upgrades are anticipated to improve overall visitor experience at Edith Cavell.

Surveillance, Monitoring, and Consultation

14. SURVEILLANCE

Document whether surveillance (also referred to as compliance monitoring or site inspection) will be required while the project is underway, to verify that required mitigation measures are implemented.

- ☐ Surveillance required
☐ Surveillance not required

The ESO may conduct regular inspections during rehabilitation works at Edith Cavell to ensure the prescribed mitigation measures are in place and maintained during and after completion of the project. The ESO will also inspect site reclamation.

15. FOLLOW-UP MONITORING

Follow-up monitoring is:

- ☐ not required
☐ legally required (e.g., under the *Species at Risk Act* or *Fisheries Act*)
☐ required in accordance with the *Parks Canada Cultural Resource Management Policy*

16. SPECIES AT RISK ACT NOTIFICATION

Notification is:

- ☐ not required
☐ required under the *Species at Risk Act*.

17. EXPERTS CONSULTED

Department/Agency/Institution:
Landon Shepherd, Vegetation Restoration Supervisor, JNP Brenda Shepherd, Conservation Biologist, JNP Meagan Saunders, Environmental Assessment Scientist, JNP Rene Belland, Bryologist / Lichenologist, University of Alberta Layla Neufeld, Woodland Caribou Specialist, JNP
Expertise Requested: Local knowledge and guidance from Jasper Field Unit
Response: Comments provided and incorporated into the BIA


BIA Outcome

18. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

_____ not likely to cause significant adverse environmental effects.
_____ likely to cause significant adverse environmental effects.

BIA Author (Associated Environmental Consultants Inc.):

Name: Joël Gervais, B.Sc., CISEC, QAES	Date: April 22, 2016
Position: Environmental Scientist	
Signature: 	

BIA Reviewed by (Associated Environmental Consultants Inc.):

Name: Sandra Meidinger, P.Biol., R.P.Bio.	Date: April 22, 2016
Position: Senior Environmental Scientist, Regional Manager	
Signature: 	

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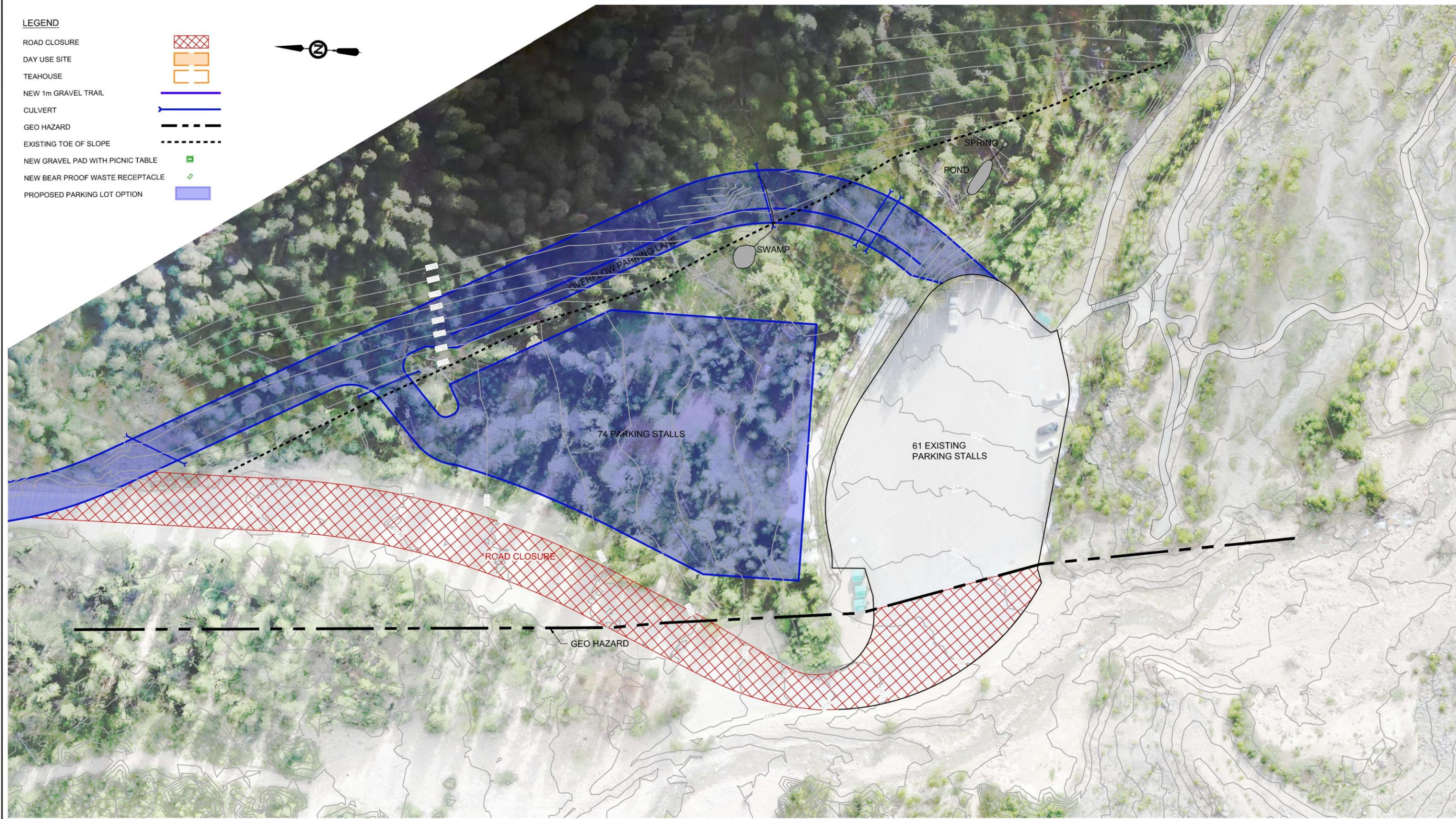
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Appendix A – Site Drawings and Whitebark Pine Locations

LEGEND

ROAD CLOSURE	
DAY USE SITE	
TEAHOUSE	
NEW 1m GRAVEL TRAIL	
CULVERT	
GEO HAZARD	
EXISTING TOE OF SLOPE	
NEW GRAVEL PAD WITH PICNIC TABLE	
NEW BEAR PROOF WASTE RECEPTACLE	
PROPOSED PARKING LOT OPTION	



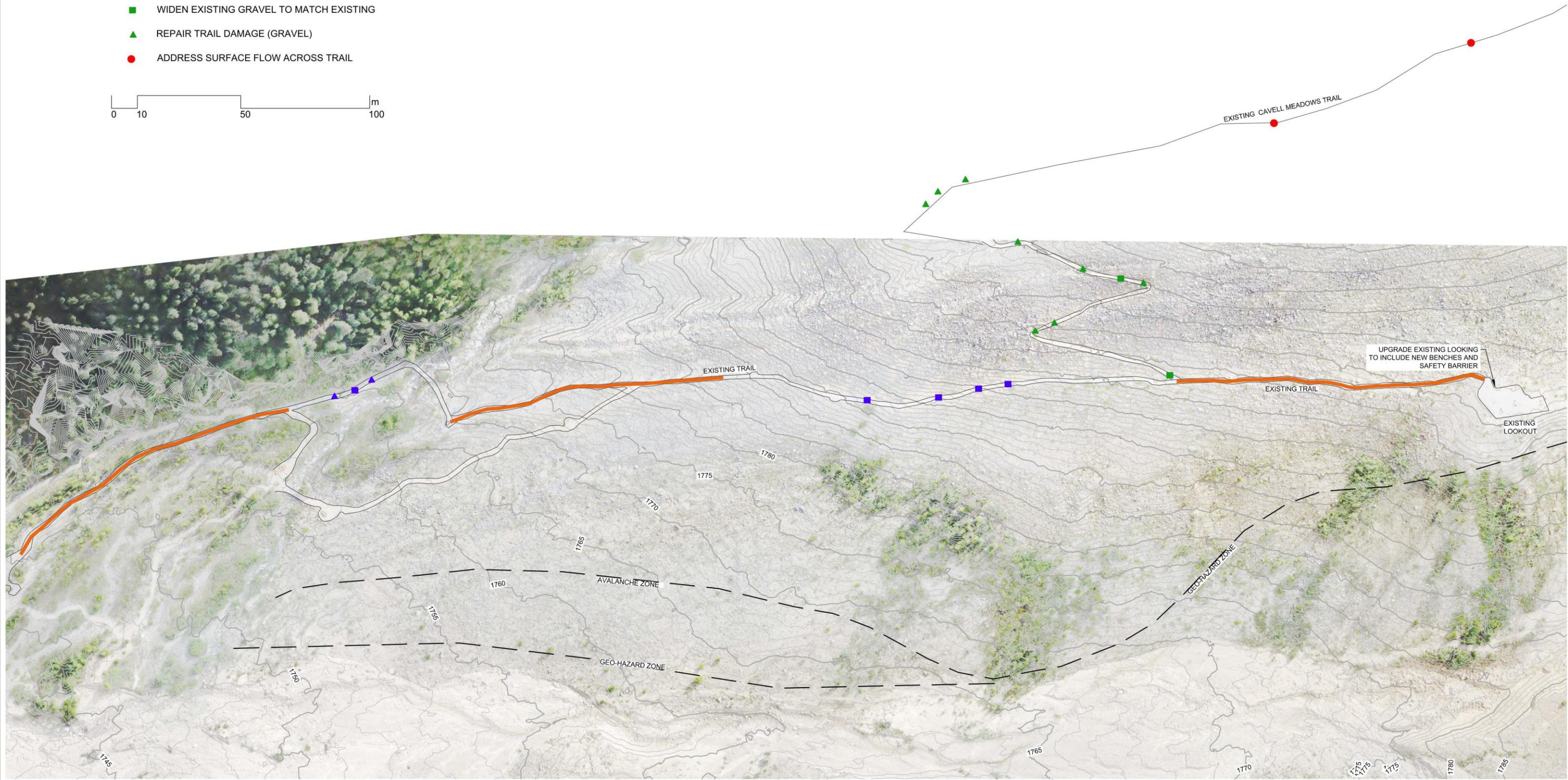
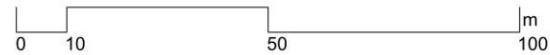
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APPROVED	
DATE	2015OCT08
REV	0
DESCRIPTION	ISSUED FOR REPORT

Figure 1
PARKS CANADA
MOUNT EDITH CAVELL REHABILITATION
PARKING LOT EXPANSION
OPTION 2B

LEGEND

- EXISTING GRAVEL TRAIL UPGRADED TO 1.2m WIDTH ASPHALT TRAIL
- WIDEN EXISTING ASPHALT TO 1.2m WIDTH
- REPAIR TRAIL DAMAGE (ASPHALT)
- WIDEN EXISTING GRAVEL TO MATCH EXISTING
- REPAIR TRAIL DAMAGE (GRAVEL)
- ADDRESS SURFACE FLOW ACROSS TRAIL



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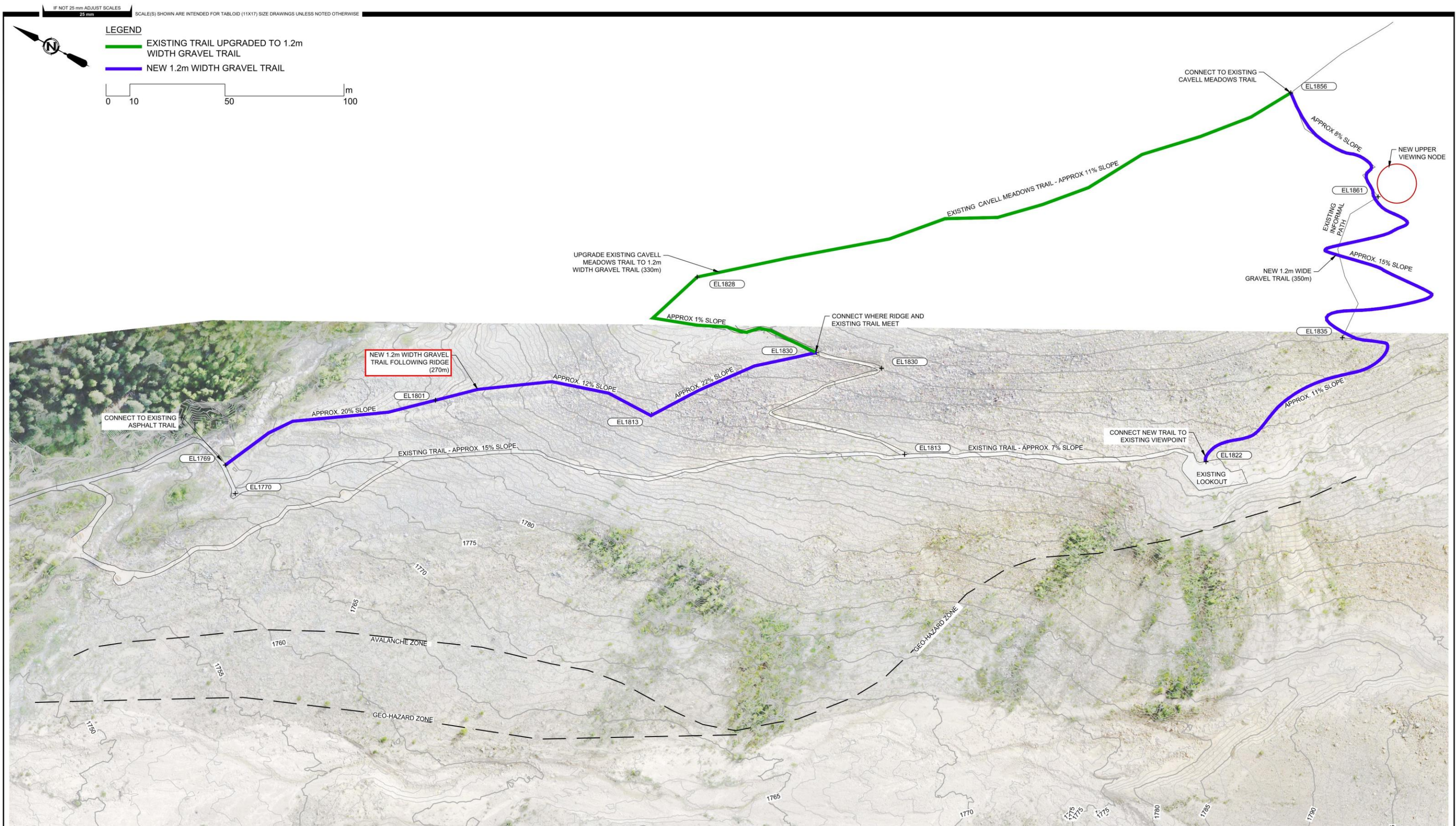
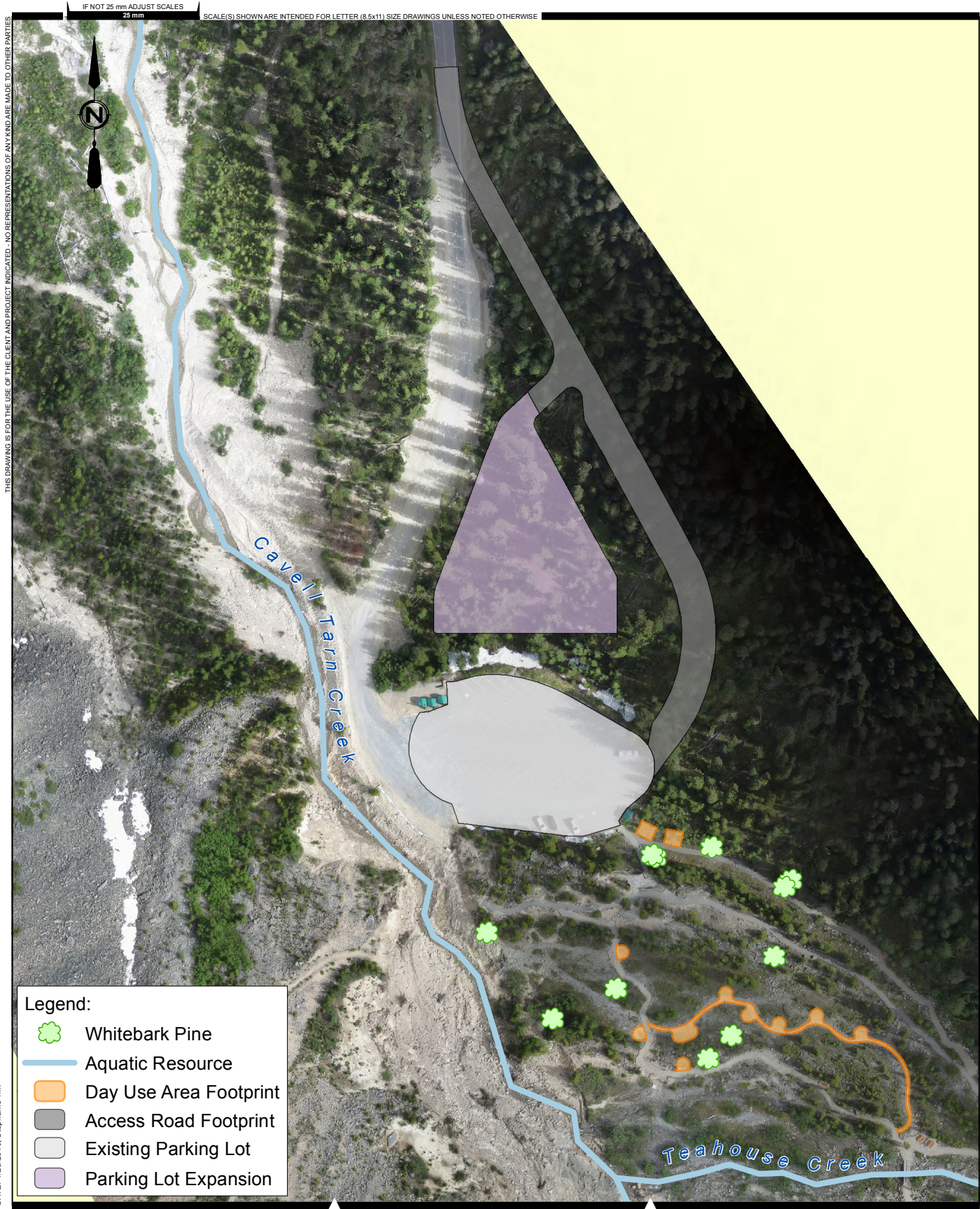




Figure 5



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DATE: 4/25/2016, Stephanie Tik



AE PROJECT No.	2015-3498.010.100
SCALE	1:1,600
APPROVED	
DATE	2016APR25
REV	
DESCRIPTION	ISSUED FOR REPORT

FIGURE No. 5

MT. EDITH CAVELL REHABILITATION

LOCATION OF WHITEBARK PINE

Appendix B – Effects Identification Matrix

You may wish to change the components listed under the headings to specify the natural or cultural resource or visitor experience objectives that are priority considerations for your PCA site or for the specific project being reviewed.

[illegible]

Appendix B – Effects Identification Matrix

[illegible]

Section B of the matrix should be used to identify potential indirect effects that may result from impacts on components of the environment you have identified on the preceding pages (see Section A - direct effects to natural resources). This is required under CEAA 2012 Sections 5(1)(c) and 5(2)(b).

For example:

- if the proposed project could lead to adverse effects to water quality and quantity, could this then effect the quantity and quality of water resources (e.g. potable water) used by an Aboriginal community?
- Could there also be adverse socio-economic effects to a community that relies on recreational fishing tourism?

B. Indirect Effects (all phases)				
<p>You may wish to change the components listed under the headings to specify the natural or resources that are priority considerations for your PCA site or for the specific project being reviewed.</p>		Impacts as a result of changes to the environment		
		With respect to non-Aboriginal peoples:		With respect to Aboriginal peoples:
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes
Phase	Natural resource components affected by the project			
All phases: Preparation /construction operation/implementation/decommissioning	Could impacts to <u>air</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>soils and landforms</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>flora</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

No indirect effects were identified.

Appendix C – Vegetation Survey Results

Rare Plant Surveys

Methods

A plant survey of the Edith Cavell area was conducted on August 5 and 20, 2015 by Associated Environmental Consultants biologists Joël Gervais, B.Sc., and Molly Penzes, B.Sc., A.I.T. A survey effort of 22 hours between both staff was spent at Edith Cavell.

Desktop searches of Government databases were conducted prior to the field survey to inform an understanding of potential rare or sensitive species that are likely to be found in the area, based on previous detections.

For the purposes of the field survey, the study area was divided into three sub-areas (the potential parking lot expansion area, the potential day use area, and the potential trail upgrades network). A walking survey of each sub-area documented 31 plant species in the parking lot expansion and day use area (Table C-1), and 17 species along the trail alignment (Table C-2). A focus was placed on detection of whitebark pine (*Pinus albicaulis*), and Haller's apple moss (*Bartramia halleriana*) due to their federal Species-At-Risk status (Government of Canada 2013; B. Shepherd, personal communication, 2015)

The potential parking lot area was traversed on foot in three meandering transects. The day use area was traversed on foot in all open areas and all areas of vegetation were investigated. The potential trail alignment was assessed by walking along the proposed alignment three times and investigating features on and within 25 m of the alignment which may represent environmental sensitivities to the project.

During the field survey, plant samples were collected for accurate identification when approximately 500 or more individuals were present in the study area, as per instruction from Parks Canada (B. Shepherd, personal communication, 2015). A sub-set of these plant samples were sent for lab identification.

The following vegetation list documents the species observed by Associated Environmental Consultants on August 5 and 20, 2015, as well as the rare plant taxa and moss species documented by Belland et al. in a 2001 report (Table C-3)¹.

¹ Belland, R.J., J. Gould, P. Cotterill, and W.J. Crins. Survey of Plant Species of Special Concern: Mt. Edith Cavell, JNP. Report prepared for Parks Canada, JNP. Reference No. QK 203.A3.B3 2001 9J 05.

Table C-1. Plant species observed by Associated Environmental Consultants in August, 2015 within the potential parking lot expansion and the potential day use area and their provincial and federal statuses

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Whitebark pine	<i>Pinus albicaulis</i>	May be at Risk	Endangered	Endangered	Endangered (Schedule 1)	S2
Sitka columbine / Crimson Columbine	<i>Aquilegia formosa</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Arrow leaved coltsfoot	<i>Petasites sagittatus</i>	Secure	Not scheduled	No status	Not scheduled	S5
Balsam poplar*	<i>Populus balsamifera</i>	Secure	Not scheduled	No status	Not scheduled	S5
Big red stem / Red-stemmed feather moss	<i>Pleurozium schreberi</i>	Secure	Not scheduled	No status	Not scheduled	S5
Blueberry	<i>Vaccinium myrtillus</i>	Secure	Not scheduled	No status	Not scheduled	S4
Bunchberry / Dwarf Dogwood	<i>Cornus canadensis</i>	Secure	Not scheduled	No status	Not scheduled	S5
Clubmoss	<i>Lycopodium</i> spp.	Secure	Not scheduled	No status	Not scheduled	---
Common yarrow	<i>Achillea millefolium</i>	Secure	Not scheduled	No status	Not scheduled	S5
Dewberry / Dwarf Red Raspberry	<i>Rubus pubescens</i>	Secure	Not scheduled	No status	Not scheduled	S5
Douglas fir	<i>Pseudotsuga menziesii</i>	Secure	Not scheduled	No status	Not scheduled	S4
Engelmann spruce	<i>Picea engelmannii</i>	Secure	Not scheduled	No status	Not scheduled	S5

² Government of Alberta. 2012. General Status of Alberta Wildlife Species 2010. Sustainable Resource Development; Fish & Wildlife Division.

³ Government of Alberta. 2016. Wildlife Regulation. Alberta Queen's Printer.

⁴ Government of Canada. 2015. Species at Risk Public Registry. http://www.registrelep-sararegistry.gc.ca/sar/index/default_e.cfm (accessed 06 Jan., 2016).

⁵ NatureServe. 2015. NatureServe Explorer. <http://services.natureserve.org> (accessed 22 Mar, 2016).

⁶ N (national rank), S (subnational rank), 1 (critically imperiled), 2 (imperiled), 3 (vulnerable), 4 (apparently secure), 5 (secure)

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Fairy puke / Candy lichen	<i>Imadophila erictorum</i>	Secure	Not scheduled	No status	Not scheduled	S5
Fireweed	<i>Chamerion angustifolium</i>	Secure	Not scheduled	No status	Not scheduled	S5
Fringed grass-of- parnassus	<i>Parnassia fimbriata</i>	Secure	Not scheduled	No status	Not scheduled	S4
Indian paintbrush	<i>Castilleja miniata</i>	Secure	Not scheduled	No status	Not scheduled	S5
Knight's plume moss	<i>Ptilium crista- castrensis</i>	Secure	Not scheduled	No status	Not scheduled	S5
Northern felwort gentian / Northern gentian	<i>Gentianella amarella</i>	Secure	Not scheduled	No status	Not scheduled	S5
Old man's beard	<i>Bryoria capillaris</i>	Secure	Not scheduled	No status	Not scheduled	S3S5
One-flowered wintergreen	<i>Moneses uniflora</i>	Secure	Not scheduled	No status	Not scheduled	S5
One-sided wintergreen	<i>Orthilia secunda</i>	Secure	Not scheduled	No status	Not scheduled	S5
Pelt lichen	<i>Peltigera</i> spp.	---	Not scheduled	No status	Not scheduled	---
Pixie-cup lichen	<i>Cladonia asahinae</i>	Secure	Not scheduled	No status	Not scheduled	S4 (British Columbia)
Pussytoes	<i>Antennaria</i> spp.	Potentially, May be at Risk	Not scheduled	No status	Not scheduled	---
Gray reindeer lichen	<i>Cladonia rangiferina</i>	Secure	Not scheduled	No status	Not scheduled	S5
Slender wheatgrass	<i>Elymus trachycaulus</i>	Secure	Not scheduled	No status	Not scheduled	S5
Stair-step moss	<i>Hylocomium splendens</i>	Secure	Not scheduled	No status	Not scheduled	S5
Strawberry	<i>Fragaria virginiana</i>	Secure	Not scheduled	No status	Not scheduled	S5
Water scouring-rush	<i>Equisetum fluviatile</i>	Secure	Not scheduled	No status	Not scheduled	S5

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
White spruce	<i>Picea glauca</i>	Secure	Not scheduled	No status	Not scheduled	S5
Willow species	<i>Salix</i> spp.	---	Not scheduled	No status	Not scheduled	---

*Uncommon within the study area.

Table C-2. Plant species observed by Associated Environmental Consultants in August, 2015 along the potential trail alignment and trail work areas, and their provincial and federal statuses

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Alpine clubmoss	<i>Diphasiastrum alpinum</i>	Secure	Not scheduled	No status	Not scheduled	S4
Blueberry	<i>Vaccinium myrtillus</i>	Secure	Not scheduled	No status	Not scheduled	S4
Douglas fir	<i>Pseudotsuga menziesii</i>	Secure	Not scheduled	No status	Not scheduled	S4
Engelmann spruce	<i>Picea engelmannii</i>	Secure	Not scheduled	No status	Not scheduled	S5
Fireweed	<i>Chamerion angustifolium</i>	Secure	Not scheduled	No status	Not scheduled	S5
Fringed grass-of-parnassus	<i>Parnassia fimbriata</i>	Secure	Not scheduled	No status	Not scheduled	S4
Jack pine	<i>Pinus banksiana</i>	Secure	Not scheduled	No status	Not scheduled	S5
Lodgepole pine	<i>Pinus contorta</i>	Secure	Not scheduled	No status	Not scheduled	S5
Northern holly fern	<i>Polystichum lonchitis</i>	Secure	Not scheduled	No status	Not scheduled	S3
One-flowered wintergreen	<i>Moneses uniflora</i>	Secure	Not scheduled	No status	Not scheduled	S5
Reindeer lichen	<i>Cladonia arbuscula</i>	Secure	Not Scheduled	No Status	Not Scheduled	S5
Snow willow	<i>Salix vestita</i>	Secure	Not scheduled	No status	Not scheduled	S4
Strawberry	<i>Fragaria vesca</i>	Secure	Not scheduled	No status	Not scheduled	S4
Water scouring-rush	<i>Equisetum fluviatile</i>	Secure	Not scheduled	No status	Not scheduled	S5
Willow species	<i>Salix</i> spp.	---	Not scheduled	No status	Not scheduled	---
White spruce	<i>Picea glauca</i>	Secure	Not scheduled	No status	Not scheduled	S5
Yellow mountain Heather	<i>Phyllodoce glanduliflora</i>	Secure	Not scheduled	No status	Not scheduled	S4

Table C-3. Rare plants and mosses observed by Belland et al. (2001)¹ throughout Edith Cavell and their provincial and federal statuses

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Northern bent grass	<i>Agrostis mertensii</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Thurber's bentgrass	<i>Agrostis thurberiana</i>	---	Not scheduled	No status	Not scheduled	---
Pygmy pussytoes	<i>Antennaria monocephala</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Alpine sweet grass	<i>Hierochloa alpina</i>	---	Not scheduled	No status	Not scheduled	S3
Sitka columbine	<i>Aquilegia Formosa</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Mingan moonwort	<i>Botrychium minganense</i>	---	Not scheduled	No status	Not scheduled	Unrankable
Alpine bittercress	<i>Cardamine bellidifolia</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Few-seed Bittercress	<i>Cardamine umbellata</i>	---	Not scheduled	No status	Not scheduled	S3
Curved-spike sedge	<i>Carex incurviformis</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Arctic hare's foot sedge	<i>Carex lachenalii</i>	---	Not scheduled	No status	Not scheduled	S2
Shore sedge / Enander's sedge	<i>Carex lenticularis dolia</i>	Secure	Not Scheduled	No status	Not scheduled	S1
Shortleaf sedge	<i>Carex misandra</i>	---	Not scheduled	No status	Not scheduled	S1 S2
Rough fescue	<i>Festuca altaica</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Pale gentian	<i>Gentiana glauca</i>	Secure	Not scheduled	No status	Not scheduled	S3
Western oak fern / Pacific oak fern	<i>Gymnocarpium disjunctum</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Alpine alumroot	<i>Heuchera glabra</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Alpine clubmoss / Haleakala fir- clubmoss	<i>Huperzia haleakalae</i>	Undermined	Not scheduled	No status	Not scheduled	Unrankable
Two-flower rush	<i>Juncus biglumis</i>	Sensitive	Not scheduled	No status	Not scheduled	S2

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Iceland purslane / Island koenigia	<i>Koenigia islandica</i>	May Be At Risk	Not scheduled	No status	Not scheduled	S1
Alpine azalea	<i>Loiseleuria procumbens</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Purple sweet cicely	<i>Osmorhiza purpurea</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Langsdorff's lousewort	<i>Pedicularis langsdorffii arctica</i>	No assessment reported	Not scheduled	No status	Not scheduled	S2
Letterman's blue grass	<i>Poa lettermanii</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Alaska willow	<i>Salix alaxensis</i>	Sensitive	Not scheduled	No status	Not scheduled	S2S3
Undergreen willow	<i>Salix commutata</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Creeping willow	<i>Salix stolonifera</i>	May Be At Risk	Not scheduled	No status	Not scheduled	S1
Rusty-hair saxifrage	<i>Saxifraga ferruginea</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Heart-leaved saxifrage / Porsild's saxifrage	<i>Saxifraga nelsoniana ssp. porsildiana</i>	Sensitive	Not Scheduled	No status	Not scheduled	S3
Snow saxifrage	<i>Saxifraga nivalis</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Alpine blueberry	<i>Vaccinium uliginosum</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Black rock moss	<i>Andreaea rupestris</i>	Secure	Not scheduled	No status	Not scheduled	S3
Sprig moss	<i>Aongstroemia longipes</i>	Undermined	Not scheduled	No status	Not scheduled	S2
Reflexed ragged moss / Cedar moss	<i>Brachythecium reflexum</i>	Secure	Not scheduled	No status	Not scheduled	S2
Tendrill feather moss	<i>Cirriophyllum cirrosum</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Awl-leaved forklet	<i>Dicranella subulata</i>	Sensitive	Not scheduled	No status	Not scheduled	N5

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Moss						
Montane cow-hair Moss	<i>Ditrichum montanum</i>	Undermined	Not scheduled	No status	Not scheduled	S1
---	<i>Grimmia alpestris</i>	Undermined	Not scheduled	No status	Not scheduled	S2
Donn's grimmia moss	<i>Grimmia donniana</i>	Secure	Not scheduled	No status	Not scheduled	S2
Sun grimmia moss	<i>Grimmia montana</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Blytt's fork moss	<i>Kiaeria blyttii</i>	Secure	Not scheduled	No status	Not scheduled	S2
Starke's fork moss	<i>Kiaeria starkei</i>	Secure	Not scheduled	No status	Not scheduled	S2
---	<i>Pseudoleskea atricha</i>	Sensitive	Not scheduled	No status	Not scheduled	Unrankable
Small hair moss	<i>Oligotrichum aligerum</i>	---	Not scheduled	No status	Not scheduled	S1S2
Hercynian hair moss	<i>Oligotrichum hercynicum</i>	---	Not scheduled	No status	Not scheduled	S2
Large hair moss	<i>Oligotrichum parallelum</i>	---	Not Scheduled	No status	Not scheduled	S1S2
---	<i>Orthotrichum rivulare</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Mountain hair moss	<i>Pogonatum dentatum</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Urn hair moss	<i>Pogonatum urnigerum</i>	Sensitive	Not scheduled	No status	Not scheduled	S2S3
Blunt-bud nodding Moss	<i>Pohlia bulbifera</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Pipe nodding moss	<i>Pohlia crudoides</i>	May Be At Risk	Not scheduled	No status	Not scheduled	S1
Drummond's nodding moss	<i>Pohlia drummondii</i>	Sensitive	Not scheduled	No status	Not scheduled	S2

Common Name	Species Name	General Status of Alberta Wild Species 2010 ²	Wildlife Act Regulations (Schedule 6) ³	Committee on the Status of Endangered Wildlife in Canada ⁴	Species At Risk Act, Species Status (Schedule 1) ⁴	NatureServe Rank ^{5,6}
Slender noddling moss	<i>Pohlia filum</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Bluntleaf threadmoss	<i>Pohlia obtusifolia</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Northern haircap moss	<i>Polytrichum sexangulare</i>	Sensitive	Not scheduled	No status	Not scheduled	S3
Clustered rock moss	<i>Racomitrium fasciculare</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Yellow-green rock moss	<i>Racomitrium heterostichum</i>	Sensitive	Not Scheduled	No status	Not scheduled	S2
Small-fruited rock Moss	<i>Racomitrium microcarpon</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Slender rock moss Narrow-leaved rock moss	<i>Racomitrium sudeticum</i>	Sensitive	Not scheduled	No status	Not scheduled	S1S2
Naked leafy moss	<i>Rhizomnium nudum</i>	Sensitive	Not scheduled	No status	Not scheduled	S2
Square gooseneck moss	<i>Rhytidiadelphus squarrosus</i>	Sensitive	Not scheduled	No status	Not scheduled	S1
Tongue-leaved trumpet moss	<i>Tayloria lingulata</i>	Sensitive	Not scheduled	No status	Not scheduled	S2

Appendix D – Reclamation Seed Mix

Date: January 12, 2016 **File:** 2015-3V08
To: Landon Shepherd, Jasper National Park
From: Joël Gervais, B.Sc., CISEC
Project: Edith Cavell Rehabilitation
Subject: Seed Mix Options

MEMO

Edith Cavell – Acceptable native species for seed mix

Establishing plants from seed may be difficult due to the high elevation and soil conditions at Edith Cavell. This seed mix list is intended to supplement the reclamation suggestions provided in the mitigation section of the Basic Impact Analysis. Additional measures such as greenhouse establishment of plant material prior to planting, or watering of seeded areas may be necessary. The seed mix should contain *Elymus trachycaulus* (number 1) and a minimum of 3 additional species from the following list (number 2 to 7);

1. The manufacturer's recommended seed ratio should be reviewed and approved by the PCA Vegetation Specialist;
2. Drill seeding not to exceed 15 kg/ha, broadcast seeding not to exceed 30 kg/ha;
3. Seeded areas should be fenced to protect from foot traffic;
4. Stockpile and re-use existing topsoil as it contains an existing seedbank; and
5. It is highly recommended that forbs be included in the seed mix (number 8 to 13).

Recommended: mandatory grasses:

- | | | |
|----------|---|---|
| 1 | Name: <i>Elymus trachycaulus</i> / <i>Agropyron trachycaulum</i>
Status: Native, Secure
Habitat: high elevations
Forage: upland game birds and small mammals | Name(s), common:
Slender wheatgrass
Slender wild rye |
|----------|---|---|

Recommended: any three of the following grasses:

- | | | |
|----------|---|--|
| 2 | Name: <i>Calamagrostis purpurascens</i>
Status: Native, Secure
Habitat: Dry mountainous zones
Forage: big horn sheep | Name(s), common:
Purple reedgrass
Purple pinegrass
Alpine reedgrass |
| 3 | Name: <i>Danthonia parryi</i>
Status: Native, Secure
Habitat: high elevations
Forage: | Name(s), common:
Parry's oatgrass
Parry's danthonia |
| 4 | Name: <i>Festuca campestris</i>
Status: Native, Secure
Habitat: dry to moist grasslands and open forests
Forage: ungulates | Name(s), common:
Foothills rough fescue
Mountain rough fescue
Buffalo bunchgrass |

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5	Name: <i>Koeleria macrantha</i> Status: Native, Secure Habitat: Forage: ungulates, deer	Name(s), common: Prairie Junegrass Crested hair grass
6	Name: <i>Poa alpine</i> Status: Native, Secure Habitat: dry, cold, boreal and mountainous areas Forage: ungulates, deer	Name(s), common: Alpine bluegrass Alpine meadowgrass
7	Name: <i>Stipa richardsonii</i> / <i>Achnatherum richardsonii</i> Status: Native Habitat: grasslands and pine forests Forage: elk, big horn sheep	Name(s), common: Richardson's needlegrass Spreading needlegrass Canada mountain-ricegrass

Recommended: include three or more of the following forbs in the seed mix

	Scientific Name	Common name
8	<i>Aquilegia</i> species	Columbine
9	<i>Aster ciliolatus</i>	Lindley's aster
10	<i>Lupinus sericeus</i>	Silky lupine
11	<i>Fragaria virginiana</i>	Strawberry
12	<i>Achillea millefolium</i>	Yarrow
13	<i>Lathyrus ochroleucus</i>	Yellow peavine

Compiled by:

Submitted digitally

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