

REPORT

B.C. Ministry of Transportation and Infrastructure

Cosen's Bay Road - Environmental Impact Assessment



July 2014

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1 Introduction

The B.C. Ministry of Transportation and Infrastructure (MOTI) is investing the impacts of a boundary adjustment from BC Parks to obtain a 30 m right-of-way (ROW) from Kalamalka Lake Provincial Park (KLPP; the Park) to flank the existing public road (Cosens Bay Road) that traverses the Park. The existing road alignment in the provincial park is 4.5 km long and the legal footprint maintained by MOTI is the width of the current road surface. The proposed 30 m ROW, 15 m on either side of the current centre line along Cosens Bay Road (the Project) is required to accommodate roadway improvements and road maintenance.

As a result of a decision regarding legal action brought by Cosens Bay property owners, it was determined in 1996 that MOTI is required to perform regular maintenance on Cosens Bay Road within the KLPP boundary (MOTI 2013). Since 1996, MOTI has worked in partnership with BC Parks (the current overseeing jurisdiction) staff to perform limited maintenance and improvements on the road. These improvements have included culvert installations, safety bollards, and placement of crushed road-surfacing gravel. Regular maintenance includes brushing, grading, base stabilization, and snow plowing. The lack of an adequate ROW severely limits MOTI's ability to maintain the road and carry out necessary improvements to ensure the safety of its users. The 1996 ruling only identified the travelling surface of Cosens Bay Road for maintenance and operation; there was no deliberation of an ROW width or activities relating to an ROW. An ROW wider than the travelling surface would allow for improvements such as widening, realignment for safety, drainage ditch establishment, and sight distance improvements.

The road currently services approximately 73 landowners beyond the Park who rely on this route to access their land. Of these landowners, approximately three to five are currently full-time, year-round residents, and the remainder are primarily seasonal. Based on traffic counts conducted in August 2010 (MOTI 2013), the road carries up to 230 vehicles per day during peak season.

MOTI is proposing this public ROW through the Park to facilitate necessary maintenance, to address needs and concerns of Park users and of landowners beyond the Park, and to improve safety.

1.1 SCOPE OF ASSESSMENT

Summit Environmental Consultants Inc. (Summit) was retained by MOTI to conduct an environmental impact assessment (EIA) and report for on the potential impacts related to the proposed widening of Cosens Bay Road in KLPP. The existing public road within the KLPP boundary is 4.5 km in length and of limited width. This report presents the results of the EIA. To assess the baseline environment appropriately and quantify potential impacts effectively, two distinct assessment areas were defined: the Project Footprint and the Project Area, as described in Table 1-1.



Table 1-1 Spatial boundaries for the environmental assessment

Area Designation	Area Description
Project Footprint	The area delineated by a 30-m ROW (15 m on either side of the centre line) along the road through the Park. The ROW would require that approximately 13.5 ha of land be transferred from BC Parks to MOTI.
Project Area	The area that includes 50 m on either side of the existing Road edge. This is the area where there is reasonable potential for environmental effects from the Project.

1.2 PROJECT DESCRIPTION

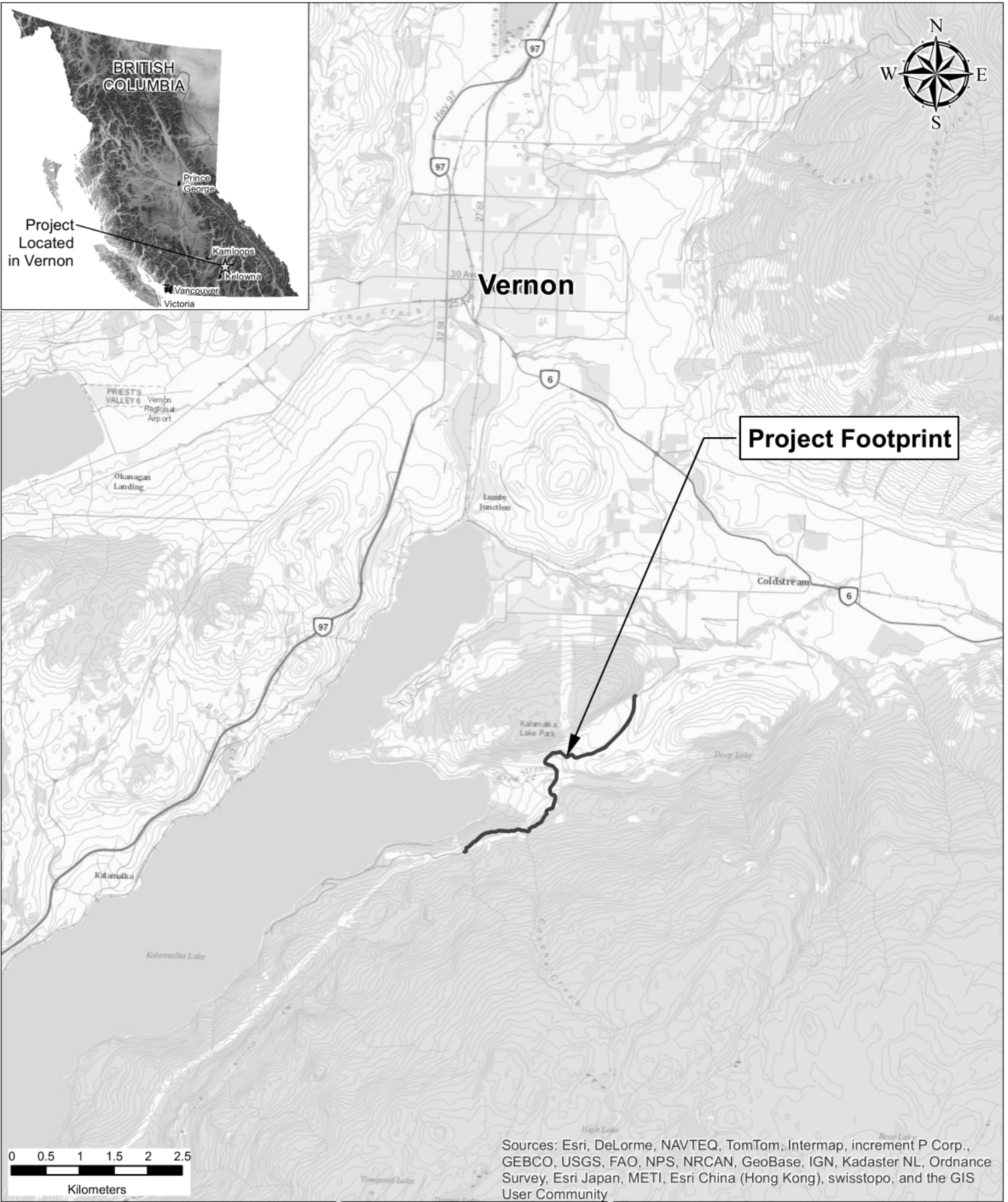
Cosens Bay Road begins at Coldstream Creek Road in Coldstream, southeast of the City of Vernon. It traverses KLPP in a southwesterly direction, exits the Park just south of Cosens Bay, and terminates further south, approximately one-third of the way along the east side of Kalamalka Lake. The Project location and proposed development are shown in Figure 1-1.

MOTI is proposing the following improvements to the road over the next 5 years:

- establishment of drainage ditches;
- replacement of culverts, as necessary;
- base stabilization and dust suppressant (continuation of current work);
- brushing to improve sight line and remove danger trees;
- grading as necessary (continuation of current work);
- snow plowing during winter months (continuation of current work);
- surface gravelling (continuation of current work); and
- expansion of the road surface by 1 to 1.5 m width.

Since 1996, MOTI has worked in partnership with BC Parks staff to perform limited maintenance and improvements on the road. This work has included installation of culverts and safety bollards, and the placement of surfacing gravel. Maintenance in the forms of brushing, grading, base stabilization and snow plowing are also carried out on a scheduled basis. However, the current allotment of space (i.e. the road surface alone) limits MOTI's ability to plan and carry out necessary works on the road. To allow for the required maintenance and improvements, MOTI proposes to obtain a 30-m ROW from the Park.





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Currently, there are several operational concerns with the road:

- Road washouts due to lack of drainage, which result in road deficiencies and safety concerns.
- Poor lines of sight due to trees/foliage and poor horizontal and vertical alignment.
- Narrow road surface in many areas, which can lead to vehicle conflicts. There is also no shoulder area for pedestrians using the road.
- Danger to grasslands caused by drivers leaving the road.

1.2.1 Alternative Options Assessed

Summit conducted an EIA in 2001 to evaluate a number of options to upgrade road access through the Park for property owners south of the Park. Two main options were considered:

1. Establishing a new road alignment; and
2. Upgrading the existing road and changing its status from “unconstructed, unmaintained” to MOTI’s standard for a “low volume road,” or making minor changes to the existing road while retaining its current status.

MOTI, in consultation with BC Parks, identified a potential route for a new Cosens Bay Road. The results of the environmental and archaeological assessments indicated that the proposed new route would have serious negative impacts that could not be fully mitigated through either road design or best management practices for construction and maintenance.

The report indicated that upgrading or conducting minor changes to the existing Road was the preferred option. Upgrading the existing route would result in negligible or minor impacts on water resources and quality, fisheries, archaeological and heritage features, recreation, most wildlife and wildlife habitat, and cumulative impacts. With this option, significant impacts were anticipated for reptiles, terrestrial ecosystems and some environmentally sensitive areas. Significant impact was defined as mitigable with considerable effort or expense, or through off-site compensation.

1.3 KALAMALKA LAKE PROVINCIAL PARK

Kalamalka Lake Provincial Park is considered one of the best examples of north Okanagan grassland in the region. Established as a provincial park in 1975, KLPP features a very high level of plant diversity and suitable habitat for a number of rare or endangered wildlife species (BC Parks 2014). However, some areas of the Park still show evidence of anthropogenic disturbance (notably, infestations of noxious weeds) related to land use activities prior to the land being designated a park. In contrast, natural disturbance by wildfire has been limited, and this has led to tree encroachment and build-up of fuel loads. KLPP is a “near-urban” park and is heavily used for recreation by local residents and visitors (Summit 2001).

Relatively recently, the risk of anthropogenic disturbance to KLPP, in particular the grasslands, has increased in part, due to the change in status of Cosens Bay Road, which provides access to vacation and permanent residential homes south of the park. In the past, a locked gate, controlled by BC Parks, limited



access to the road route and landowners travelled to their properties by water. A court decision led to unrestricted access to this route, and eventually to MOTI assuming responsibility for the road (MOTI 2013). The current status (road class) of Cosens Bay Road is “unconstructed and unmaintained”. Since unrestricted access was granted, there has been an increase in human activities in the more remote area of the park, as well as vehicles illegally driving over the grasslands and vandalism at Cosens Bay Beach. Erosion of the road surface and risks to wildlife from traffic are also sources of concern (Summit 2001).

When KLPP was established in 1975, the objective was to “provide opportunities of regional, provincial and national significance for access to outstanding natural features and significant outdoor recreation opportunities” (Public Advisory Committee 1984, in Tedesco 2006). In recent years, this objective has been expanded to include the protection of grasslands, upland forest, lakeshore, and species at risk, while still providing for a wide range of day-use outdoor recreation activities (Tedesco 2006).

The State of the Parks Analysis that was prepared by Tedesco in 2006 identified invasive species and conservation of remaining intact grassland areas as the issue of greatest concern in the Park (Tedesco 2006). The report noted that varied impacts of fire suppression, which also relate to invasive plants and grassland conservation, require further review as well. Tedesco indicated that human pressures on the Park from recreation use and Cosens Bay Road are also of significant concern and need to be addressed with both research and regulatory control. The review highlighted the range of inventories and assessments that need to be completed within the Park before managers can identify conservation values and threats. Since Cosens Bay Road was opened to the public some 18 years ago, there have been no baseline inventories of animal mortality or wildlife disturbance resulting from road use.

1.4 OBJECTIVE AND APPROACH

The objective of this EIA was to assess the potential impacts of the proposed acquisition of the 30 m ROW from BC Parks to MOTI. To achieve this objective, Summit carried out the following:

- assessed the value of MOTI's proposed Road upgrades for local landowners and Park users;
- assessed the value of the Park from ecological and recreational perspectives; and
- identified potential impacts from upgrading the road versus doing nothing.

Based on the findings, we developed recommendations that will satisfy the needs of road users without compromising the ecological value of the Park. Upgrading the road may provide opportunities to conduct species-specific inventories and, thereby, gain greater understanding of the conservation values of KLPP and help define future conservation objectives.



2 Regulatory Framework

This section details the specific legislation and regulations applicable to the project that were considered when developing this EIA.

2.1 SPECIES AT RISK ACT

The federal *Species at Risk Act* (SARA) provides legal protection of wildlife and their habitats as designated under Schedule 1 of the Act (Gov Canada 2002). The purposes of the Act are to; i) prevent Canadian indigenous species, subspecies, and distinct populations from becoming extirpated or extinct, ii) provide for the recovery of endangered or threatened species, and iii) encourage the management of other species to prevent them from becoming at risk. SARA makes it an offence (under Sections 32 and 33) to kill, harm, harass, capture or take an individual of a listed species that is extirpated, endangered or threatened; to possess, collect, buy, sell or trade an individual of a listed species that is extirpated, endangered or threatened, or its part or derivative; or to damage or destroy the residence of one or more individuals of a listed endangered or threatened species or of a listed extirpated species if a recovery strategy has recommended its reintroduction.

2.2 MIGRATORY BIRD CONVENTION ACT

The *Migratory Bird Convention Act* protects migratory birds and nests from indiscriminate harvesting and destruction (Gov B.C. 1994). The Migratory Bird Regulations stipulate that “no person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird” (Section 6 [a]), and that “no person shall deposit or permit to be deposited oil, oil wastes or any other substance harmful to migratory birds in any waters or any area frequented by migratory birds (Section 35 [1]) (Gov Canada 1994).

In addition, restrictions have been put in place for certain activities, such as clearing and grubbing, during the migratory bird season (March 15 to August 15; CWS 2008). Site-preparation activities scheduled for within the migratory bird window must be preceded by surveys by a Qualified Environmental Professional (QEP) for the presence and nesting of migratory birds within the Project Area. Any occurrences confirmed within or adjacent to the footprint require specific management, which is to be determined by the QEP and carried out by the contractor. Management may include species-specific buffer zones, delay of site clearing in specific sites, and construction monitoring to ensure that activities are not harassing or stressing the migratory bird(s) in the footprint. Vegetation removal and other activities within the buffer zone may recommence once a QEP confirms the nest is abandoned or once all nestlings have fledged.

2.3 FISHERIES ACT

The *Fisheries Act* is designed to protect fish and fish habitat (Gov Canada 1996). According to the Act, “No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a



commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.” The Act applies to this Project since watercourses in the Project Area either provide fish habitat directly or support fish habitat in the Project Area.

2.4 B.C. WILDLIFE ACT AND WILDLIFE AMENDMENT ACT

The provincial *Wildlife Act* protects vertebrate animals from direct harm, except as allowed by regulation within the province (e.g. hunting, trapping; Gov B.C. 1996a, 2004). All active bird nests are protected under the *Wildlife Act* and it is an offence to destroy nests occupied by a bird or its eggs or young. Vegetation clearing can only proceed within the sensitive nesting window (April 1 to July 31) if a survey conducted by a qualified biologist has concluded that no nests are present (MWLAP 2004). In B.C., the *Wildlife Act* was amended to align with SARA to protect and recover certain rare plant and animal species identified by Cabinet, making it an offence to kill, harm, harass or capture such species on Crown land. Cabinet also has the ability to define and protect the residence of a species at risk, and it is an offence to damage or destroy these residences.

2.5 B.C. PARKS ACT

The *Parks Act* is the main legislation governing protected areas in B.C. and provides for the designation and administration of the following:

- provincial parks;
- recreation areas; and
- nature conservancy areas.

The *Parks Act* is administered by the B.C. Ministry of Environment. Aspects of the Act can also apply to other provincial land use designations, such as ecological reserves, greenbelt land and private land, in certain circumstances. The Act provides protection for the natural resources within park boundaries. Land cannot be sold, leased or granted, and natural resources cannot be removed from any provincial park, except as authorized by a park use permit (Gov B.C. 1996b). Boundary adjustments (including the acquisition of land from the park) in protected areas, including ecological reserves, may be considered by the Minister¹ when a proponent is proposing to allow for a development or activity not allowed by authorization under the legislation. In these instances, the Provincial Protected Area Boundary Adjustment Policy, Process and Guidelines² apply.

2.6 B.C. WEED CONTROL ACT

The *Weed Control Act* designates provincially and regionally noxious weeds (Schedule A) and the associated regulations (RSBC 1996c). The Act provides guidelines for noxious weed prevention and management, and imposes a duty on all land occupiers to control designated noxious plants. Weeds identified as provincially or regionally noxious must be controlled, particularly during site preparation when

¹ Under this Policy, “Minister” refers to the minister responsible for the *Park Act*.

² http://www.env.gov.bc.ca/bcparks/planning/docs/boundary_adj_guide.pdf



major clearing and grubbing of the land within the project footprint will occur. Additionally, weeds must be controlled throughout construction when heavy machinery is moving on and off site.

2.7 B.C. WATER ACT

The *Water Act* is provincial legislation that protects the quality of water, fish and wildlife habitat, and the rights of licensed water users (Gov B.C. 1996d). Under Section 9 of the Act, any activities that result in changes in or about a stream require notification or approval.

An approval or notification under the *Water Act* may be required for this Project because the proposed ROW crosses both Cosens Creek and Brew Stream.

3 Methods

The EIA was completed through a review of existing information, field inspections of the existing road corridor, and an evaluation of mitigation options. For each environmental study component (i.e. terrestrial ecosystems that include ecological communities defined by Sensitive Ecosystem Inventory, aquatic ecosystems, and wildlife/wildlife habitat), a qualitative rating system was developed to compare the baseline conditions to the conditions that would exist during/after the proposed improvements to the road. For consistency, the general qualitative rating system that was developed for the initial EIA (Summit, 2001) was also used in this assessment. This system is outlined in Table 3-1.

Table 3-1 Impact ratings and definitions

Rating	Definition
None / negligible	<ul style="list-style-type: none"> No detectable change from the baseline condition.
Minor	<ul style="list-style-type: none"> Impacts easily mitigable with known technology. Potential impacts largely confined to the immediate footprint of the project, and the area is already developed or has limited ecological values.
Significant	<ul style="list-style-type: none"> Impacts only mitigable with considerable effort or expense, or through off-site compensation. The impacts requiring mitigation are likely to occur beyond the immediate project area and/or for an extended period. Impacted area has ecological values of local or regional significance that require protection.
Extreme	<ul style="list-style-type: none"> Impacts result in considerable negative environmental change. Generally not mitigable. Impacted area has ecological values of provincial or national significance.

This general rating system was used for the climate, soils, water resources, archaeology and recreation components of the EIA. However, due to the complexity of the ecological communities and wildlife components in KLPP, the rating systems used for these components were customized versions of the general framework. The qualitative impact criteria that were used to assess impacts to terrestrial ecosystems and wildlife are presented in Table 3-2.

Table 3-2 Qualitative impact criteria for ecological communities and wildlife

Impact	Ecological Community	Wildlife
None/Negligible	<ul style="list-style-type: none"> Area is already developed, disturbed or has limited ecological value Impacts do not require mitigation 	<ul style="list-style-type: none"> Wildlife absent or at very low occurrence No utilization by rare or endangered species Impacts do not require mitigation
Minor	<ul style="list-style-type: none"> Area previously disturbed and is recovering Young seral stage forests Grasslands currently grazed or disturbed Impacts generally mitigable with known technology 	<ul style="list-style-type: none"> Moderate use by common wildlife species No utilization by Blue- or Red-listed species Valued ecosystem components absent Impacts generally mitigable with known technology
Significant	<ul style="list-style-type: none"> Natural ecosystem at late or climax seral stage (e.g. forests . 80 yrs old) Areas with high biodiversity values (e.g. environmentally sensitive areas) Blue-listed ecosystem site unit Impacts generally mitigable with considerable effort or expense 	<ul style="list-style-type: none"> Primary habitat of Blue-listed wildlife species or species of management concern Area contains constraining life requisite for common wildlife species Areas of high wildlife biodiversity Impacts generally mitigable with considerable effort or expense
Extreme	<ul style="list-style-type: none"> Wetlands Red-listed ecosystem site units Impacts result in considerable negative environmental change that is generally not mitigable 	<ul style="list-style-type: none"> Primary habitat of Red-listed wildlife species Area contains constraining life requisite for Red- or Blue-listed species Impacts result in considerable negative change in rare and endangered wildlife species that is generally not mitigable

3.1 INFORMATION REVIEW

Baseline environmental conditions were determined by reviewing existing reports for the area and conducting online searches of provincial and federal databases. Information reviewed for this report included the following:

- Aerial photos and maps of the Project Area;
- B.C. Species and Ecosystems Explorer database search for species at risk (CDC 2014a);
- B.C. Conservation Data Centre online database search for biogeoclimatic zone and subzone information, and species at risk, including masked occurrences (CDC 2014b);
- B.C. Water Resources Atlas for aquifer and water well information (MOE 2011);
- B.C. Fisheries Inventory Summary System database to determine presence and distribution of fish species in each surface water system in the Project Area;



- Sensitive Ecosystem Inventory for Coldstream (Iverson et al. 2008, Iverson and Uunila 2008, Haney and Sarell 2008, MELP 1999);
- Ministry of Forests, Lands and Natural Resource Operations, Archaeology Site Data (MFLNRO 2014);
- Cosens Bay Road Environmental Impact Assessment. Vernon, B.C (Summit 2001);
- State of the Park Analysis for Kalamalka Lake Provincial Park, Kalamalka Lake Protected Area and Cougar Canyon Ecological Reserve (Tedesco 2006); and
- Invasive Plant Inventory in Parks and Protected Areas of the Okanagan Region (Alcock 2006).

3.2 EXISTING INVENTORY STUDIES

A number of biophysical inventories have been completed for the North Okanagan. These inventories were reviewed and used to support this environmental assessment.

3.2.1 Sensitive Ecosystem Inventory

The desktop analysis was used to establish sensitivity ratings for the various habitats within the Project Area. It included a review of the existing Sensitive Ecosystem Inventory (SEI) data (Iverson 2008, Iverson and Uunila 2008, Haney and Sarell 2008) and identification of known and potential rare ecological communities, wildlife habitat and corridors, and other rare and endangered plants and wildlife.

The SEI for the Coldstream – Vernon area was used because the Project Area is within this study area. The purpose of the SEI is to identify remnants of rare and fragile terrestrial ecosystems and to encourage land-use decisions that will ensure the continued integrity of these ecosystems. SEI delineates the ecosystems within the Project Area as polygons based on dominant plant associations or ecological communities (dominant tree species, dominant shrub or forb species). The SEI is largely based on interpretation from orthophotographic imagery at a 1:15,000 scale, with some limited field sampling. The inventory system incorporates condition of the habitat (e.g. understory fragmentation, forest ingrowth, and invasive plants) as well as the sensitivity/rarity of the ecosystem, the condition of the ecosystem, and the wildlife values. Based on the SEI data for the Project Area, a frequency distribution of the ecological communities present was generated. This was used to systematically select a representative sample of SEI polygons to ground truth for vegetation and wildlife features.

3.2.2 Additional Inventory Studies

The following additional inventories were reviewed and used to support this environmental assessment:

- Terrestrial Ecosystem Mapping (TEM) – This is a landscape level inventory of ecological communities. The TEM for the Project Area and surrounding landscape was mapped.
- Sensitive Habitat Inventory and Mapping (SHIM) – This was an initiative to locally identify and map all creeks. No creeks or rivers were identified in the Project Area through the SHIM survey. The nearest water body identified is Coldstream Creek to the north.



- **Wetland Inventory Mapping (WIM)** – This is a method of identifying, classifying and mapping all wetlands. No wetlands were identified in the Project Area through the WIM survey, most likely because the area is covered in more detail by the SEI inventory. Only one wetland was identified by SEI within the Project Footprint.

3.2.3 Known Species at Risk Occurrences

In May 2014, species and ecosystems at risk in the Project Area were identified through a search of the B.C. Conservation Data Centre (CDC). This information is sensitive and, while it contributed to establishing the Environmentally Sensitive Areas for this EIA, it is not detailed in this report.

3.3 FIELD ASSESSMENT

Terrestrial ecologists Nicole Basaraba, B.Sc., P.Ag., Keenan Rudichuk B.N.R.Sc., and Stephanie Murphy, M.Sc. of Summit conducted field assessments on May 9 and 16, and June 4, 2014. SEI data for ecosystems and wildlife habitat were verified on the ground, and other significant ecological features were noted within the Project Area, such as drainage, existing disturbance, invasive species, and wildlife trees, and Environmentally Sensitive Areas.

Stream and creek crossings along the road were assessed for fish habitat suitability and culvert performance. Data were collected following Resource Information Standards Committee standards for stream assessments (MOE 2006).

3.4 ANALYSIS

3.4.1 Wildlife Habitat Ratings

Within the SEI data for Coldstream – Vernon, 10 wildlife species known to occur in the north Okanagan were selected, based on species identified by SEI and their likelihood to occur in the park, to assess important wildlife habitats in the study area. The SEI wildlife habitat ratings developed for each species (Haney and Sarell 2008) were used to identify the highest-value habitat for key wildlife in the Project Area. Within each survey plot, Summit identified two of the 10 wildlife species selected to ground truth the SEI-assigned wildlife habitat ratings. The sets of two species were selected subjectively based on which were thought to be most important in a given ecological community (i.e. wildlife habitat ratings of moderate or high). These wildlife species are listed in Table 3-3.

Wildlife habitat ratings were assigned to delineated habitats in the field based on each selected species' needs for their particular life requisites (e.g. nesting, foraging, hibernation or denning; Table 3-3). Wildlife habitat within each survey plot was compared to the best possible habitat in the province and was rated for each species based on suitability (Table 3-4).

Table 3-3 Key information for the species used to assess wildlife habitat ratings



Common Name	Scientific Name	Life Requisite and Habitat Use
Badger	<i>Taxidea taxus jeffersonii</i>	Security/thermal habitat and food for general living; all year.
Gopher snake	<i>Pituophis catenifer</i>	Food and security/thermal habitat for general living; growing season. Security/thermal habitat for reproducing (egg-laying sites).
Grasshopper sparrow	<i>Ammodramus savannarum</i>	Security/thermal habitat and food for general living; growing season.
Great basin spadefoot	<i>Spea intermontana</i>	Security/thermal habitat for reproducing (breeding ponds). Security/thermal habitat and food for general living; all year (terrestrial sites).
Painted turtle	<i>Chrysemys picta</i>	Security/thermal habitat for reproducing (egg-laying sites). Security/thermal habitat and food for general living; all year (ponds).
Swainson's hawk	<i>Buteo swainsoni</i>	Security habitat for reproducing. Food for general living; growing season.
Western rattlesnake	<i>Crotalus oreganus</i>	Security/thermal habitat for general living; all year (basking/denning sites). Food and security/thermal habitat for general living; summer.
Yellow-breasted chat	<i>Icteria virens</i>	Security/thermal habitat and food for general living; growing season.

Table 3-4 Habitat rating scheme* used to assess wildlife habitat in the Project Area

Percent of Provincial Benchmark**	4-Class Rating***	
76-100%	High	H
51-75%	Moderate	M
26-50%		
6-25%	Low	L
1-5%		
0%	Nil	N

* Source of rating scheme: Resources Inventory Committee 1999. (now Resources Information Standards Committee).

** The best habitat in the province. For example, High suitability (1 or H) is 76-100% as good as the best habitat in the province (Haney and Sarell 2008).

***Rating based on intermediate knowledge of habitat use.

3.4.2 Environmentally Sensitive Areas

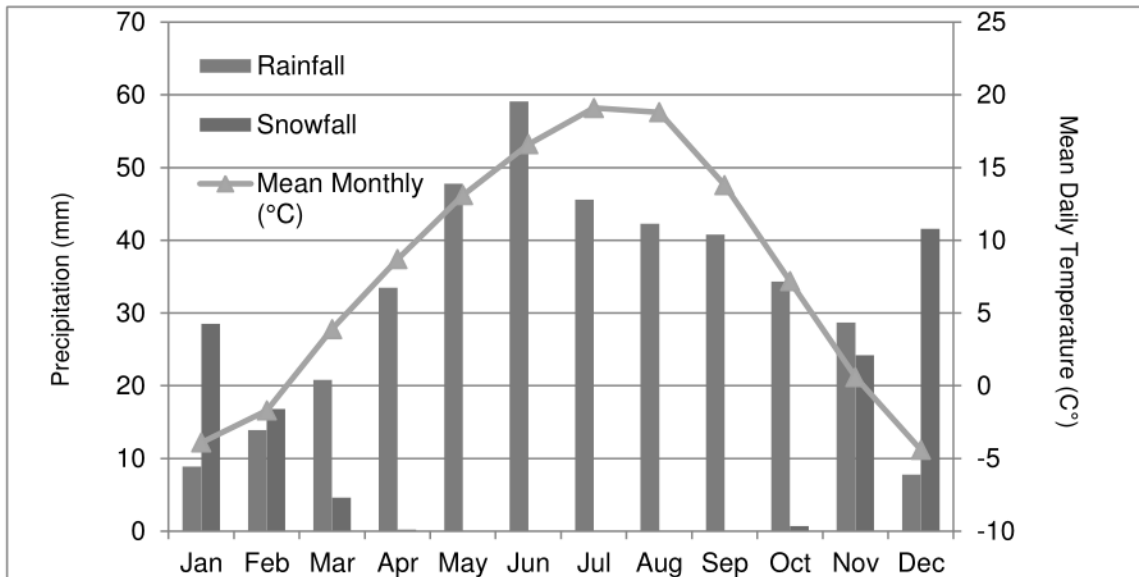
Based on the findings from SEI data analysis, background research, and field visits to the Project Area, six Environmentally Sensitive Areas along Road were identified as requiring particular attention through avoidance, remediation, and/or mitigating measures.



4 Baseline Biophysical Environment

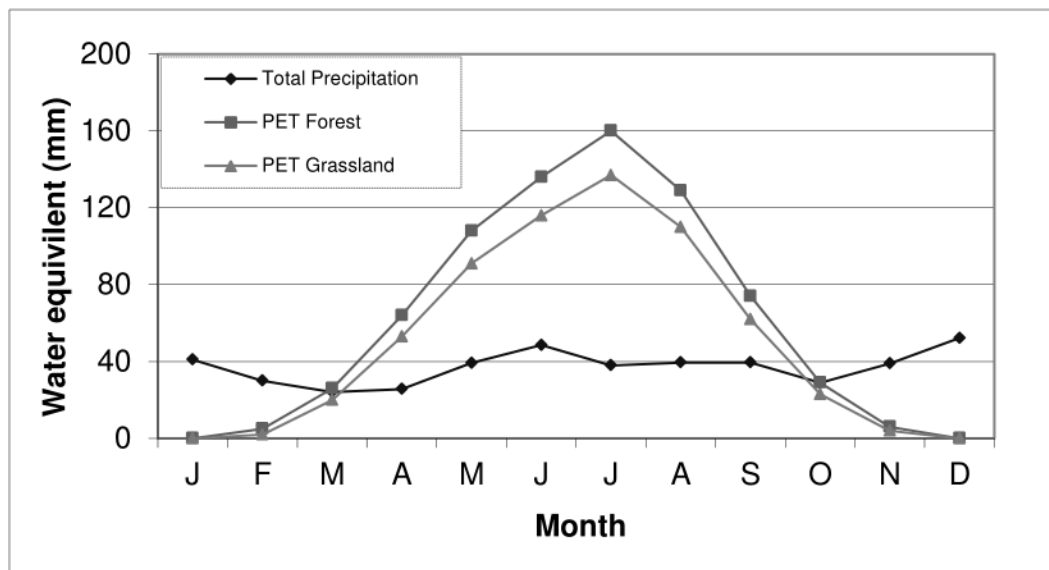
4.1 CLIMATE AND BIOGEOCLIMATIC ZONES

The entire Project Area is located in the Okanagan Very Dry Hot Interior Douglas-fir variant, grassland phase biogeoclimatic zone (IDFxh1). The nearest climate station to the site is at Coldstream Ranch (elevation 482 metres above sea level (m.a.s.l.)), approximately 3 km from the Park (11U 343049, 5565037). Figure 4-1 shows the average monthly daily temperature and precipitation for that station based on climate data from 1981 to 2010 (Environment Canada 2014). The area is characterized by a significant summer soil moisture deficit. Figure 4-2 shows monthly average potential evapotranspiration for forests and grasslands, as estimated by the Priestley-Taylor equation, compared to average total precipitation (Atmospheric Environment Service, 1993, Summit 2001).



Source: Gov of Canada 2014.

Figure 4-1 Normal monthly precipitation at the Coldstream Ranch station.



Source: Summit 2001

Figure 4-2 Estimated normal monthly potential evapotranspiration (PET) and precipitation for forest and grassland.

4.2 TERRAIN AND SOILS

At the City of Vernon, the Okanagan Valley joins Coldstream Valley, a major east-west valley that forms the northern boundary of KLPP (Cannings 1975). The Park is bounded to the east by rangeland, cliffs and woodland of Bear Valley, to the south by the rocky upland of the ridges east of Kalamalka Lake, and to the west by Kalamalka Lake and its northerly extension, Cosens Bay. Much of the Park is occupied by Rattlesnake Hill, a ridge of more or less exposed Precambrian metamorphic rock that extends west in various stages into Kalamalka Lake as Rattlesnake Point. The ridge separates Cosens Bay and the rest of the Park from the farmland of the District of Coldstream. East of Cosens Bay, grasslands extend in a series of benches towards the Park gate between Rattlesnake Hill and the uplands to the southeast. The south shore of Cosens Bay climbs to the ridges east of Kalamalka Lake to heights of over 1,373 m.a.s.l (Cannings 1975).

The District of Coldstream completed terrain stability and erosion potential mapping in 1998 (Summit 2001). The Park was not included in this, but the Bear Valley/Deep Lake area was mapped and it is reasonable to extend those classifications along the valley into the Park. Slopes on the north side of the valley were mapped as Terrain Stability Class IV (expected to contain areas where there is moderate likelihood of slope failure following conventional road construction after timber removal) with “low” erosion potential and “very high” fine sediment transfer potential. The Bear Valley bottom was mapped as Terrain Stability Class II (very low likelihood of slope failure following road construction) with “moderate” erosion potential and “very high” fine sediment transfer potential.



Given these findings, it is reasonable to extrapolate that the Cosens Valley, particularly the grassland areas are likely to have moderate slope failure potential with “low” erosion potential and “moderate” fine sediment transfer potential. The forested section to the south, however, is likely to have high probability of slope failure with “high” erosion potential and “very high” fine sediment transfer potential.

4.3 WATER RESOURCES

Water resources information relative to the Project Area was obtained from the B.C. Water Resources Atlas database (MOE 2014) and from the field assessment. Field-based hydrogeological investigations were not completed as part of this EIA.

4.3.1 Groundwater

A database search revealed no mapped aquifers within an approximate 500 m radius search of the Project Area. The closest aquifer, Coldstream Aquifer, is approximately 960 m north (AQ Tag: 0352; MOE 2014). It is comprised of sand and gravel and has moderate demand, high productivity, and a low vulnerability rating. The Project is not anticipated to impact this aquifer. However; a database search revealed 53 water wells within a 500 m radius from the Project Area (Appendix B, Table 1), with an average well depth of 96.7 m and average depth to water of 28.4 m. None of these well falls within the Project Area and no effects from the Project are anticipated.

4.3.2 Surface Water and Fisheries

Database and field visits identified two surface water bodies in the Project Area: Cosens Creek (Watershed Code 310-939400-20900) and Brew Stream (Watershed code 900-406900-16700; Figure 4-3). A third culvert crossing was noted during the field visit where the road exits the Park. No water was present in this ephemeral drainage feature. Table 4-1 lists the attributes of each surface water body where it crosses the road.

Table 4-1 Stream attributes at the crossing points

Brew Stream	Cosens Creek
<ul style="list-style-type: none"> Stream has fast flow, mostly riffle Channel width approximately 2 m Wetted width approximately 1 m Substrate pebbles 80% and boulders 20% High overhanging cover and shade Minimal woody debris Culvert 500 mm diameter Fill depth in culvert 7 cm, embedded 10% of culvert 	<ul style="list-style-type: none"> Stream has fast flow but blocked by woody debris at culvert entrance, 25% gradient Channel width approximately 3.5 m Wetted width approximately 1.1 m Substrate 90% fines, very little cobbles or gravel Overhanging cover approximately 40% Moderate woody debris Double culverts 500 mm each, partially blocked at inflow

Brew Stream	Cosens Creek
<ul style="list-style-type: none"> • Culvert perched at outflow • No backwatering 	<ul style="list-style-type: none"> • Fill depth in culvert 10 cm, not embedded • Culvert perched at outflow (naturally steep gradient) • No backwatering (too steep)

Brew Stream

Brew Stream (Photograph 13, Appendix A) is a small intermittent stream that originally crossed Cosens Bay Road at two locations 2+200 and 2+650 (Figure 4-3). At the time of the field assessment, no water was evident at the north crossing (2+200). It appeared to have been dry for some time. The second crossing point (2+650) further south has a culvert and the stream had water at the time of the field assessment. The two forks of Brew Stream join just west of Cosens Bay Road, and the stream runs through the western quarter of the grasslands before draining into Cosens Bay Pond at the northeastern corner of Cosens Bay. According to Cannings (1975), this pond marks an old shoreline and, at one time Brew Stream was dammed to form a cattle-watering pond in the uplands to the east of the road.

No fish have been reported in Brew Creek (FISS 2014).

Cosens Creek

Cosens Creek (Figure 4-3, Photograph 15, Appendix A) crosses Cosens Bay Road south of Brew Stream. It also had water at the time of the field assessment. There are no records of fish in this creek (FISS 2014) and the 25% stream gradient is such that fish are not able to navigate up as far as the road. Cosens Creek enters the lake at the south end of Cosens Bay Beach.

Both creeks reportedly dry up by mid-summer (Cannings 1975).

Kalamalka Lake

Kalamalka Lake is a large, approximately 4-km-long, fish-bearing glacial lake that flows into Okanagan Lake. The shortest distance from the Project Area to Kalamalka Lake is approximately 670 m. The following fish species have been recorded in Kalamalka Lake: largescale sucker (*Catostomus macrocheilus*), cutthroat trout, Kokanee salmon (*O. nerka*), lake trout (*S. namaycush*), mountain whitefish (*Prosopium williamsoni*), northern pikeminnow (*Ptychocheilus oregonensis*), perch (general), peamouth chub (*Mylocheilus caurinus*), pumpkinseed (*Lepomis gibbosus*), rainbow trout (*O. mykiss*), redbelt shiner (*Richardsonius balteatus*), and whitefish (general) (FISS 2014). It is not anticipated that there will be any impact to Kalamalka Lake as a result of the Project.

4.4 VEGETATION AND ECOLOGICAL COMMUNITIES

The Park features a variety of different habitat types that support highly diverse flora and fauna, including many species at risk. The habitats include dry ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) forests, dry gullies and shrublands, ponds, lakes, riparian areas, rock outcrops and talus slopes.

As noted, the entire Project Area is in the Okanagan Very Dry Hot Interior Douglas-fir variant, grassland phase (IDF_h1) biogeoclimatic zone. Mesic sites within the IDF_h1 tend to be dominated by Idaho fescue (*Festuca idahoensis*) and bluebunch wheatgrass (*Agropyron spicatum*), with lesser amounts of silky lupine (*Lupinus sericeus*), arrow-leaved balsamroot (*Balsamorhiza sagittata*), parsnip-flowered buckwheat (*Eriogonum heracleoides*) and junegrass (*Koeleria macrantha*) (Lloyd et al. 1990, Lea et al. 1991). The canopy is comprised by open forests of ponderosa pine and Douglas-fir followed by a well-established shrub layer. The shrub layer is diverse and dominated by Saskatoon (*Amelanchier ainifolia*), willow (*Salix* spp.), chokecherry (*Prunus virginiana*), birch-leaved spirea (*Spiraea betulifolia*), falsebox (*Pachistima myrsinites*), Douglas maple (*Acer glabrum*), and snowberry (*Symphoricarpos albus*) (Lloyd et al. 1990). The herbaceous vegetation is dominated by pinegrass (*Calamagrostis rubescens*). An inventory of plant species identified during the field visits is included is presented in Appendix B, Table 2.

Figure 4-3 shows the Terrestrial Ecosystem Mapping for the Project Footprint and surrounding lands and the available Sensitive Habitat Inventory mapping for the local area. However, there is no Sensitive Habitat Inventory or Wetland Inventory Mapping available within the Park. Therefore, wetland habitats identified by SEI data area presented instead. One wetland was identified in the Project Area. This was dry at the time of survey (see Section 4.4.5).

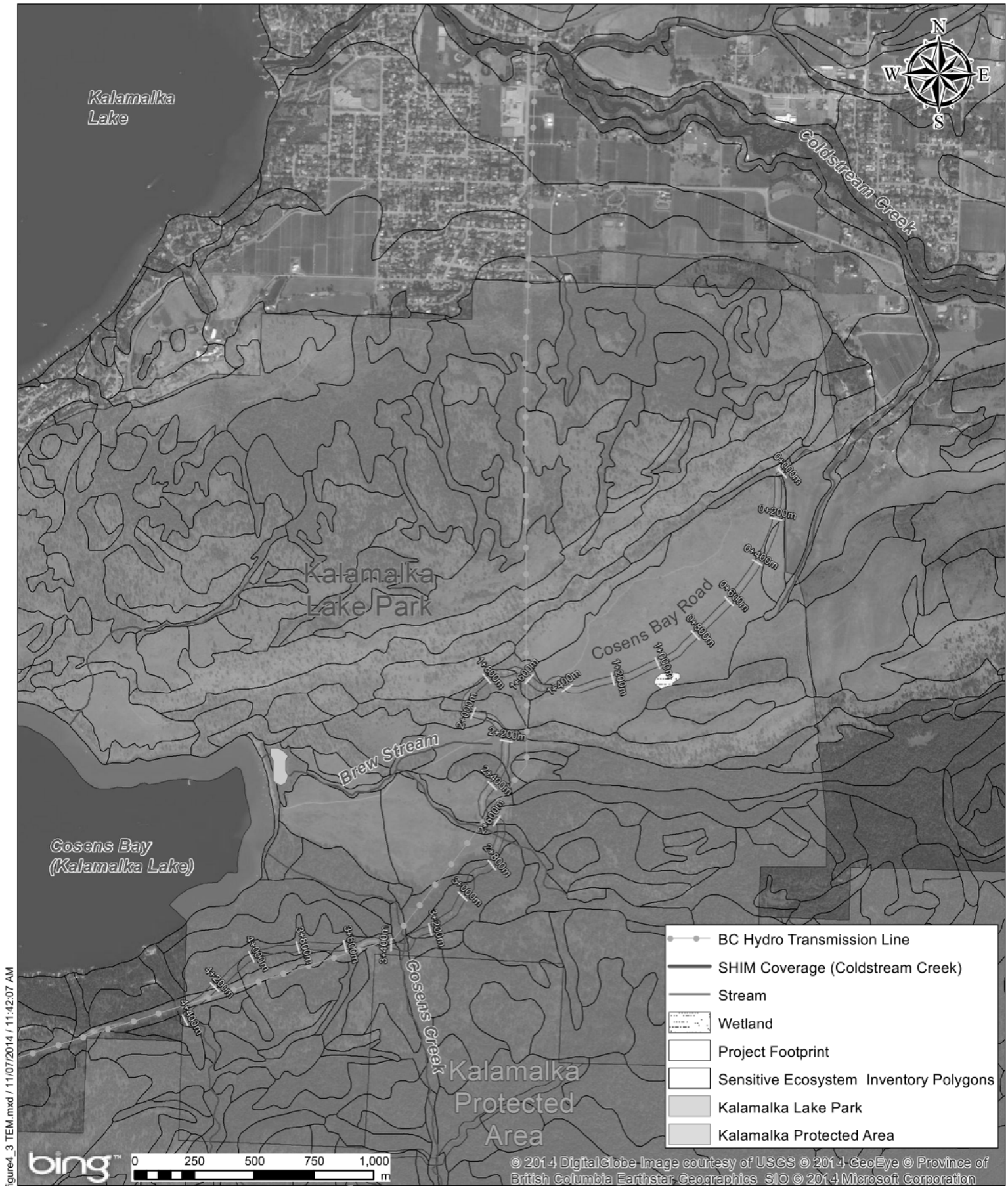


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Based on the field assessment and SEI data (Iverson and Uunila 2008), five primary ecosystem units were identified in the Project Area. Figure 4-4 shows the ecological communities identified within the Project Area, and the location of each survey plot within each of the five primary units. Within the five units, 10 sensitive ecological communities (Table 4-2) and two non-sensitive units (Table 4-3) were identified.

Table 4-2 Sensitive ecological communities in the Project Area

Habitat Type	Sensitive Ecological Community	Scientific Name	Site Series	B.C. List	Amount found (ha) within Project Area
Forest	Douglas-fir/ponderosa pine-bluebunch wheatgrass-pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> - <i>Calamagrostis rubescens</i>	IDFxh1 /03	Blue	2
Forest	Douglas-fir-ponderosa pine/snowbrush/pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Ceanothus velutinus</i> / <i>Calamagrostis rubescens</i>	IDFxh1 /04	Not Listed	3
Forest	Douglas-fir/ponderosa pine - pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Calamagrostis rubescens</i>	IDFxh1 /01	Blue	13
Grassland	Idaho-fescue /bluebunch wheat grass	<i>Festuca idahoensis</i> - <i>Pseudoroegneria spicata</i>	IDFxh1 /91	Red	4
Grassland	Prairie rose/Idaho fescue	<i>Rosa woodsii</i> / <i>Festuca idahoensis</i>	IDFxh1 /97	Red	2
Grassland	Bluebunch wheatgrass-arrowleaf balsamroot	<i>Pseudoroegneria spicata</i> - <i>Balsamorhiza sagittata</i>	IDFxh 1 /93	Blue	17
Sparsely Vegetated, Talus	Saskatoon - mock orange talus	<i>Amelanchier alnifolia</i> - <i>Philadelphus lewisii</i>	IDFxh1 /00	Not Listed	<1
Riparian	Douglas-fir/ponderosa pine-snowberry-spirea	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> / <i>Spiraea betulifolia</i>	IDFxh1 /07	Not Listed	1



Habitat Type	Sensitive Ecological Community	Scientific Name	Site Series	B.C. List	Amount found (ha) within Project Area
Riparian	Hybrid white spruce-Douglas-fir/Douglas maple / dogwood	<i>Picea engelmannii x glauca</i> / <i>Acer glabrum</i> - <i>Cornus stolonifera</i>	IDFxh1 /08	Not Listed	1
Wetland	Baltic rush marsh-meadow	<i>Juncus balticus</i> - meadow	IDFxh1 /00	Not Listed	<1

Table 4-3 Non-sensitive ecological communities in the Project Area

Non-Sensitive Ecological Community	Area (ha)
Cultivated field	<1
Road surface	3

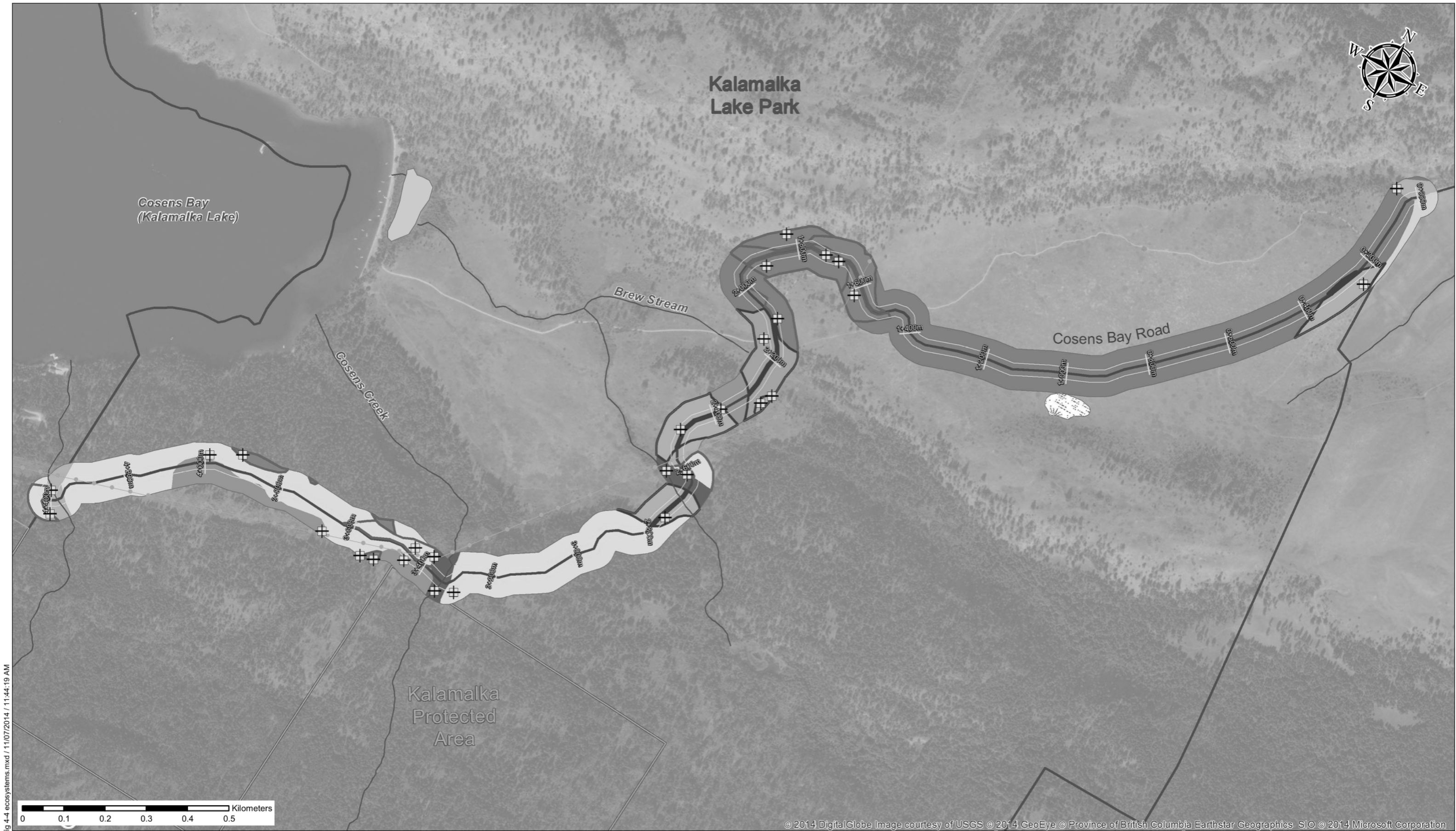


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SUMMIT
ENVIRONMENTAL CONSULTANTS INC.
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Sample Plot Locations
 stations
 BC Hydro Transmission Line
 Stream

Project Footprint
 Wetland
 Red Listed Ecosystem
 Blue Listed Ecosystem
 Kalamalka Protected Area
 Kalamalka Lake Park

SEI Ecosystems

Existing Road
 Baltic rush marsh-meadow - wetland
 Cultivated field
 Douglas-fir/Ponderosa pine - pinegrass
 Douglas-fir/Ponderosa pine-snowberry-spirea
 Douglas-fir/Ponderosa pine-bluebunch wheatgrass-pinegrass

Douglas-fir/Ponderosa pine-snowberry-spirea
 Douglas-fir-Ponderosa pine/snowbrush/pinegrass
 Idaho-fescue /bluebunch wheatgrass
 Prairie rose/Idaho fescue
 Saskatoon - Mock orange talus
 Bluebunch wheatgrass-arrowleaf balsamroot

PROJECT NO.: 2014-8067.000.000
 DATE: June 2014
 DRAWN BY: BdJ / DA

**FIGURE 4-4 ECOLOGICAL COMMUNITIES
WITHIN THE PROJECT AREA**
 Ministry of Transportation and Infrastructure
 Cosens Bay Road Environmental
 Impact Assessment

4.4.1 Grasslands

The Park is considered to be the best representation of North Okanagan grassland in the region (Tedesco 2006). Grasslands dominate the northern half of Cosens Bay Road, running from the Park entrance to Brew Stream (Photographs 3 and 4, Appendix A). Most of the grasslands have patchy sections of noxious weeds; however, the first kilometre of the road from the north entrance is particularly weed infested, with weeds seeming to radiate outwards from the road. Noxious weeds include diffuse knapweed (*Centaurea diffusa*), Russian knapweed (*Acroptilon repens*), sulphur cinquefoil (*Potentilla recta*), Dalmatian toad flax (*Linaria dalmanica*), and mullein (*Verbascum thapsus*). Typical native grassland species such as desert-parsley (*Lomatium* spp.), yellow bell (*Fritillaria pudica*), large-flowered tritelia (*Brodiaea douglasii*), yarrow (*Achillea millefolium*), silky lupine, june grass, Baltic rush meadow (*Juncus balticus*), arrowleaf balsamroot, and Idaho fescue are also present.

The presence of the road has, no doubt, contributed to the spread of weeds in the Park, as has the absence of fire and grazing. Absence of grazing may have led to proliferation of grassland species, but it has also contributed to tree encroachment, which is evident at the sharp bend along the road from 1+500 m to 2+200 m (Figure 1-1) where intermittent clusters of ponderosa pine begin.

Based on the SEI data and the field assessment, three grassland ecological communities are represented in the Project Area:

- Bluebunch wheatgrass / arrowleaf balsamroot;
- Idaho-fescue / bluebunch wheatgrass; and
- Prairie rose / Idaho fescue.

4.4.2 Forests

A number of forested ecosystems are present in the Park. Open ponderosa pine forests are the most prevalent in the lowland areas, whereas Douglas-fir dominates the southern areas of the Park. Some of these forested stands are considered old forests dominated by large, old trees (average tree height 22 m, diameter at breast height >40cm). On the north side of the road, along the sharp bend, 1+600 to 1+800 m, the landscape is steep with a talus slope and grassland, but the area downslope across the road exhibits a gradually increasing percentage cover of snowberry and the landscape changes to open ponderosa pine forest. The southern portion of the road is dominated by open ponderosa pine and Douglas-fir forest. Here, the topography slopes north and downwards to the lake. Mature trees and snags are more predominant downslope of the road (Photograph 17, Appendix A), whereas the area upslope features mainly younger trees. Large ponderosa pine snags in this open forest habitat are important breeding areas for woodpecker species such as the Blue-listed Lewis's woodpecker (*Melanerpes lewis*). The forest habitat is fragmented by a hydro-electric transmission line that runs approximately east-west near Cosens Bay Road.

Four forest ecological communities are represented in the Project Area:

- Douglas-fir/ponderosa pine – pinegrass;
- Douglas-fir/ponderosa pine-bluebunch wheatgrass-pinegrass;
- Douglas-fir/ponderosa pine/snowbrush/pinegrass; and
- Douglas-fir/ponderosa pine-snowberry-spirea.

4.4.3 Riparian

The Project Area includes riparian habitat at Cosens Creek (photograph 15, Appendix A) and Brew Stream, and in some low-lying areas where moisture collects. The mature trees in these areas consist mainly of Douglas-fir and ponderosa pine, and there are some paper birch (*Betula papyrifera*). The understory is comprised of willow, Saskatoon, Douglas maple, and snowberry. These areas are much wetter than the surrounding habitat, and they create a diverse landscape, habitat variability, and a larger percentage cover of moss than elsewhere in the Project Area. The vegetation detected during the field assessment was inconsistent with the SEI ecological community classification, as hybrid white spruce (*Picea engelmannii* x *glauca*) was not observed. However, our assessment was based on a small percentage of the entire SEI study area, and this species may be present outside the Project Area.

For the EIA we maintained the classifications set out by the SEI and noted two riparian ecological communities represented in the Project Area:

- Hybrid white spruce/Douglas-fir-Douglas maple- osier dogwood; and
- Douglas-fir/ponderosa-pine-snowberry-spirea.

4.4.4 Rock Outcrops and Talus Slopes

Sparsely vegetated ecosystems within the Project Area are comprised of areas where bedrock, rocky outcrops and talus limit the establishment of vegetation. These habitats can be made up of discontinuous vegetation, steep vertical cliffs, or rocky outcrops with cracks, crevices, narrow ledges, and small pockets of soil, or slopes of angular rock fragments.

There is a large rock outcrop at the entrance to the Park north of the road, and a second outcrop and talus slope along the sharp bend in the centre of the road, also north of the road (Photographs 1 and 7, Appendix A). Rock outcrops and talus are some of the defining features of the Park and provide habitat for unique species, such as the Red-listed flat-topped broomrape (*Orobanche corymbosa*), and for other wildlife species, such as snakes. Other plant species adapted to the harsh conditions of rocky substrates include mock-orange (*Philadelphus lewisii*), oceanspray (*Holodiscus discolor*), fern-leaved desert-parsley (*Lomatium dissectum*), Oregon woodsia (*Woodsia oregana*) and round-leaved alumroot (*Heuchera cylindrica*). These areas are often surrounded by saskatoon, chokecherry, and snowberry, all of which provide cover, foraging opportunities and resting habitat for a variety of species.

One rock outcrop/talus slope ecological community is represented in the Project Area:

- Saskatoon - mock orange talus

4.4.5 Wetlands

Wetland ecosystems occur in areas where the water table is at or near the surface of the soil. These areas can be permanent or ephemeral in nature, but the characteristics of the ecosystem are influenced by the presence of water. These areas can also be important water sources, and can include areas of marsh, swamp, and shallow water areas.

The Project features only one wetland area, which is approximately 1 km from the Park entrance on the south side of the road and occupies less than 0.1 ha. Small ponds and wetlands are rare but highly important features of the Park and provide significant habitat. Rare plant species are often associated with wetland habitats.

During the field assessment, the area identified previously as a wetland was dry but low lying (Photograph 10, Appendix A). This wetland is most likely ephemeral in nature, providing seasonal habitat to a variety of amphibians, small mammals, birds, and invertebrates. There is some encroachment of weeds, such as mullein, burdock (*Arctium* sp.), and diffuse knapweed, and this reduces the habitat value to some degree. This ephemeral wetland is located 50 m from the road (i.e. outside the Project Area). Several dry gullies were also noted along the forested section to the south. A small dry culvert was noted crossing under near where the road leaves the Park. Little evidence of wetland habitat was noted.

One wetland ecological community is represented in the Project Area:

- Baltic rush marsh-meadow.

4.4.6 Rare and Endangered Plants and Ecological Communities

The Project Area has the potential to support several rare and endangered plants. A CDC database search revealed eight Red-listed and 20 Blue-listed plant species with potential to occur in the Project Area (based on Interior Douglas-fir habitat in the Okanagan Shuswap Forest District; Appendix B, Table 3). Four rare plants are reported to occur within a 5 km radius of the Project Area (CDC 2014; Table 4-4); however, only two of these have actually been identified the Park. Awned cyprus (*Cyperus squarrosus*) is a grass species that grows in moist to wet, often sandy sites in Douglas-fir, ponderosa pine, and bunchgrass areas. It is provincially blue-listed (Tedesco 2006). The Red-listed flat-topped broomrape (*Orobanche corymbosa*) is also reported to have been observed on the rocky slopes of the Park north of Cosens Bay (M. Martin, personal communication cited in Summit 2001). The individual who reported that observation remarked on the apparently low occurrence of rare and endangered plants within the Park, and suggested that grazing in the 100 years before park creation, combined with recent herbicide applications for noxious weed control, has contributed to general degradation of the species diversity in the grasslands (Summit 2001). No rare plants were observed during the field assessment.

Table 4-4 Rare or endangered plant species reported within a 5 km radius of the Project Area

Common Name	Scientific Name	B.C. List
Crested wood fern	<i>Dryopteris cristata</i>	Blue
Orange touch-me-not	<i>Impatiens aurella</i>	Blue
Peach-leaf willow	<i>Salix amygdaloides</i>	Red
Many-headed sedge	<i>Carex sychnocephala</i>	Blue
Flat-topped broomrape	<i>Orobanche corymbosa</i>	Red
Awneid cyprus	<i>Cyperus squarrosus</i>	Blue

Source: CDC 2014; Summit 2001

Based on background review, field surveys, and the SEI conducted for the Coldstream - Vernon area (Iverson 2000, Iverson 2006), 10 ecological communities occur in the Project Area. Of these, three are provincially Blue-listed and two are Red-listed (Table 4-2). The Red-listed big sagerush/ bluebunch wheatgrass – arrowleaf balsamroot rare ecological community has potential to occur within the grasslands on the west side of Kalamalka Lake (CDC 2014), but this community does not appear to be represented in the Project Area.

4.5 WILDLIFE AND WILDLIFE HABITAT

The high diversity of habitats per unit area in KLPP makes the Park attractive to a multitude of wildlife. Few areas in all of B.C. have as diverse a terrestrial fauna. The North Okanagan Naturalists' Club has conducted numerous ecological inventories in the Park. Nine reptile species, more than 130 bird species, more than 430 plant species, and almost 70 butterfly species have been recorded (North Okanagan Naturalists' Club 1986).

4.5.1 Grasslands

In B.C., grasslands make up less than 1% of the provincial land base but provide habitat for one-third of the provinces' listed species, such as the western rattlesnake (*Crotalus oreganus*), gopher snake (*Pituophis catenifer deserticola*), great basin spadefoot (*Spea intermontana*), grasshopper sparrow (*Ammodramus savannarum*), and yellow-bellied marmot (*Marmota flaviventris*). A yellow-bellied marmot was observed during the field visit on May 16, 2014. These areas, although high in biodiversity, are sensitive to disturbance by motorized vehicle or recreational activities, and through the spread of invasive species. In addition, suppression of fire and increased management of these areas has led to forest encroachment (Iverson 2008).



4.5.2 Forest

Large trees provide habitat for primary and secondary cavity nesters, such as woodpeckers and owls. During the field visits, evidence of woodpecker excavations were observed throughout the forested areas of the Park, as were ungulate tracks. Large ponderosa pine snags provide important nesting habitat for birds such as American kestrel (*Falco sparverius*), northern flicker (*Colaptes auratus*), and the blue-listed Lewis's woodpecker. Forests provide important cover for many mammalian predator and prey species, such as American black bear (*Ursus americanus*), coyote (*Canis latrans*), white-tailed deer (*Odocoileus virginianus*), and mule deer (*Odocoileus hemionus hemionus*). A white-tailed deer was observed during one of the field visits.

In addition to providing various habitats to meet the life requisites of different species, forests can also act as buffers between ecosystems. For example, mature forests can provide buffers for old forests and have potential to restore the historical stand structure as each forest changes over time (Iverson 2008).

4.5.3 Riparian

Riparian habitats generally have a distinctive vegetative community relative to that of adjacent upland areas. These habitats tend to have high biodiversity, as they support terrestrial and aquatic species by providing shelter, water, breeding habitat, and forage. Riparian areas can also act as movement corridors for wildlife, and can function as links that connect habitat types and wildlife populations.

4.5.4 Rocky Outcrops and Talus Slopes

These areas provide specialized habitat for reptiles such as rattlesnakes, gopher snakes, and the northern alligator lizard (*Elgaria coerulea*), for mammals such as Townsend's big eared bat (*Corynorhinus townsendii*) and the spotted bat (*Euderma maculatum*), and for birds such as the canyon wren (*Catherpes mexicanus*).

Sparsely vegetated ecosystems are sensitive to disturbance and require extensive time to recover. If soil or rock is removed or eroded, these ecosystems may never recover. The result could be loss of unique features such as snake and bat hibernacula sites, which constitute a life requisite that may already be a limiting factor for species at the northern extents of their range (Macartney 1985; COSEWIC 2002, 2004a, 2004b).

4.5.5 Wetlands

Wetlands can be highly productive areas that provide shelter, forage, cover, and nesting habitat to a variety of species, such as the red-winged black bird (*Agelaius phoeniceus*), great blue heron (*Ardea herodias*), various amphibians and invertebrates, mammals such as bats, and reptiles such as western painted turtles (*Chrysemys picta bellii*).

4.5.6 Rare and Endangered Wildlife Species

Several rare and endangered wildlife species are known to occur in KLPP. A search of the CDC (2014) revealed nine such species within a 5 km radius of the Project Area. However, based on numerous presence/non-detection surveys (Okanagan Naturalists' Club 1986, Summit 2001, Hobbs 2013), a number of rare and endangered wildlife species are also likely to occur in the Park (Cannings and Cannings 1995; Table 4-5). In general, invertebrate species occurrence and distribution within KLPP is very poorly understood. A list of rare and endangered species that have been identified or have potential to occur in the Project Area is presented in Table 4-5.

Table 4-5 Rare or endangered wildlife species documented or likely to occur in the KLPP

Common Name	Scientific Name	B.C. List ¹	COSEWIC ²	SARA ³
<i>Invertebrates</i>				
Baird's swallowtail	<i>Papilio machaon pikei</i>	Blue		
Immaculate green hairstreak	<i>Callophrys affinis</i>	Blue		
Okanagan robber fly	<i>Efferia okanagana</i>	Red	Endangered	
<i>Amphibians</i>				
Great basin spadefoot	<i>Spea intermontana</i>	Blue	Threatened	1
<i>Reptiles</i>				
Gopher snake	<i>Pituophis catenifer deserticola</i>	Blue	Threatened	1
North American racer	<i>Coluber constrictor</i>	Blue	Special Concern	1
Painted turtle	<i>Chrysemys picta</i>	Blue	Endangered / Special Concern	1
Rubber boa	<i>Charina bottae</i>	Yellow	Special Concern	1
Western rattlesnake	<i>Crotalus oreganus</i>	Blue	Threatened	1
<i>Birds</i>				
Canyon wren	<i>Catherpes mexicanus</i>	Blue		
Flammulated owl	<i>Otus flammeolus</i>	Blue	Special Concern	1
Grasshopper sparrow	<i>Ammodramus savannarum</i>	Red		



Common Name	Scientific Name	B.C. List ¹	COSEWIC ²	SARA ³
Lewis's woodpecker	<i>Melanerpes lewis</i>	Red	Threatened	1
Peregrine falcon	<i>Falco peregrinus anatum</i>			
Prairie falcon	<i>Falco mexicanus</i>			
Swainson's hawk	<i>Buteo swainsoni</i>	Red		
Western screech owl	<i>Megascops kennicottii macfarlanei</i>	Red	Threatened	1
Mammals				
American badger	<i>Taxidea taxus</i>	Red	Endangered	1
Spotted bat	<i>Euderma maculatum</i>	Blue	Special Concern	1
Townsend's big-eared bat	<i>Corynorhinus townsendii</i>	Blue		
Western harvest mouse	<i>Reithrodontomys megalotis</i>	Blue	Special Concern	1

¹Red-listed species include any species that is Extirpated, Endangered, or Threatened in B.C.; Blue-listed species are those indigenous species, subspecies or ecological communities considered to be of Special Concern in B.C. because of characteristics that make them particularly sensitive to human activities or natural events.

²The Committee on the Status of Endangered Wildlife in Canada (COSEWIC; www.cosewic.gc.ca), is the independent agency that determines the status of species in Canada. COSEWIC status is defined as SC = Special Concern; TH = Threatened; EN = Endangered; DD = Data Deficient; and, NAR = Not at Risk.

³Schedule 1 of the *Species at Risk Act* (SARA) is the official list of wildlife species at risk in Canada. It includes species that are extirpated, endangered, threatened, and of special concern. Once a species is listed on Schedule 1, protection and recovery measures are developed and implemented.

The Park features numerous snake hibernacula, which constitute a critical life requisite for snake species. Baseline studies indicate that there are as many as 21 snake dens in KLPP (Hobbs 2013), and several of these are near the Project Area. Because the B.C. Conservation Data Centre notes these as masked occurrences, locations of snake dens are not specified in this report. The Project Footprint is unlikely to impact the snake den sites, but there is likely to be significant seasonal snake movement to and from these sites on a twice yearly basis.

There are several historical accounts of Lewis's woodpecker nesting in the Park. This red-listed species is strongly associated with mature, open-canopied ponderosa pine forests and black cottonwood stands. The blue-listed canyon wren (*Catherpes mexicanus*) nests and feeds in steep cliffs and canyons, such as those in the area of Rattlesnake Hill.

A particular species of robber fly (*Efferia okanagana*) documented in the Park is only found in the Okanagan Valley. This harmless insect spends its larval stage in the soil hunting for other larvae and pupae as food sources. It lays its eggs in the dried flowerbeds of bunchgrass (Tedesco 2006). Little else is known about this red-listed species.



The western harvest mouse (*Reithrodontomys megalotis*) is a Blue-listed, grassland-associated rodent. Its preferred habitat is densely shrub-covered dry gullies that border open grasslands (Tedesco 2006). Suitable habitat for this species exists in the Brew Steam section of the Project Area, particularly at the northernmost fork of the stream where it is dry and shrubby.

4.5.7 Wildlife Habitat Ratings

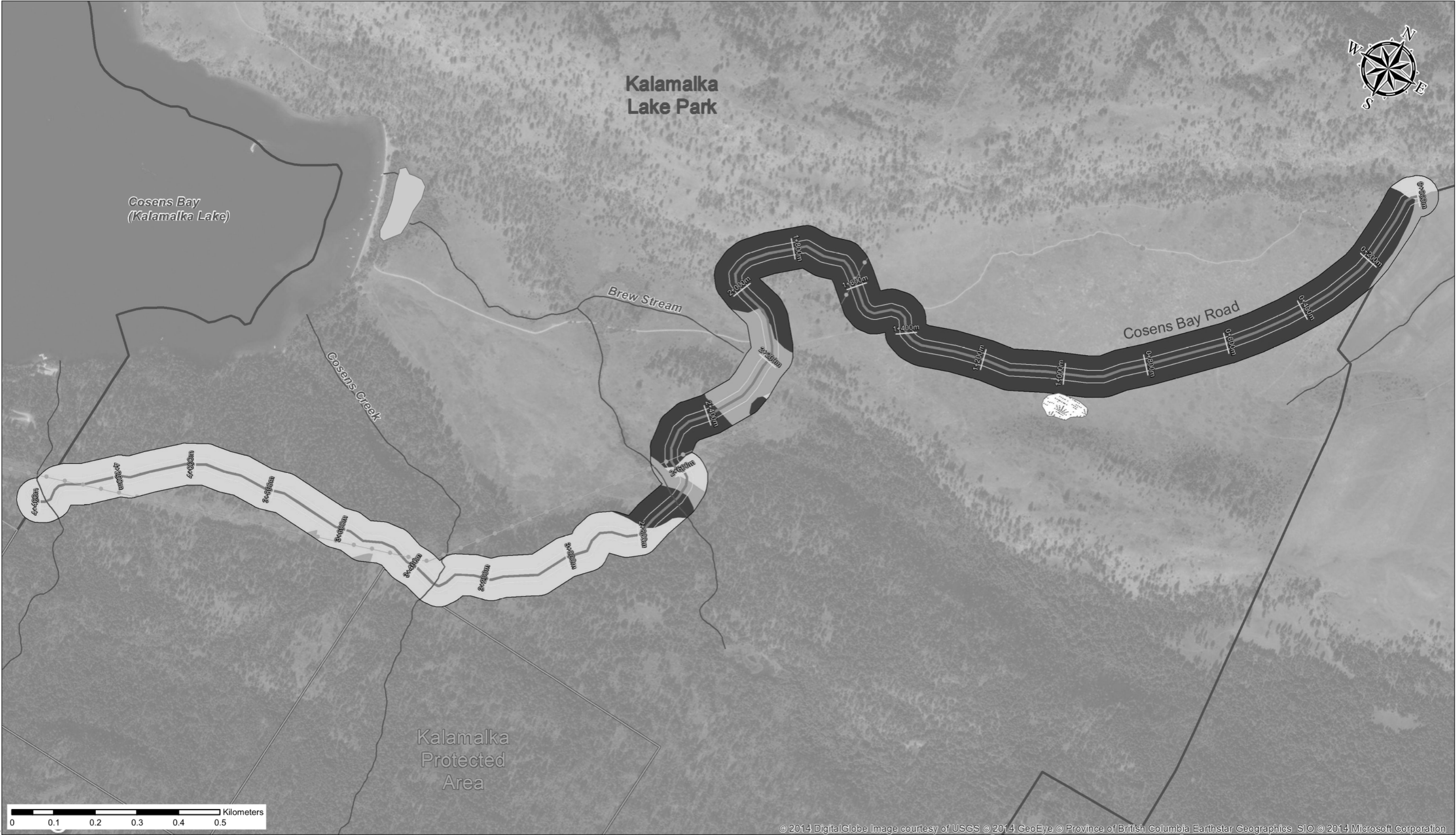
As outlined in Section 3.4.1, Summit identified two species per SEI polygon to verify the SEI-assigned wildlife habitat ratings in the field. Table 4-6 presents the habitat rating for each wildlife species (as determined based on the field assessment) and the overall wildlife habitat rating for each ecological community in the Project Area. The wildlife species were selected based on SEI-assigned habitat ratings of moderate or high. If an ecological community was assigned a low habitat rating for one species but a high habitat rating for another species, the habitat was rated as high overall. Thus, all the ecological communities were assigned a moderate or high wildlife habitat rating. The overall wildlife habitat ratings per ecological community according to SEI data are shown in Figure 4-6.

Table 4-6 Wildlife habitat ratings for the selected species and their respective ecological communities in the Project Area

Ecological Community	Species	Wildlife Habitat Rating (Overall)		Additional Comments
Douglas-fir/ponderosa pine – pinegrass	Western rattlesnake	M	M	Good nesting habitat in mature ponderosa's; good forage habitat for bear, deer, and woodpecker. Suitable yellow-breasted chat habitat.
	Swainson's hawk	M		
Douglas-fir/ponderosa pine-snowberry-spirea	Western rattlesnake	H	M-H	Snags provide suitable raptor nesting habitat; woodpecker excavations evident; some areas too open for yellow-breasted chat; good rattlesnake forage habitat; good small mammal and bat habitat.
	Yellow-breasted chat	M		
	Gopher snake	M		
Douglas-fir/ponderosa pine-bluebunch wheatgrass	Great-basin spadefoot	L	H	Reptile basking and shelter habitat on rocky outcrops; Good nesting and forage habitat for Swainson's hawk; good deer bedding and forage habitat for deer and bear; evidence of wildlife trees with cavities.
	Western rattlesnake	M		
	Swainson's hawk	H		
Idaho-fescue / bluebunch wheatgrass	Swainson's hawk	H	H	Unsuitable for painted turtle, lack of wetlands; Excellent nesting and forage habitat for Swainson's hawk; good travel corridor for gopher snake and moderate forage habitat
	Painted turtle	L		
	Badger	H		
	Grasshopper	H		



Ecological Community	Species	Wildlife Habitat		Additional Comments
		Rating (Overall)		
	sparrow			
Prairie rose/Idaho fescue	Western rattlesnake	M	M	Good snake forage habitat, potential corridor b/w den and forage sites; good deer bedding and browse habitat and bear foraging habitat.
	Gopher snake	M		
Hybrid white spruce-Douglas-fir/Douglas maple / Dogwood	Western rattlesnake	H	H	Good deer habitat, lots of bedding for cover and winter forage, evidence of browsing; forage habitat for deer and bear; potential badger habitat; wildlife trees.
	Swainson's hawk	H		
	Yellow-breasted chat	M		
Saskatoon – Mock orange talus	Western rattlesnake	H	H	Excellent habitat for reptiles and small mammals.
Douglas-fir-ponderosa pine/snowbrush/pinegrass	Swainson's hawk	M	M	Snags provide raptor nesting potential; mature with structural diversity; occasional rocky outcrops suitable for rattlesnake; forage habitat for Swainson's hawk, black bear and deer. Suitable for small mammal burrows also.
	Western rattlesnake	M		
	Gopher snake	M		
Bluebunch wheatgrass-arrowleaf balsamroot	Gopher snake	H	H	Talus section has good denning habitat for both snake species, potential snake corridor and forage habitat
	Western rattlesnake	H		
	Badger	H		
H = High wildlife habitat rating M = Moderate wildlife habitat rating L = Low wildlife habitat rating				



- BC Hydro Transmission Line
- Stream
- Wetland
- Project Area
- Project Footprint
- Kalamalka Protected Area
- Kalamalka Lake Park
- Existing Road Surface

- SEI Wildlife Habitat Ratings**
- High
 - Moderate
 - Low

PROJECT NO.: 2014-8067.000.000
DATE: June 2014
DRAWN BY: DA

FIGURE 4-5: PROJECT AREA WILDLIFE HABITAT RATINGS
Ministry of Transportation and Infrastructure
Cosens Bay Road Environmental Impact Assessment

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4.6 ARCHAEOLOGICAL AND HERITAGE RESOURCES

Kalamalka Lake Provincial Park is within the traditional territory of the Okanagan Indian Band. The traditional village of TsxElho'qEm, which is near the outlet from Vernon Creek at the northern end of Kalamalka Lake, is located a short distance from Cosens Bay (approximately 6.5 km by canoe) (Summit 2001). The grasslands and bluffs of the Park were traditionally used by the Okanagan Indian Band. Kekuli pits and six sites of lithic artifacts are located in the Park, along with evidence of small village clusters of pithouses and a larger cultural village (BC Parks in Kal Park News 2010/2011).

A request was submitted to the Archaeology Branch of the Ministry of Forests, Lands and Natural Resource Operations in June 2014. Data received from the Archaeology Branch were mapped but remain confidential at the request of the data administrator. Several cultural deposits were discovered in the Park; however, none are close to the Project Area. The closest archaeological feature is approximately 0.75 km from the Project Area.

4.7 ENVIRONMENTALLY SENSITIVE AREAS

As described in Section 3.4.2, we identified six Environmentally Sensitive Areas (ESAs) along Cosens Bay Road that require particular attention to ensure their protection during development/use of the proposed ROW. This attention could be in the form of avoidance, remediation, and/or specific mitigating measures. The ESAs are described below and the location of each is illustrated in Figure 4-7.

ESA 1

This ESA (11 ha, Figure 4-6, Photographs 2-4, Appendix A) begins at the entrance gate (0+0 m) to the park and ends approximately around 1+150 m, and has been identified for the protection of snakes and snake habitat, as well as grassland ecosystems. The rocky outcrop immediately north of the road provides excellent denning, basking, foraging and refugia for rattlesnakes and gopher snakes. The large boulder immediately west of the entrance gate (north of the road) provides suitable refugia for snakes as they emerge from dens. Foliage around the parking lot at the gate is dense and provides suitable foraging and refugia for snakes. The entire area around the entrance gate and parking lot is considered a migratory route for snakes as they travel to and from denning sites.

The grassland section included in ESA 1 is an area of heavy weed infestation, in particular those areas closest to the road. The grassland ecosystems of the Park constitute one of the areas of greatest concern noted in the 2006 State of the Park Analysis (Tedesco 2006). Increased access to the Park could facilitate further encroachment of weeds. The future protection and remediation of these grasslands should be a priority for Park officials and users.

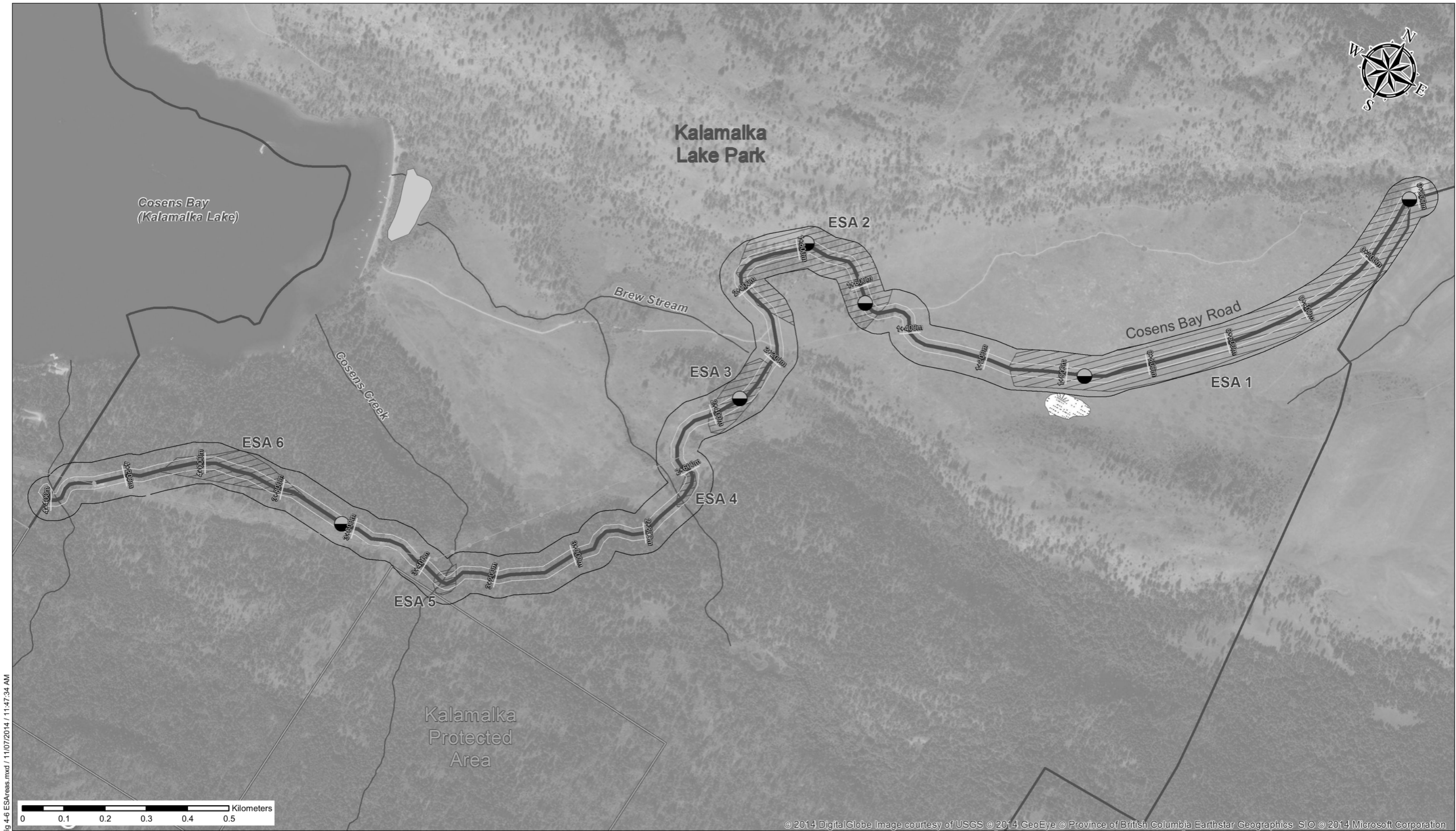


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<p>SUMMIT ENVIRONMENTAL CONSULTANTS INC. A Member of the Associated Engineering Group of Companies</p>	Proposed Underpass	Project Area	Environmentally Sensitive Area	<p>PROJECT NO.: 2014-8067.000.000</p> <p>DATE: June 2014</p> <p>DRAWN BY: DA</p>	<p>FIGURE 4-6: ENVIRONMENTALLY SENSITIVE AREAS</p> <p>Ministry of Transportation and Infrastructure</p> <p>Cosens Bay Road Environmental Impact Assessment</p>
	BC Hydro Transmission Line	Project Footprint	Wetland		
	Stream	Existing Cosens Bay Road Surface	Kalamalka Protected Area		
		Kalamalka Lake Park			

Two wildlife underpasses are proposed as part of the road ROW along this ESA. One proposed underpass site is near the entrance gate to facilitate reptiles moving between denning and foraging sites. The second is near the ephemeral wetland area, which is high-value habitat for small mammals such as mice, voles and shrews. The south-facing slope at this area had evidence of small mammal use (e.g. burrowing and den excavation). Snakes emerging from denning sites along the rocky outcrop to the north of the road are likely to require access to this depression to the south.

ESA 2

ESA 2 is 5 ha and begins along the sharp curve located at approximately at station 1+500 m and ending around 2+100 m has been identified as an ESA for its high-value raptor, snake and ungulate habitat (Photograph 7 and 8, Appendix A). This area is characterized by large, well-spaced ponderosa pine trees and large well-spaced saskatoon shrubs. The pine trees provide excellent nesting and roosting habitat for Swainson's hawk (*Buteo swainsoni*) and other raptors. The understory is dominated by pinegrass and has signs of heavy ungulate (i.e. deer) use. There is a sizable talus slope north of the road. The slope is south-facing and relatively steep (>50%), and it provides suitable forage, basking, resting and refugia for snakes and other reptiles. At the base of this slope, across the road, is a topographical depression that likely provides high-value foraging habitat for snakes. Interspersed throughout the talus are large boulders (>3 m diameter) that may provide suitable denning habitat. As well, numerous large boulder complexes along the south side of the road are suitable for denning, basking and resting snakes.

Two wildlife underpasses are proposed in this ESA to project wildlife movement between the northern uplands and the southern lowlands.

ESA 3

This ESA is just over 1 ha in size (2+200 m to approximately 2+425 m) and encompasses the northern fork of Brew Stream, which is dry and well vegetated (Photograph 12, Appendix A). This depression likely acts as a natural migratory corridor, providing suitable cover for large and small mammals. White-tailed deer (*Odocoileus virginianus*) were observed in this area during one of the field visits. This densely shrub-covered dry gully that borders open grasslands may also provide suitable habitat for the blue-listed western harvest mouse. Nearby are rocky outcrops and mature Douglas -fir and ponderosa pines on both sides of the road. These provide high-value habitat for small mammals and birds, and, therefore, forage and hunting habitat for reptiles and raptors. The large trees provide roosting, perching and nesting habitat for raptors such as Swainson's hawk. Large over-mature trees also provide suitable forage and roosting habitat for insectivorous birds seeking larvae and insects in bark.

A wildlife underpass is proposed at this location because the dry gully forms a natural movement corridor.

ESA 4

This ESA (0.2 ha) encompasses the southern fork of Brew Stream (2+600 m to 2+750 m; Photograph 14, Appendix A). Here, the stream was flowing at the time of the field assessment and the habitat had higher moisture than the surrounding Park. The existing culvert at the outflow location of this stream is a perched outfall and should be replaced during future road upgrade works.

ESA 5

This area (0.3 ha) is located at the crossing point of Cosens Creek (3+250 m to 3+350 m) to a fast-flowing creek in an incised channel. The surrounding vegetation also represents a higher-moisture habitat than surrounding areas (Photograph 16, Appendix A). The crossing is upstream of Cosens Creek waterfall, which is a natural barrier to fish due to its high gradient. Two 500 mm culverts are located at the outflow point as a result of the steeply sloped stream channel. Culvert inflow was partially blocked by woody debris, backwatering, and siltation, which indicates that the size of the culvert may need to be increased. A number of high-value Douglas-fir trees in the area provide nesting and roosting habitat for raptors. Large shrubs along the drainage channel are likely to support small passerines, such as yellow-breasted chat (*Icteria virens*).

ESA 6

This ESA is just under 2 ha and (3+750 m to 4+100 m) was selected because it features mature coniferous forest along the western end of the road, where the roadway deviates from the hydro-electric transmission line ROW (Photograph 17 and 18, Appendix A). Much of this forested area can be considered valuable to a variety of species, including bear, deer, moose, cougar and a multitude of birds. This area is steeply sloped to the north and features larger, more mature trees on the downslope than on the upslope. The down slope also has a number of snags suitable for wildlife trees.

There is a dry drainage channel along this section of forest that would be suitable for a wildlife underpass. Small mammals are likely to use depression features such as this as natural movement corridors.

4.8 RECREATIONAL USE

Kalamalka Lake Provincial Park is one of the most striking parks in the north Okanagan attracting locals and tourists. The Park is currently used by hikers, bikers, trail runners, dog walkers, horseback riders, water users, hunters and fishers, rock climbers, birdwatchers, and other environmental enthusiasts. Depending on snow levels, the Park can provide cross-country skiing in the winter. Park rules prohibit the following:

- overnight camping;
- fires;
- motorized vehicles;
- dogs off the leash; and
- dogs or horses on non-designated beaches.

There are two designated pet beaches for dogs and one for horses. As horses may be unpredictable, they have the right of way on trails. Interpretative signs are located at four trailheads near the parking lots. Recreation facilities are limited to parking lots, pit toilets, and picnic tables. There are three main parking areas at the Park: Red Gate, Cosens Bay Gate, and Jade and Juniper Bay. These are day-use areas only. Cosens Bay Gate parking area has space for approximately 20 vehicles. Cosens Bay Road is intended to be used for through traffic only and for accessing private properties beyond the Park (BC Parks 2014). However, pullout areas are evident along the length of Cosens Bay Road and cars have been seen parked in these pullout areas, which often encroach onto grassland habitat.



4.9 SUMMARY OF BASELINE ENVIRONMENT

The Park provides home to a diverse range of ecosystems and wildlife species. As it stands, Cosens Bay Road provides access to Park users and local landowners. However, the road is narrow and has limited lines of sight in several places. The existence of the road has opened up a greater area of the Park for human enjoyment, but with that comes human influences such as:

- weed encroachment (Photograph 4, Appendix A).;
- unauthorized pullout areas disturbing grasslands (Photograph 11, Appendix A).;
- trial heads being used as parking areas;
- wildlife casualties on the road; and
- insufficient culverts to accommodate spring flows in streams/creeks (Photograph 15, Appendix A)..

Should the Project proceed, these concerns will need to be addressed to ensure that environmental concerns relating to access are not magnified.

5 Environmental Impact Assessment

As outlined in Section 3, the qualitative rating system developed for the initial EIA (Summit, 2001) was used to compare the baseline conditions to the conditions that would be produced by the Project (i.e. creation of the proposed ROW). The general rating system is presented in Table 3-1, and the customized rating system for ecological communities and wildlife is presented in Table 3-2.

5.1 CLIMATE AND BIOGEOCLIMATIC ZONES

The Project to create the ROW will involve removal of approximately 10.6 ha of habitat from the Park. Removal of vegetated surface may result in a fractional increase of surface temperature within the Project Footprint, and may result in a fractional decrease of potential evapotranspiration. The Project is unlikely to affect total precipitation. Overall, the loss of vegetated surface would amount to approximately 0.25% of the KLPP total area. The potential impact of the Project on local climate and biogeoclimatic zones is anticipated to be negligible.

5.2 TERRAIN AND SOILS

Erosion potential is assumed to be lower in the Cosens Valley section and higher along the steep forested section to the south. Potential erosion and sediment transfer are possible impacts of the Project. Potential impacts to soils and terrain include the following:

- erosion leading to reduced soil nutrient content and hydration;
- fine sediment transfer resulting in siltation of surface water or nuisance dust;
- soil compaction resulting in loss of subterranean habitat for snakes, amphibians and small mammals; and
- changes to the topography of the terrain as a result of cut and fill operations.

If best management practices in road construction are implemented, it is expected that potential impacts to soils can be mitigated; therefore, the potential impact of the Project on terrain and soils is expected to be minor.

5.3 WATER RESOURCES

There are no groundwater wells within the Project Area. The Project is expected to have no impact to groundwater in the area.

Neither of the two surface water bodies in the Project Area are thought to be fish-bearing. Potential impacts as a result of the Project may include the following:

- Localised siltation close to water bodies as a result of ground disturbance and runoff resulting in deterioration of water quality;



- reduction in shading and/or increase in stream temperature as a result of vegetation clearing around stream crossings; and
- reduction in water quality as a result of an oil or fuel spill from construction equipment used.

If best management practices in road construction are implemented, it is expected that the potential impacts to surface water will be minor and can be mitigated. The existing culverts at each of the two stream crossings have been assessed as insufficient to accommodate spring flows based on observations of the upstream channel condition (e.g. indications of backwatering higher than the height of the culvert, debris buildup at the upstream opening of the culverts). These could be improved with respect to size, gradient and percent of the culvert embedded. Thus, while minor impacts to surface water are expected during the construction phase of the Project, appropriate mitigation measures should improve the overall performance of the stream crossings on Cosens Bay Road, resulting in negligible impact overall.

5.4 VEGETATION AND ECOLOGICAL COMMUNITIES

The Project will result in loss of small portions of several ecological communities. The most significantly affected of these would be the Blue-listed bluebunch wheatgrass-arrowleaf balsamroot (anticipated loss approximately 4.33 ha). The second most significantly affected area would be the Blue-listed Douglas-fir/ponderosa pine-pinegrass habitat (anticipated loss 3.43 ha). The two Red-listed communities (Idaho-fescue/bluebunch wheatgrass and prairie rose/Idaho fescue) will lose less than 1 ha and less than 0.5 ha, respectively. It should be noted that there is moderate existing disturbance in each of these communities, as they all border the existing Road and have varying levels of weed and/or tree encroachment. The greatest disturbance from weed encroachment is evident in the red-listed Idaho-fescue/bluebunch wheatgrass and blue-listed bluebunch wheatgrass-arrowleaf balsamroot communities. Table 5-1 lists the loss (ha) of each ecological community within the Project Footprint, and in relation to the Park as a whole (%).

Table 5-1 Loss of each ecological community within the Project Footprint and in relation to the Park

SEI Unit	Ecological Community	Scientific Name	B.C. List	Area (ha) lost to Project Footprint	% lost from KLPP
Forest	Douglas-fir/ponderosa pine-bluebunch wheatgrass-pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Pseudoroegneria spicata</i> - <i>Calamagrostis rubescens</i>	Blue	0.5	0.5
Forest	Douglas-fir-ponderosa pine/snowbrush/pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Ceanothus velutinus</i> / <i>Calamagrostis rubescens</i>	Not Listed	0.6	1

SEI Unit	Ecological Community	Scientific Name	B.C. List	Area (ha) lost to Project Footprint	% lost from KLPP
Forest	Douglas-fir/ponderosa pine - pinegrass	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Calamagrostis rubescens</i>	Blue	3	2
Grassland	Idaho-fescue /bluebunch wheat grass	<i>Festuca idahoensis</i> - <i>Pseudoroegneria spicata</i>	Red	1	0.7
Grassland	Prairie rose/Idaho fescue	<i>sa woodsii</i> / <i>Festuca idahoensis</i>	Red	0.5	2.0
Grassland	Bluebunch wheatgrass- arrowleaf balsamroot	<i>Pseudoroegneria spicata</i> - <i>Balsamorhiza sagittata</i>	Blue	4	3
Sparsely vegetated, talus	Saskatoon - mock orange talus	<i>Amelanchier alnifolia</i> - <i>Philadelphus lewisii</i>	Not Listed	0	0
Riparian	Douglas-fir/ponderosa pine-snowberry-spirea	<i>Pseudotsuga menziesii</i> - <i>Pinus ponderosa</i> / <i>Symphoricarpos albus</i> / <i>Spiraea betulifolia</i>	Not Listed	0.2	0.2
Riparian	Hybrid white spruce-Douglas-fir/Douglas maple / dogwood	<i>Picea engelmannii</i> x <i>glauca</i> / <i>Acer glabrum</i> - <i>Cornus stolonifera</i>	Not Listed	0.2	0.5
Wetland	Baltic rush marsh-meadow	<i>Juncus balticus</i> - meadow	Not Listed	0	0
Cultivated field	N/A	N/A	Not Listed	0.02	0.07
Road surface	N/A	N/A	Not Listed	2.7	N/A

Table 5-2 summarizes the quantitated impact of the Project on each ecosystem unit or habitat type within the Project Footprint and compares to existing baseline conditions. The Project is expected to have significant impact on grassland habitats; however, many of the predicted impacts to grassland are already occurring in the Park. Should the Project proceed, these impacts will need to be addressed through mitigation and/or compensation.



Table 5-2 Potential impact on ecosystem units within the Project Footprint

SEI Unit	Approx. % of Route	Baseline		The Project	
		Impact Rating	Comments	Impact Rating	Comments
Grassland	55	Significant	<ul style="list-style-type: none"> • high weed encroachment • off-road/trail disturbance • encroachment of forest 	Significant	<ul style="list-style-type: none"> • Area with high biodiversity value • Potential for increased disturbance • Impacts mitigable with effort
Forest	43	Minor	<ul style="list-style-type: none"> • low impact 	Minor	<ul style="list-style-type: none"> • Loss of some wildlife trees • Potential for erosion/instability • Impacts mitigable
Riparian	2	Minor	<ul style="list-style-type: none"> • culverts requiring upgrade 	Minor	<ul style="list-style-type: none"> • Low occurrence • Impacts mitigable
Sparsely vegetated, talus	0	None	<ul style="list-style-type: none"> • none in close proximity 	None	<ul style="list-style-type: none"> • none in close proximity
Wetland	0	None	<ul style="list-style-type: none"> • none in close proximity 	None	<ul style="list-style-type: none"> • None in close proximity

5.5 WILDLIFE AND WILDLIFE HABITAT

Potential impacts to wildlife as a result of the Project are expected to be varied. With the exception of some habitat loss, most anticipated impacts are minor and similar to the existing baseline in the Park (Table 5-3). The potential impact to reptiles, however, has been rated as significant because the road bisects suitable denning and foraging areas within the Park. The risk of road-related mortality will still exist however, the Project will allow for implementation of mitigation measures, such as wildlife underpasses, to reduce this impact.



Table 5-3 Potential impact on wildlife within the Project Footprint

Wildlife	Baseline		The Project	
	Impact Rating	Comments	Impact Rating	Comments
Birds	Negligible	<ul style="list-style-type: none"> Disturbance 	Minor	<ul style="list-style-type: none"> Minor loss of habitat and disturbance Impacts mitigable
Mammals	Minor	<ul style="list-style-type: none"> Road-related mortality, disturbance 	Minor	<ul style="list-style-type: none"> Road-related mortality, disturbance and minor loss of habitat Impacts mitigable
Amphibians	Minor	<ul style="list-style-type: none"> Road-related mortality, disturbance 	Minor	<ul style="list-style-type: none"> Road-related mortality, disturbance and minor loss of habitat Impacts mitigable
Reptiles	Minor	<ul style="list-style-type: none"> Road-related mortality, disruption of movement and foraging habitat 	Significant	<ul style="list-style-type: none"> Loss of high value habitat, road-related mortality and disruption of hibernacula and foraging habitats Impacts mitigable with effort
Invertebrates	Minor	<ul style="list-style-type: none"> Indirect loss of habitat through weed encroachment 	Minor	<ul style="list-style-type: none"> Minor loss of habitat, weed encroachment Impacts mitigable

5.6 ARCHAEOLOGY AND HERITAGE RESOURCES

The Project will not impact known archaeological features within the Park; however, there is potential that previously unidentified archaeological features might be affected. Completion of an Archaeological Impact Assessment would identify areas along the proposed ROW that might require additional field investigations. Following mitigation, the impact to archaeology and heritage resources as a result of the Project is expected to be minor to negligible.

5.7 ENVIRONMENTALLY SENSITIVE AREAS

The identified ESAs (Figure 4-7) were assessed with respect to potential impacts from the Project, and comparison of these to current impacts from the road (Table 5-4). Potential impact has been rated as significant for three areas, ESA 1, 2 and 6, as the Project will result in loss of some high-value grassland and mature forestry habitat from these areas. These impacts can be mitigated with effort and/or addressed through compensation.

Table 5-4 Potential impact on Environmentally Sensitive Areas within the Project Footprint

ESA	Baseline		The Project	
	Impact Rating	Comments	Impact Rating	Comments
ESA 1	Significant	<ul style="list-style-type: none"> • Weed encroachment and road-related mortality and disruption of hibernacula and foraging habitats 	Significant	<ul style="list-style-type: none"> • Loss of high value habitat, disturbance of foraging habitats, and weed encroachment • Impacts mitigable with effort
ESA 2	Minor	<ul style="list-style-type: none"> • Road-related mortality, disturbance, disruption of hibernacula and foraging habitats 	Significant	<ul style="list-style-type: none"> • Loss of high value habitat, road-related mortality, disruption of hibernacula and foraging habitats, disturbance to talus • Impacts mitigable with effort
ESA 3	Negligible	<ul style="list-style-type: none"> • Road-related mortality, disturbance 	Minor	<ul style="list-style-type: none"> • Road-related mortality, disturbance and minor loss of habitat • Impacts mitigable
ESA 4	Minor	<ul style="list-style-type: none"> • Road-related mortality, disturbance, inadequate stream crossing 	Minor	<ul style="list-style-type: none"> • Road-related mortality , disturbance, minor habitat loss but improvement of stream crossing • Impacts mitigable
ESA 5	Minor	<ul style="list-style-type: none"> • Road-related mortality, disturbance, inadequate culvert 	Minor	<ul style="list-style-type: none"> • Road-related mortality , disturbance, minor habitat loss but improvement of stream crossing • Impacts mitigable

ESA	Baseline		The Project	
	Impact Rating	Comments	Impact Rating	Comments
ESA 6	Negligible	<ul style="list-style-type: none"> Disturbance, fragmentation 	Significant	<ul style="list-style-type: none"> Loss of mature wildlife trees, slope stability risk, disturbance Impacts mitigable with effort

5.8 RECREATIONAL USE

As noted, KLPP is one of the attractive parks in the north Okanagan. Opening Cosens Bay Road to the public has increased Park access for recreational use, which has increased environmental disturbance in the Park. For many, the Park's diverse range of species and ecological communities is its primary attraction. The proposed road improvements as part of this Project, such as establishment of ditches and replacement of culverts, should decrease erosion and the encroachment of weed while improving road safety for both humans and wildlife. With full implementation of proposed mitigation measures, such as weed management, the overall impact on recreation use of the Park should be positive.

5.9 CUMULATIVE IMPACTS

Cumulative impacts can occur when the effects of two or more actions combine to result in an incremental effect that is greater than the effects from any single action (BC Parks 1999). This can occur because of direct physical interaction between two or more actions, or because of changes to the regional landscape due to the presence of physical structures or changes in the type or level of human activity. BC Parks (1999) identified five types of cumulative impacts that may occur in protected areas:

- sensory disturbance;
- contaminant transport;
- habitat loss and fragmentation;
- viewshed degradation; and
- experiential degradation.

Our assessment of these impacts followed the procedure for evaluating the potential for cumulative environmental impacts as outlined in the BC Parks Impact Assessment Process (1999). Other actions/changes may also potentially interact with the Project:

- An increase in recreational use of KLPP as a result of population growth in the north Okanagan. The population of Vernon increased by 6.7% between the 2001 and 2006 census (Statistics Canada 2014). As of 2006, the population of Vernon was 42,812. The current population of greater Vernon is 58,585 people (City of Vernon 2014).



- An increase in road use as a result in increased development south of the Park. Since the opening of Cosens Bay Road, private development has taken place south of KLPP. Future development is expected to be low, however, due to topography and Crown land constraints.

The values assessed were 1) habitat for rare and endangered species, 2) rare and endangered ecological communities, 3) biodiversity, 4) recreation, and 5) wilderness experience. The completed BC Parks cumulative impact assessment form is provided in Appendix C. The results indicate that the cumulative impact of the Project as a whole is generally expected to be low, with the exception of certain areas. For instance, moderate cumulative impacts may be expected for wilderness experience and biodiversity if the number of road users increases. Moderate impacts are expected to be only slightly detrimental and are mitigable over a few years (BC Parks 1999).

6 Mitigation Measures and Recommendations

The results of this EIA indicate that significant impacts are expected for grasslands and reptiles, and in certain ESAs along the proposed ROW. Measures to mitigate these impacts are proposed below.

6.1 GENERAL MITIGATION

- Employ Best Management Practices throughout construction, including but not limited to those in the following sources:
 - Develop with Care 2012: Environmental Guidelines for Urban and Rural Land Development in B.C. (MOE 2012);
 - Standards and Best Practices for In-stream Works (MWLAPa 2004);
 - Land Development Guidelines for the Protection of Aquatic Habitat (Chillibeck 1992);
 - Best Management Practices for Amphibians and Reptiles in Urban and Rural Environments in British Columbia (MWLAP 2004b); and
 - Guidelines for Raptor Conservation during Urban and Rural Land Development in B.C. (MOE 2013).
- Limit habitat loss and disturbance to the Project Footprint boundary.
- Limit clearing as much as possible, and stage construction vehicles on previously disturbed, non-vegetated areas. Construct cut slopes that are as steep as is reasonable in order to minimize the area cleared and the permanent loss of adjacent habitats.
- Establish a buffer zone of no activity immediately outside the Project Footprint.
- Wherever possible, minimize width of roads, and relax standards for grade, sag and curve radius to avoid excessive cutting and filling.
- Avoid rock blasting. If blasting of rock outcrops is required, obtain wildlife permits for reptile salvage prior to blasting. All wildlife surveys and salvage work must be conducted by a Qualified Environmental Professional (QEP). Blasting must avoid reptile hibernation times (September / October).
- Retain habitat that provides shelter for reptiles, such as talus, rock outcrops with fissures, and coarse woody debris.
- Avoid construction around rock outcrops in the winter to reduce disturbance to reptile dens.
- Avoid removal of established trees or shrubs where possible.
- Undertake all vegetation clearing outside the bird breeding window (April 1 to July 31).
- Contract a QEP to undertake a rare plants survey prior to any vegetation clearing works in grassland habitat.
- Salvage bluebunch wheatgrass, shrubs and other native plants, including young ponderosa pine and Douglas-fir, from cleared areas wherever possible. Re-plant disturbed areas such as fill slopes and road edges promptly after construction to minimize potential for soil erosion. Seed all exposed areas with an approved grass and herb seed mix that includes bluebunch wheatgrass. Do this shortly after completion to reduce soil erosion.
- Deposit no excavated on native vegetation. Use geotextiles or stabilization matting to cover soil storage areas to reduce wind, water, and erosion, and to stabilize the slopes created in these



- areas. Construction works in areas of slope instability should follow guidance, such as the Manual of Erosion Control and Shallow Slope Movement (MOT 1997).
- Avoid working during periods of heavy rainfall.
 - Conduct all works in and around water bodies in isolation from flow (i.e. in the dry).
 - Use silt fences and other temporary structures to prevent sediment transport near water bodies.
 - Avoid removal of riparian vegetation and overhanging vegetation as much as possible. Re-vegetate riparian areas immediately after in-stream works, as per guidelines in Highway Corridor Management Specifications for Highway Concessions (MOT 2004) and the Manual of Aesthetic Design Practice (MOT 1991).
 - Reduce the spread of invasive species during construction by ensuring that all equipment is cleaned before entering or leaving the site.
 - Retain an experienced Environmental Monitor to oversee the application of mitigation measures, provide technical advice on environmental issues, and evaluate the effectiveness of mitigation measures throughout the Project, with particular attention during vegetation clearing and culvert installation.
 - Pullout areas for Road upgrades should capitalize on existing pullouts where possible, and the previously disturbed ground under the hydro-electric transmission line (Photograph 19, Appendix A). Any pullout areas not required for maintenance should be re-vegetated with native seed mix.

6.2 ARCHAEOLOGICAL MITIGATION

- An Archaeological Impact Assessment should be completed to identify areas of archaeological potential along the proposed ROW.
- A qualified archaeologist should be present during all soil disturbances in areas along the proposed ROW with archaeological potential.

6.3 SPECIFIC MITIGATION FOR ENVIRONMENTALLY SENSITIVE AREAS

ESA 1

- Avoid disturbance to the large boulder inside the entrance gate and limit removal of mature vegetation surrounding the parking lot and entrance gate.
- Install two wildlife underpasses at the locations shown in Figure 4-6. Ensure natural substrates are placed along the bottom of the underpasses.
- Implement stringent weed control measures to prevent further introduction and/or spread of weed species into currently undisturbed areas.
- Prepare a Weed Management Plan in advance of works to control the spread of weeds to grassland habitats. This should include a detailed weed maintenance plan post-construction that is aimed at eradicating most weeds from this area of the Park. If this strategy is successful, consider implementing it throughout the Park (i.e. along trails).

ESA 2

- Avoid or limit removal of large conifers and shrubs.
- Avoid disturbance to the talus slope north of the road. If possible, restrict development to the fill slope on the inside of the bend in the road in this area.
- Avoid removal of large boulders from the inside of the bend in the road; rather, relocate these to outside the Project Footprint in an ecologically similar location (e.g. slope, aspect, vegetation type). Reptile surveys should be conducted prior to any boulder disturbance or movement.
- Install two wildlife underpasses at the locations shown in Figure 4-7. Ensure natural substrates are placed along the bottom of the underpasses.

ESA 3

- Limit disturbance to mature trees and shrubs.
- Limit disturbance to rocky outcrops.
- Install a wildlife underpass at the location shown in Figure 4-7. Ensure natural substrates are placed along the bottom of the underpass.

ESA 4

- Undertake culvert replacement in line with Standards and Best Practices for In-stream Works (MOE 2004), and conduct work in the dry.
- Limit removal of riparian vegetation.

ESA 5

- Undertake culvert replacement in line with Standards and Best Practices for In-stream Works (MOE 2004), and conduct work in the dry.
- Limit removal of riparian vegetation and mature Douglas-fir.
- If possible, widen on the downslope side of the road.

ESA 6

- Limit removal of mature trees and snags, particularly on the downslope side of the road.
- If mature trees adjacent to the road or trails are deemed a safety hazard, top the trees at 5 m to create wildlife snags rather than removing the trees.
- Replace removed trees at a ratio of two trees to every one removed. Newly planted trees should be inspected over 2 years and any that die during this period should be replaced.
- If possible, widen the upslope side of the road where the trees are younger.
- Install a wildlife underpass at the location shown in Figure 4-7. Ensure that natural substrates are placed along the bottom of the underpass.

6.4 MITIGATION FOR RECREATION USE AND THROUGH TRAFFIC

- Install and maintain low fencing or boulders throughout grassland areas along the roadway, leaving gaps for wildlife passage, to prevent disturbance of grassland communities by off-road vehicles.
- Install signage alerting drivers about the environmental sensitivity at the gate entrance area of the Park.



- Install signage requesting drivers to watch for and avoid snakes and other wildlife crossing the road.
- Install signage at each pullout area informing the public that parking is not permitted along Cosens Bay Road.
- Upgrade roads and ditch lines that will deter roadside parking or access to vegetated areas.

6.5 RECOMMENDATIONS

1. Prepare a Construction Environmental Management Plan prior to any works commencing.
2. Prepare a Weed Management Plan in advance of works to control the spread of weeds to grassland habitats. This should include a detailed weed maintenance plan for ESA 1 post-construction that is aimed at eradicating most weeds from this area of the Park. A recommended reference for developing this plan is Best Management Practices for Recreational Activities on Grasslands in the Thompson and Okanagan Basins (MWLAP 2004c).
3. If active nests or living areas of raptors or red- and blue-listed wildlife species are found within the Project Footprint, a Wildlife Management Plan should be developed to protect nest or den sites while these are active.
4. Any additional works proposed outside of the scope of this assessment should require an updated Environmental Impact Assessment.
5. Consider identifying additional neighbouring lands that may be incorporated into the Park as an offsetting measure to mitigate the loss of 10.6 ha from the Park that would occur as a result of the Project.
6. Replace or extend existing culverts at stream crossings. Carry out an assessment to properly size culverts replace or modify them accordingly.

7 Conclusion

This EIA has identified significant potential impacts associated with the Project, primarily in relation to grassland ecosystems, reptiles and reptile habitat, and mature coniferous forest. However, the existing Road is causing impacts to grassland ecosystems and reptiles that are not currently being addressed. While the Project would result in loss of approximately 10.6 ha of land from the Park, mitigation measures, such as replacement of culverts, installation of wildlife underpasses, and weed management, can reduce long-term impacts on the Park. Improving access for road maintenance will increase road safety for both Park users and local landowners, and will reduce vehicular access to off-road areas and wildlife collision risk. The result should be an overall net benefit for the Park as a whole.



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Appendix A Photographs

Photograph 1:
Start of Project Area, car park and
gate entrance to KLPP.



Photograph 2: Looking north
towards gate entrance in ESA 1.
Note rocky outcrop to left and
natural grassland to right.



Photograph 3: Grassland habitat
borders the first third of Cosens
Bay Road, ESA 1.



Photograph 4:
Weed encroachment in grassland
habitat, ESA 1.



Photograph 5:
Pedestrian bridge along a
recreation path.



Photograph 6: Looking west
towards Cosens Bay.



Photograph 7:
Looking northeast towards talus
slope in ESA 2.



Photograph 8:
Boulders in ESA 2, suitable snake
habitat.



Photograph 9: Unauthorized pullout
areas at trail heads.



Photograph 10:
Pullouts and weeds encroaching on
grassland habitat.



Photograph 11: Looking southeast
towards SEI wetland area. No
water present.



Photograph 12: Shrubs and snags
at ESA 3.



Photograph 13: Outflow at Brew Stream



Photograph 14: ESA 4 at Brew Stream crossing



Photograph 15: Inflow at Cosens Creek. Note woody debris blocking culvert entrance.



Photograph 16: Riparian habitat
around Cosens Creek – ESA 5.



Photograph 17: Drainage culvert in
ESA 6, potential wildlife underpass.



Photograph 18: Mature coniferous
forest of ESA 6.



Photograph 19: Previously disturbed ground under power lines, suitable for pull out areas.



Appendix B Tables

Table 1 Water Wells found within a 500 m radius search of the Project Area

Well Tag No	Water Depth (ft)	Depth Well Drilled (ft)	Construction Method Name	Construction Start Date	Water Supply System Name	Well Location	Well Use Name
000000055 812		180	Unknown	11-Mar-86			Private Domestic
000000008 580		15	Dug	31-Dec-49			Private Domestic
000000014 216	16	23	Dug	31-Dec-53			Private Domestic
000000008 614	15	18.5	Dug	31-Dec-49			Private Domestic
000000026 407		60	Drilled	31-May-72			Unknown Well Use
000000015 118	10	24	Dug	31-Dec-56			Private Domestic
000000015 542	2	9	Dug	31-Dec-57			Private Domestic
000000062 333	95	500	Drilled	4-Aug-94			Private Domestic
000000008 454		17	Dug	31-Dec-49			Commercial and Industrial
000000008 384		24	Dug	31-Dec-49			Private Domestic
000000103 533		112		30-Apr-10		NOT PROVIDED.	Private Domestic
000000002 144		0	Dug	31-Dec-41			Unknown Well Use
000000000 999		310	Unknown				Unknown Well Use
000000000 154	22	48	Drilled				Private Domestic
000000008 514		45	Dug	31-Dec-49			Private Domestic

000000026 406	3	25	Drilled	31-May-72			Unknown Well Use
000000017 349	7	12	Dug	31-Dec-61			Private Domestic
000000008 555		0	Unknown	31-Dec-49			Unknown Well Use
000000047 818	2	175	Drilled	30-Apr-81	CITY OF VERNON	WELL INSIDE PUMPHOUS E.	Water Supply System
000000002 499	3	12	Dug	31-Dec-44			Private Domestic
000000051 386	21	82	Drilled	8-Dec-82	CITY OF VERNON	COLDSTRE AM RANCH	Water Supply System
000000062 332	240	500	Drilled	1-Aug-94			Private Domestic
000000008 423		21	Dug	31-Dec-49			Private Domestic
000000015 543	23	23.5	Dug	31-Dec-57			Private Domestic
000000008 469		5	Dug	31-Dec-49			Irrigation
000000026 405	13	44	Drilled	31-May-72			Unknown Well Use
000000103 536	123	400		14-May-10		NOT PROVIDED	Irrigation
000000019 026		200	Drilled	31-Dec-64			Unknown Well Use
000000049 195		360	Drilled	27-Sep-81			Private Domestic
000000008 637	19	22	Dug	31-Dec-49			Private Domestic
000000008 535		22	Dug	31-Dec-49			Private Domestic
000000008 574		21	Dug	31-Dec-49			Private Domestic
000000008 710		18	Dug	31-Dec-49			Private Domestic
000000015 546	21	26	Dug	31-Dec-57			Private Domestic

000000008 330	35	43	Dug	31-Dec-49			Private Domestic
000000026 404	1	25	Drilled	31-May-72			Unknown Well Use
000000062 335		220	Drilled	6-May-88			Irrigation
000000015 124		26	Dug	31-Dec-56			Unknown Well Use
000000003 357		45	Dug	31-Dec-48			Private Domestic
000000015 873	5	8	Dug	31-Dec-58			Private Domestic
000000046 619	4	175	Drilled	13-Nov-80			Unknown Well Use
000000049 185		300	Drilled	24-Sep-81			Unknown Well Use
000000026 403	2	15	Drilled	31-May-72			Unknown Well Use
000000000 995		370	Unknown				Unknown Well Use
000000008 367		19	Dug	31-Dec-49			Private Domestic
000000008 378		26	Dug	31-Dec-49			Private Domestic
000000049 978	20	209	Drilled	28-Feb-82			Unknown Well Use
000000008 396		23	Dug	31-Dec-49			Private Domestic
000000008 341		23	Dug	31-Dec-49			Private Domestic
000000021 200	37	45	Dug	31-Dec-67			Unknown Well Use
000000008 672	4	8	Dug	31-Dec-49			Private Domestic
000000049 912	20	176	Drilled	31-Jan-82			Unknown Well Use
000000019 025	4	15	Dug	31-Dec-64			Unknown Well Use



Table 2 Plant species identified during field visit

Common Names	Scientific Names
Trees	
Douglas-Fir	<i>Pseudotsuga menziesii</i>
Paper Birch	<i>Betula papyrifera</i>
Ponderosa Pine	<i>Pinus ponderosa</i>
Shrubs	
Beaked Hazelnut	<i>Corylus cornuta</i>
Big sagebrush	<i>Artemisia tridentata</i>
Birch-leaved spirea	<i>Spiraea betulifolia</i>
Black Gooseberry	<i>Ribes lacustre</i>
Choke Cherry	<i>Prunus virginiana</i>
Common Snowberry	<i>Symphoricarpos albus</i>
Devil's club	<i>Oplopanax horridus</i>
Douglas Maple	<i>Acer glabrum</i>
Kinnickinnick	<i>Arctostaphylos uva-ursi</i>
Prairie Rose	<i>Rosa woodsii</i>
Red Raspberry	<i>Rubus idaeus</i>
Saskatoon	<i>Amelanchier alnifolia</i>
Tall Oregon-Grape	<i>Mahonia aquifolium</i>
Thimbleberry	<i>Rubus parviflorus</i>
Trailing blackcurrent	<i>Ribes laxiflorum</i>
Willow spp.	<i>Salix</i> spp.
Herbs/Moss/Lichen	



Common Names	Scientific Names
Alfalfa	<i>Medicago sativa</i>
Arrow-leaved Balsamroot	<i>Balsamorhiza sagittata</i>
Baltic rush	<i>Juncus balticus</i>
Barestem Desert-Parsley	<i>Lomatium nudicale</i>
Blue Clematis	<i>Clematis occidentalis</i>
Bluebunch Wheatgrass	<i>Agropyron spicatum</i>
Bluejoint	<i>Calamagrostis canadensis</i>
Cheat grass	<i>Bromus tectorum</i>
Chocolate Lily	<i>Fritillaria lanceolata</i>
Clasping Twistedstalk	<i>Streptopus amplexifolius</i>
Club moss	<i>Lycopodium</i> spp
Columbia monkshood	<i>Aconitum columbianum</i>
Common Dandelion	<i>Taraxacum officinale</i>
Common Red Paintbrush	<i>Castilleja miniata</i>
Cow parsnip	<i>Heracleum maximum</i>
Diffuse Knapweed	<i>Centaurea diffusa.</i>
Fairy slipper	<i>Calypso bulbosa</i>
False Solomon's Seal	<i>Smilacina racemosa</i>
Few-flowered Shooting-Star	<i>Dodecatheon pulchellum</i>
Fireweed	<i>Chamerion angustifolium</i>
Freckle pelt lichen	<i>Peltigera aphthosa</i>
Geranium spp	<i>Geranium</i> spp
Great Burdock	<i>Arctium lappa</i>



Common Names	Scientific Names
Great Mullein	<i>Verbascum thapsus</i>
Heart-leaved Arnica	<i>Arnica cordifolia</i>
Junegrass	<i>Koeleria macrantha</i>
Lady Fern	<i>Athyrium filix-femina</i>
Large-flowered blue-eyed Mary	<i>Collinsia grandiflora</i>
Lemonweed	<i>Lithospermum ruderales</i>
Lupine	<i>Lupinus</i> sp.
Milk vetch	<i>Astragalus adsurgens</i>
Oregon Woodsia	<i>Woodsia oregana</i>
Pasture Sage	<i>Artemisia frigida</i>
Pearly Everlasting	<i>Anaphalis margaritacea</i>
Pinegrass	<i>Calamagrostis rubescens</i>
Prickly pear	<i>Opuntia</i> spp.
Racemose Pussytoes	<i>Antennaria racemosa</i>
Red Clover	<i>Trifolium pratense</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Rocky Mountain fescue	<i>Festuca saximontana</i>
Round-leaved Alumroot	<i>Heuchera cylindrica</i>
Russian knapweed	<i>Centaurea maculosa</i>
Self-heal	<i>Prunella vulgaris</i>
Silky Lupine	<i>Lupinus sericeus</i>
Skunk Cabbage	<i>Lysichiton americanum</i>
Small-flowered Blue-eyed Mary	<i>Collinsia parviflora</i>



Common Names	Scientific Names
Small-flowered Woodland Star	<i>Lithophragma parviflorum</i>
Spotted knapweed	<i>Polygonum persicaria</i>
Spring beauty	<i>Claytonia virginica</i>
Sticky Geranium	<i>Geranium viscosissimum</i>
Stinging Nettle	<i>Urtica dioica</i>
Sulphur Cinquefoil	<i>Potentilla recta</i>
Sweet-scented Bedstraw	<i>Galium triflorum</i>
Thistle spp.	<i>Cirsium</i> spp.
Tufted club-rush	<i>Tricophorum cespitosum</i>
Upland Larkspur	<i>Delphinium nuttallianum</i>
Wild Strawberry	<i>Fragaria virginiana</i>
Yarrow	<i>Achillea millefolium</i>
Yellow Salsify	<i>Tragopogon dubius</i>



Table 3 Plant species with the potential to occur in the Project Area

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
pink agoseris	<i>Agoseris lackschewitzii</i>		Blue		dicots
cut-leaved water-parsnip	<i>Berula erecta</i>		Blue		dicots
field dodder	<i>Cuscuta campestris</i>		Blue		dicots
three-flowered waterwort	<i>Elatine rubella</i>		Blue		dicots
orange touch-me-not	<i>Impatiens aurella</i>		Blue		dicots
flat-topped broomrape	<i>Orobancha corymbosa</i> ssp. <i>mutabilis</i>		Blue		dicots
Engelmann's knotweed	<i>Polygonum engelmannii</i>		Blue		dicots
peach-leaf willow	<i>Salix amygdaloides</i>		Red		dicots
Tweedy's willow	<i>Salix tweedyi</i>		Blue		dicots
blunt-sepaed starwort	<i>Stellaria obtusa</i>		Blue		dicots
blue vervain	<i>Verbena hastata</i> var. <i>scabra</i>		Blue		dicots
northern violet	<i>Viola septentrionalis</i>		Red		dicots
Mexican mosquito fern	<i>Azolla mexicana</i>	T (Nov 2008)	Red	1-T (Jun 2003)	ferns
crested wood fern	<i>Dryopteris cristata</i>		Blue		ferns
hairy water-clover	<i>Marsilea vestita</i>		Red		ferns
American sweet-flag	<i>Acorus americanus</i>		Blue		monocots
many-headed sedge	<i>Carex sychnocephala</i>		Blue		monocots
fox sedge	<i>Carex vulpinoidea</i>		Blue		monocots
red-rooted cyperus	<i>Cyperus erythrorhizos</i>		Red		monocots
awned cyperus	<i>Cyperus squarrosus</i>		Blue		monocots
elliptic spike-rush	<i>Eleocharis elliptica</i>		Blue		monocots

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
beaked spike-rush	<i>Eleocharis rostellata</i>		Blue		monocots
giant helleborine	<i>Epipactis gigantea</i>	SC (May 1998)	Blue	3	monocots
porcupinegrass	<i>Hesperostipa spartea</i>		Red		monocots
yellow widelip orchid	<i>Liparis loeselii</i>		Red		monocots
least moonwort	<i>Botrychium simplex</i> var. <i>compositum</i>		Blue		byrophyte
	<i>Schistidium</i> <i>heterophyllum</i>		Blue	byrophyte	
	<i>Weissia brachycarpa</i>		Red		byrophyte

Table 4 Wildlife species identified during field visit

Common Name	Scientific Name
Invertebrates	
Canadian tiger swallowtail	<i>Papilio canadensis</i>
Spring azure	<i>Celastrina ladon</i>
Birds	
Black-capped chickadee	<i>Poecile atricapillus</i>
Canada goose	<i>Branta canadensis</i>
Common raven	<i>Corvus corax</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Great horned owl	<i>Bubo virginianus</i>
Northern flicker	<i>Colaptes auratus</i>
Pileated woodpecker	<i>Dryocopus pileatus</i>
Red breasted nuthatch	<i>Sitta canadensis</i>
Red tailed hawk	<i>Buteo jamaicensis</i>
Swainson's hawk	<i>Buteo swainsoni</i>
Spotted towhee	<i>Pipilo maculatus</i>
Western meadowlark	<i>Sturnella neglecta</i>
Winter wren	<i>Troglodytes troglodytes</i>
Mammals	
White-tailed deer	<i>Odocoileus virginianus</i>
Yellow-bellied marmot	<i>Marmota flaviventris</i>



Table 5 Wildlife species with the potential to occur in the Project Area

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
Western Grebe	<i>Aechmophorus occidentalis</i>	C (Jul 2011)	Red		birds
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		Red		birds
Great Blue Heron,	<i>Ardea herodias herodias</i>		Blue		birds
Short-eared Owl	<i>Asio flammeus</i>	SC (Mar 2008)	Blue	1-SC (Jul 2012)	birds
Burrowing Owl	<i>Athene cunicularia</i>	E (Apr 2006)	Red	1-E (Jun 2003)	birds
American Bittern	<i>Botaurus lentiginosus</i>		Blue		birds
Swainson's Hawk	<i>Buteo swainsoni</i>		Red		birds
Canyon Wren	<i>Catherpes mexicanus</i>	NAR (May 1992)	Blue		birds
Lark Sparrow	<i>Chondestes grammacus</i>		Red		birds
Common Nighthawk	<i>Chordeiles minor</i>	T (Apr 2007)	Yellow	1-T (Feb 2010)	birds
Olive-sided Flycatcher	<i>Contopus cooperi</i>	T (Nov 2007)	Blue	1-T (Feb 2010)	birds
Black Swift	<i>Cypseloides niger</i>	C (Jul 2011)	Yellow		birds
Bobolink	<i>Dolichonyx oryzivorus</i>	T (Apr 2010)	Blue		birds
Horned Lark	<i>Eremophila alpestris merrilli</i>		Blue		birds
Sandhill Crane	<i>Grus canadensis</i>	NAR (May 1979)	Yellow		birds
Barn Swallow	<i>Hirundo rustica</i>	T (May 2011)	Blue		birds
Yellow-breasted Chat	<i>Icteria virens</i>	E (Nov 2011)	Red	1-E (Jun 2003)	birds
Western Screech-Owl	<i>Megascops kennicottii</i>	T (May 2012)	No Status	1	birds
Western Screech-Owl,	<i>Megascops kennicottii macfarlanei</i>	T (May 2012)	Red	1-E (Jan 2005)	birds
Lewis's Woodpecker	<i>Melanerpes lewis</i>	T (Apr 2010)	Red	1-T (Jul 2012)	birds

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
Long-billed Curlew	<i>Numenius americanus</i>	SC (May 2011)	Blue	1-SC (Jan 2005)	birds
Flammulated Owl	<i>Otus flammeolus</i>	SC (Apr 2010)	Blue	1-SC (Jun 2003)	birds
Williamson's Sapsucker	<i>Sphyrapicus thyroideus</i>	E (May 2005)	Blue	1-E (Aug 2006)	birds
Williamson's Sapsucker,	<i>Sphyrapicus thyroideus thyroideus</i>	E (May 2005)	No Status	1-E (Aug 2006)	birds
Brewer's Sparrow,	<i>Spizella breweri breweri</i>		Red		birds
Barn Owl	<i>Tyto alba</i>	T (Nov 2010)	Blue	1-SC (Jun 2003)	birds
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>		Blue		mammals
Spotted Bat	<i>Euderma maculatum</i>	SC (May 2004)	Blue	1-SC (Jul 2005)	mammals
Wolverine, <i>luscus</i> subspecies	<i>Gulo gulo luscus</i>	SC (May 2003)	Blue		mammals
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>		Blue		mammals
Little Brown Myotis	<i>Myotis lucifugus</i>	E (Nov 2013)	Yellow		mammals
Fringed Myotis	<i>Myotis thysanodes</i>	DD (May 2004)	Blue	3 (Mar 2005)	mammals
Bighorn Sheep	<i>Ovis canadensis</i>		Blue		mammals
Fisher	<i>Pekania pennanti</i>		Blue		mammals
Great Basin Pocket Mouse	<i>Perognathus parvus</i>		Red		mammals
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	SC (Apr 2007)	Blue	1-SC (Mar 2009)	mammals
Preble's Shrew	<i>Sorex preblei</i>		Red		mammals
Northern Bog Lemming, <i>artemisiae</i> subspecies	<i>Synaptomys borealis artemisiae</i>		Blue		mammals

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
American Badger	<i>Taxidea taxus</i>	E (Nov 2012)	Red	1-E (Jun 2003)	mammals
Grizzly Bear	<i>Ursus arctos</i>	SC (May 2002)	Blue		mammals
Northern Rubber Boa	<i>Charina bottae</i>	SC (May 2003)	Yellow	1-SC (Jan 2005)	reptiles
North American Racer	<i>Coluber constrictor</i>	SC (Nov 2004)	Blue	1-SC (Aug 2006)	reptiles
Western Rattlesnake	<i>Crotalus oreganus</i>	T (May 2004)	Blue	1-T (Jul 2005)	reptiles
Gopher Snake, <i>deserticola</i> subspecies	<i>Pituophis catenifer deserticola</i>	T (Apr 2013)	Blue	1-T (Jan 2005)	reptiles
Western Skink	<i>Plestiodon skiltonianus</i>	SC (May 2002)	Blue	1-SC (Jan 2005)	reptiles
Painted Turtle - Intermountain - Rocky Mountain Population	<i>Chrysemys picta pop. 2</i>	SC (Apr 2006)	Blue	1-SC (Dec 2007)	turtles
Western Toad	<i>Anaxyrus boreas</i>	SC (Nov 2012)	Blue	1-SC (Jan 2005)	amphibians
Great Basin Spadefoot	<i>Spea intermontana</i>	T (Apr 2007)	Blue	1-T (Jun 2003)	amphibians
Rocky Mountain Ridged Mussel	<i>Gonidea angulata</i>	E (Nov 2010)	Red	1-SC (Jul 2005)	bivalves
Pale Jumping-slug	<i>Hemphillia camelus</i>		Blue		gastropods
Magnum Mantleslug	<i>Magnipelta mycophaga</i>	SC (May 2012)	Blue		gastropods
Umbilicate Sprite	<i>Promenetus umbilicatellus</i>		Blue		gastropods
Abbreviate Pondsnaill	<i>Stagnicola apicina</i>		Blue		gastropods
Silky Vallonia	<i>Vallonia cyclophorella</i>		Blue		gastropods
Black Gloss	<i>Zonitoides nitidus</i>		Blue		gastropods
Lance-tipped Darner	<i>Aeshna constricta</i>		Red		insects

English Name	Scientific Name	COSEWIC	BC List	SARA	Class (English)
Emma's Dancer	<i>Argia emma</i>		Blue		insects
Immaculate Green Hairstreak	<i>Callophrys affinis</i>		Blue		insects
Dark Saltflat Tiger Beetle	<i>Cicindela parowana</i>	E (Nov 2009)	Red	1-E (Jul 2012)	insects
Monarch	<i>Danaus plexippus</i>	SC (Apr 2010)	Blue	1-SC (Jun 2003)	insects
Hagen's Bluet	<i>Enallagma hageni</i>		Blue		insects
Pronghorn Clubtail	<i>Gomphus graslinellus</i>		Blue		insects
Nevada Skipper	<i>Hesperia nevada</i>		Blue		insects
Twelve-spotted Skimmer	<i>Libellula pulchella</i>		Blue		insects
Western River Cruiser	<i>Macromia magnifica</i>		Blue		insects
Common Sootywing	<i>Pholisora catullus</i>		Blue		insects
Sandhill Skipper	<i>Polites sabuleti</i>		Red		insects
Checkered Skipper	<i>Pyrgus communis</i>		Blue		insects



Appendix C Cumulative Impact Assessment Form





BC Parks Impact Assessment Process
Level 2, Detailed Screen Report:
C. Cumulative Effects Screening Matrix
 (See Users Guide, pp. 21 to 23)

File No.: _____

Name of Action: Boundary adjustment to remove a 30 m ROW along Cosens Bay Road from Kalamalka Lake Provincial Park

Proponent: Ministry of Transportation and Infrastructure and B.C. Parks

Review Date(s): June 2014

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Effects Due to Action Under Review	Other Actions				
	Increased park use due to population increase	Increased road use due to increased development south of park			
Value: Habitat for Rare and Endangered Species					
Sensory Disturbance	L	M			
Contaminant Transport	n/a	L			
Habitat Loss and Fragmentation	M	L			
Viewshed Degradation	n/a	n/a			
Experiential Degradation	M	M			
Other:					
Value: Rare and Endangered Ecological Communities					
Sensory Disturbance	M	L			
Contaminant Transport	n/a	L			
Habitat Loss and Fragmentation	M	L			
Viewshed Degradation	n/a	n/a			
Experiential Degradation	M	L			
Other:					
Value: Biodiversity					
Sensory Disturbance	L	M			
Contaminant Transport	n/a	L			
Habitat Loss and Fragmentation	L	L			
Viewshed Degradation	L	M			
Experiential Degradation	L	M			
Other: Direct mortality	L	M			



File No.: _____

BC Parks Impact Assessment Process
Level 2, Detailed Screen Report:
C. Cumulative Effects Screening Matrix
(See Users Guide, pp. 21 to 23)

Name of Action: Boundary adjustment to remove a 30 m ROW along Cosens Bay Road from Kalamalka Lake Provincial Park

Proponent: Ministry of Transportation and Infrastructure and B.C. Parks

Review Date(s): June 2014

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Effects Due to Action Under Review	Other Actions				
	Increased park use due to population increase	Increased road use due to increased development south of park			
Value: Recreation					
Sensory Disturbance	L	M			
Contaminant Transport	n/a	n/a			
Habitat Loss and Fragmentation	L	L			
Viewshed Degradation	n/a	n/a			
Experiential Degradation	L	L			
Other:					
Value: Wilderness Experience Values					
Sensory Disturbance	M	M			
Contaminant Transport	n/a	n/a			
Habitat Loss and Fragmentation	M	M			
Viewshed Degradation	n/a	n/a			
Experiential Degradation	M	M			
Other:					
Value:					
Sensory Disturbance					
Contaminant Transport					
Habitat Loss and Fragmentation					
Viewshed Degradation					
Experiential Degradation					
Other:					