



April 2016

Parks Canada Basic Impact Analysis

1. PROJECT TITLE & LOCATION

Highway 93 North Roadway Rehabilitation, km 0 to km 121

- and -

Highway 93 South Roadway Rehabilitation, km 10 to km 103

2. PROPONENT INFORMATION

Parks Canada Agency (PCA)

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BIA Author

Barr Engineering and Environmental Science Canada Ltd. (Internal Filing #: 61011106.01/02)

3. PROPOSED PROJECT DATES

Planned commencement: 2016-04-01

Planned completion: 2020-12-31

4. INTERNAL PROJECT FILE #

2016-014L





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5. PROJECT DESCRIPTION

Background, purpose, objectives

Parks Canada Agency (PCA) has identified Highway 93 North (Hwy 93N) and Highway 93 South (Hwy 93S) as high priority candidates for roadway and auxiliary structure maintenance.

Hwy 93N is a 232 km section of highway that connects Jasper, Alberta (AB), to the TransCanada Highway (Hwy 1) approximately 3 km northwest of Lake Louise, AB. The road is used to connect Banff National Park (BNP) with Jasper National Park, and is the southernmost of three access points to the Icefields Parkway, a popular scenic route.

Hwy 93S is a 104 km section of highway that connects Hwy 1 at Castle Junction, AB, to Highway 95 at Radium Hot Springs, British Columbia (BC). The road is the primary point of access for visitors from Alberta to Kootenay National Park (KNP), and also serves as one of the main routes for visitors from BC to BNP. The highway also serves as a corridor for transport truck traffic between Alberta and Radium Hot Springs. The first 10 km stretch of Hwy 93S (starting from Hwy 1) is located within BNP.

To improve visitor experience within BNP and KNP, PCA seeks to address road maintenance issues along the route, with the intention of providing a safer and more reliable driving experience. Certain areas of deficiency have been identified, including high-accident locations, deficient intersections, potentially unstable rock slopes, and narrow shoulders. This Basic Impact Analysis (BIA) will cover four years of safety-improvement work on two highways overseen by the Lake Louise Yoho Kootenay (LLYK) Field Unit: the approximately 120 km section of Highway 93N in BNP, stretching from Hwy 1 to Sunwapta Pass; and the 94 km section of Highway 93S, beginning at the eastern edge of KNP (km 10) and ending at the western park boundary.

Scope of construction

Deficient areas will be addressed using a combination of four construction efforts: reworking rock faces, widening the roadway and shoulders, improving the pavement surface and structure, and improving roadway drainage (by upgrading problematic ditches and culverts).

The original project description submitted for approval by McElhanney Consulting Services Ltd. is included in Appendix 1.

Table 5-1 describes the proposed work areas on Hwy 93N for the four years of the project assessed in this BIA. Project areas in bold font are those areas identified for work in 2016/2017, and are described later in this section. These project details were identified using the most up-to-date knowledge, however, based on future construction, environmental, and archeological surveys, the project details in columns 3 through 6 of the table are subject to change.





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Table 5-1: Proposed work areas on Hwy 93N

Location	Scope	From (km)	To (km)	Length (km)*	Est. Footprint (ha)**
Niblock Pit	Access Improvement	0.44	+/- 0.3	0.6	1.8
Hwy 93N Toll Booth	Roadside Facility Improvement	0.70	+/- 0.3	0.6	1.8
Mosquito Creek Hostel	Access Improvement	23.75	+/- 0.3	0.6	1.8
Mosquito Creek Campground	Access Improvement	23.87	+/- 0.3	0.6	1.8
Crowfoot Glacier Viewpoint***	Access Improvement	32.70	+/- 0.3	0.6	1.8
Helen Lake Trailhead/Crowfoot Glacier Viewpoint***	Access Improvement	32.77	+/- 0.3	0.6	1.8
Bow Lake Viewpoint/Picnic Site***	Access Improvement	34.2	+/- 0.3	0.6	1.8
Num-Ti-Jah Lodge/Bow Glacier Trailhead***	Access Improvement	35.5	+/- 0.3	0.6	1.8
Bow Summit / Peyto Lake Viewpoint & Trailhead	Access Improvement	40.3	+/- 0.3	0.6	1.8
SB Passing Lane	Shoulder Widening	40.5	46.0	5.5	16.5
Right Slope	Rock-Recapitalization	43.58	43.86	0.28	0.84
Silverhorn Creek Campground Overflow	Access Improvement	51.24	+/- 0.3	0.6	1.8
Right/Left Slope	Rock-Recapitalization	68.16	69.59	1.43	4.29
Mistaya Canyon Viewpoint/Howse Pass Trailhead	Access Improvement	70.72	+/- 0.3	0.6	1.8
Saskatchewan Crossing Warden Station	Access Improvement	73.98	+/- 0.3	0.6	1.8
Rest Area	Access Improvement	75.60	+/- 0.3	0.6	1.8
Hwy 11 Intersection	Intersection Improvement	75.93	+/- 0.3	0.6	1.8
The Crossing Resort East Access	Access Improvement	76.14	+/- 0.3	0.6	1.8
The Crossing Resort Exit	Access Improvement	76.31	+/- 0.3	0.6	1.8
Rampart Creek Hostel	Access Improvement	87.98	+/- 0.3	0.6	1.8
Rampart Creek Campground	Access Improvement	88.45	+/- 0.3	0.6	1.8
Right Slope	Rock-Recapitalization	88.84	89.35	0.51	1.53
Sunset Pass & Sunset Lookout Trailhead	Access Improvement	92.49	+/- 0.3	0.6	1.8
Coleman Creek Picnic Site	Access Improvement	98.85	+/- 0.3	0.6	1.8
Right Slope	Rock-Recapitalization	101.00	+/- 0.3	0.6	1.8
Pullout – Parker Ridge	Access Improvement	116.70	+/- 0.3	0.6	1.8
Sunwapta Pass East Access	Access Improvement	120.78	+/- 0.3	0.6	1.8
Sunwapta Pass West Access	Access Improvement	120.88	+/- 0.3	0.6	1.8

* Location and length of each site is approximate (mapping-level) and may be subject to change based on site conditions such as existing and required lane configuration, topography and roadway/safety standards requirements.

** Area of disturbance may include up to an approximate 15m swath on either side of the existing pavement, depending on location.

*** Back-up project for 2016/2017





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Table 5-2 describes the proposed work areas on Hwy 93S for the four years of the project assessed in this BIA. Project areas in bold are those areas identified for work in 2016/2017, and are described later in this section. These project details were identified using the most up-to-date knowledge, however, based on future construction, environmental, and archeological surveys, the project details in columns 3 through 6 of the table are subject to change.

Table 5-1: Proposed work areas on Hwy 93S

Location	Scope	From (km)	To (km)	Length (km)*	Est. Footprint (ha)**
NB / SB Climbing and Passing Lanes	Shoulder Widening	11.00	16.60	6.6	19.8
Continental Divide / Vermilion Pass	Intersection Improvement	10.04	+/- 0.3	0.6	1.8
Marble Canyon Campground	Intersection Improvement	16.93	+/- 0.3	0.6	1.8
Marble Canyon Trailhead	Intersection Improvement	17.10	+/- 0.3	0.6	1.8
Paint Pots Trailhead***	Intersection Improvement	19.65	+/- 0.3	0.6	1.8
Numa Falls Day-Use Area	Intersection Improvement	24.20	+/- 0.3	0.6	1.8
Floe Lake / Hawk Creek	Intersection Improvement	32.45	+/- 0.3	0.6	1.8
Kootenay Park Lodge	Intersection Improvement	40.69	+/- 0.3	0.6	1.8
Vermilion Crossing	Intersection Improvement	40.80	+/- 0.3	0.6	1.8
Simpson River Day-Use Area	Intersection Improvement	46.42	+/- 0.3	0.6	1.8
NB / SB Climbing Lanes	Shoulder Widening	55.90	60.20	4.3	12.9
Kootenay Crossing (PCA Facility)	Intersection Improvement	60.70	+/- 0.3	0.6	1.8
Dolly Varden Picnic Area	Intersection Improvement	67.77	+/- 0.3	0.6	1.8
McLeod Meadows Campground	Intersection Improvement	76.37	+/- 0.3	0.6	1.8
Kootenay River Picnic Site	Intersection Improvement	80.33	+/- 0.3	0.6	1.8
Settler's Road	Intersection Improvement	84.18	+/- 0.3	0.6	1.8
Olive Lake Picnic Area	Intersection Improvement	91.14	+/- 0.3	0.6	1.8
Sinclair Canyon	Rock Re-capitalization	92.45	97.14	4.69	14.07
Operations Centre and McKay Pit	Intersection Improvement	98.96	+/- 0.3	0.6	1.8
Sinclair Canyon	Rock Re-capitalization	99.40	100.01	0.61	1.83
Radium Hot Springs Overflow Parking	Intersection Improvement	100.69	+/- 0.3	0.6	1.8
Sinclair Canyon	Rock Re-capitalization	100.76	101.02	0.26	0.78
Concrete Retaining Wall	Retaining Wall replacement	100.95	+/- 0.3	0.6	1.8
1.85 Sinclair Creek Diversion Tunnel	Rock Re-capitalization	101.15	+/- 0.3	0.6	1.8
Radium Hot Springs Parking	Intersection Improvement	101.26	+/- 0.3	0.6	1.8
Sinclair Canyon	Rock Re-capitalization	101.84	103.00	1.16	3.48

* Location and length of each site is approximate (mapping-level) and may be subject to change based on site conditions such as existing and required lane configuration, topography and roadway/safety standards requirements.

** Area of disturbance may include up to an approximate 15m swath on either side of the existing pavement, depending on location.

*** Back-up project for 2016/2017





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The particulars of general construction practices, and those practices specific to the scope items in the tables above, are described in the following sections.

General Construction Practices

Project activities are generally comprised of the following aspects:

- Mobilization/demobilization of all manpower, equipment, materials, and other resources
- Set-up and operation of traffic signage and traffic control
- Lay down and storage area set-up
 - o 69, Mannix, Niblock, Mosquito, and/or David Thompson pits will be used for material storage, equipment maintenance and fuel storage for Hwy 93N work. Mannix, Settler's, and/or Hector pits will be used for Hwy 93S. It is expected that suitable locations will be found for staging within the right-of-way or existing gravel pits.
- Earthworks:
 - o Embankment construction, excavation, removal of unsuitable material to Mannix pit to fill in a previous excavation, trim blasting of rock slopes, and rehabilitation of right-of-way. This will be primarily undertaken in frost-free period between late May and early October.
 - o Existing culverts in poor condition will be removed and replaced. Existing culverts in good condition will be extended to accommodate the shoulder widening. Existing culverts in fish bearing streams may be replaced with open bottom culverts or similar, to be confirmed in consultation with the Field Unit.
 - o Gravels will come from stockpiles in Mannix, Niblock, Mosquito, David Thompson, Settler's or Hector pits.
 - o Cut slopes initially will be cut to a uniform design slope. Most of this work will be accomplished by bulldozers, tracked excavators and off-road haulers.
 - o Rock excavation will be undertaken by blasting or ripping. Following excavation, the cut slopes will be reworked to produce an undulating profile and rounded cut perimeter to achieve a more natural and visually pleasing appearance followed by rehabilitation.
 - o Any required drilling and blasting of rock will be in accordance with Best Management Practices, and federal explosives regulations, if applicable. Overnight storage of explosives within either BNP or KNP will not occur.
- Structural work
 - o Foundation excavation (including blasting or ripping), foundation construction including pile driving, the placement of superstructure, backfilling, and site clean-up.
 - o Off-site fabrication and delivery of precast concrete barriers and lock blocks from plants located in the Canmore, AB area and the Invermere, BC area.
 - o Drainage installation.
 - o Transportation of Slet steel girders to site by highway carriers and erected by large cranes.
 - o Structural work will normally be scheduled between May and November although some foundation and superstructure work could be carried out during winter months with mitigation of any identified impacts on fish resources.





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- Paving/resurfacing;
 - o Asphalt produced using a portable asphalt plant that will be subject to any applicable air emission requirements in either Alberta or BC, depending on the location of the plant.
 - o Equipment located on-site or within active pits will crush existing native material to suitable specified gradations. The plant will be located in the selected gravel source.
 - o Work can be accomplished anytime throughout the year and will be undertaken in accordance with approved extraction and rehabilitation plans.
 - o Existing pavement not incorporated in the new roadway will be picked up, ground up and recycled into the construction of the new lanes.
 - o Where crushed gravel is required for the sub-base, base, or asphaltic concrete, the gravel is expected to come from one of the seven pits identified above, or another source deemed acceptable using further geotechnical analysis.
 - o Sub base, base and asphalt aggregate will be produced on-site or within active pits by means of crushing equipment that will crush existing native material to suitable/specified gradations.
 - o Asphalt paving work, being controlled by temperatures, will be scheduled between June and September.
- Waste Disposal
 - o All garbage and waste materials will be placed in suitable disposal containers and removed to a local licensed landfill site.
 - o Opportunities to recycle waste materials such as concrete and steel, along with wood forms will be investigated.

Specific Construction Practices for 2016/2017 Project Areas

Access improvement (Table 5-1) involves the improvement of the paved approaches to areas adjacent to the highway, such as day-use areas, campgrounds, trailheads, etc. Construction may involve widening the approach, improving the pavement surface and structure, improving drainage ditches, and/or culvert replacement.

Intersection improvement (Tables 5-1 and 5-2) involves the improvement of the merging/exit lanes used to access areas adjacent to the highway, such as day-use areas, campgrounds, trailheads, etc. Construction may involve widening the shoulders, improving the pavement surface and structure, improving drainage ditches, and/or culvert replacement. The proposed highway design uses material excavated from cuts within the right-of-way for embankment fills, or from one of the seven pits identified above.

Shoulder widening (Tables 5-1 and 5-2) may involve widening the shoulders, improving the pavement surface and structure, improving drainage ditches, and/or culvert replacement. The proposed highway design uses material excavated from cuts within the right-of-way for embankment fills.

Retaining wall replacement (Table 5-2) may involve additional improvements to pavement surface and structure, and/or improving drainage ditches. A combination of retaining walls and/or laidback slopes of varying ranges will be used, as appropriate to the particular location.





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Rock re-capitalization (Tables 5-1 and 5-2) involves the improvement of the rock faces and slopes for safety and aesthetic reasons. Construction may also involve improving the pavement surface and structure, and/or improving drainage ditches. Cut angles will be as steep as possible and uniform (not benched). Controlled blasting (either trim blasting or production blasting) will be used on all final faces to limit damage to the rock behind the face and enhance long-term stability of the rock cuts. Large areas of blasting remnants will be removed. Catchment ditches will be excavated between the toe of the rock cuts and shoulder of the highway to provide a catchment area for rock falls. Following slope remediation, removal of accumulated construction debris (rock fall) will be required for all locations. Rock and other debris which falls into the catchment area will be loaded into a truck with an excavator and transported to an appropriate disposal location (the seven pits above, or removed from the National Parks, to be confirmed in consultation with the Field Unit). Localized mitigation measures to enhance stability of the rock cuts will be performed where required. This may consist of rock reinforcement (dowels), scaling (by hand or excavator), rock removal (scaling, trim blasting or other excavation with light explosives, hydraulic splitters, chemical expanders or pneumatic hammers), dentition (shotcrete or masonry walls) and/or drainage (installing drain holes). Where required, rock support will be installed as excavation proceeds. Detailed geotechnical mapping will be conducted as excavation proceeds to identify areas that require rock support and to provide the basis for the final design of localized rock support.

Operation and Maintenance

The PCA will operate and maintain the highway, once these projects are completed, in essentially the same manner as is currently done. They will conduct checks on the performance of new features, and the effectiveness of mitigation measures. Standard periodic maintenance may be required to scale rock cuts, to repair erosion of earth slopes and fills, and to clean out adjacent ditches and culverts. No additional maintenance activities beyond the status quo are anticipated.

No decommissioning activities are anticipated for this project.

Summary of Project Activities

For the construction aspects proposed above, the activities in Table 5-3 will be necessary.





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Table 5-3: Summary of Project in Relation to Project Phases and Activities

	Phases	Examples of Associated Activities	Project Site Specifics
Project Components	Hwy 93N Construction / Site Preparation	Supply and storage of materials	Construction staging and materials/stockpiling in Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or as directed by the Departmental Representative. Construction material supply may come from outside the National Parks, pending availability within the Parks.
		Clearing	Vegetation clearing from ditches and road shoulders prior to construction efforts.
		Disposal of waste	Construction waste will be hauled to Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or removed from the National Parks as directed by the Departmental Representative.
		Drainage	Roadway ditch re-grading and culvert replacement as directed by the Departmental Representative.
		Excavation	Roadway embankments and road structure excavation for rehabilitation.
		Grading	Roadway embankments in preparation for roadway widening.
		Backfilling	Backfilling for culvert and road structure repair excavations.
		Use of machinery	Typical road construction equipment. Excavators, dump trucks, cranes, roller and vibration compaction equipment, paving machine, vehicles.
		Transport of materials/equipment	Transport of construction materials to site (aggregates, asphalt, construction equipment) and removal of construction wastes.
		Use of Chemicals	Asphalt cement in asphalt concrete pavement, fuel and oil for construction equipment and vehicles, non-toxic traffic paint.
		Set up of temporary facilities	Asphalt plant (if supplied from within the Park) and construction management facilities (trailer) in Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or as directed by the Departmental Representative.
		Traffic control	Traffic controllers and signs will be present on the roadway during construction activities.
	Hwy 93S Construction / Site Preparation	Supply and storage of materials	Construction staging and materials/stockpiling in Mannix, Settler's or Hector Pit or as directed by the Departmental Representative. Construction material supply may come from outside the National Parks, pending availability within the Parks.
		Clearing	Vegetation clearing from ditches and road shoulders prior to construction efforts.
		Disposal of waste	Construction waste will be hauled to Mannix, Settler's or Hector Pit or removed from the National Parks as directed by the Departmental Representative.
		Drainage	Roadway ditch re-grading and culvert replacement as directed by the Departmental Representative.
		Excavation	Roadway embankments and road structure excavation for rehabilitation.
		Grading	Roadway embankments for preparation for roadway widening.
		Backfilling	Backfilling for culvert and road structure repair excavations.
		Use of machinery	Typical road construction equipment. Excavators, dump trucks, cranes, roller and vibration compaction equipment, paving machine, vehicles.
		Transport of materials/equipment	Transport of construction materials to site (aggregates, asphalt, construction equipment) and removal of construction wastes.
		Use of Chemicals	Asphalt cement in asphalt concrete pavement, fuel and oil for construction equipment and vehicles, non-toxic traffic paint.





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	Phases	Examples of Associated Activities	Project Site Specifics
		Set up of temporary facilities	Asphalt plant (if supplied from within the Park) and construction management facilities (trailer) in Mannix, Settler's or Hector Pit or as directed by the Departmental Representative.
		Traffic control	Traffic controllers and signs will be present on the roadway during construction activities.
	Operation/ Implementation Decommissioning	Maintenance	On-going monitoring and maintenance of the roadway by Parks Canada.
		Use	General public, visitors and commercial vehicles.
		Vehicle Traffic	General public, visitors and commercial vehicles.





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6. VALUED COMPONENTS LIKELY TO BE AFFECTED

Using the Effects Identification Matrix (Appendix 2), the following potential interactions between the project and the surrounding environment were identified. These Valued Components (VCs) are those likely to be affected by project activities or outcomes, and can be classified as either natural or cultural.

Natural Resources

- Air Quality and Noise

Ambient air quality is generally high throughout both Banff and Kootenay National Parks. Air quality may be affected through project activities during preparation, construction and operation phases. Vehicle emissions are the primary sources of anticipated air quality effects, along with volatile organic carbons (VOCs) and fumes from chemical use. Increased ambient noise and localized temperature impacts may occur, along with temporarily increased levels of carbon dioxide and dust.

- Soil and Landforms

Adjustments to existing slopes are proposed for the road-widening aspects of the project. Therefore, the project has the potential to affect existing landforms by changing slope angles, removing stabilizing vegetation, and increasing soil exposure to erosive forces (wind and water). Such changes may cause slope instability with the potential for shift and/or slide.

Additionally, the project may affect the landscape through soil compaction and rutting, or potentially result in soil contamination through spilled materials and chemical use.

Positive benefits may include the stabilization of existing potentially unstable slopes.

- Water (surface/ground/crossings)

Surface Water

There are many named and unnamed surface water bodies and creeks located along or adjacent to the proposed work areas. Surface water in the park is used by humans for tourism and recreation. Animals also use surface water as habitat and as a water source. Temporary impacts on surface water could include visually displeasing colours and odors, water quality degradation, and disturbance of the riparian zone, while temporary or longer-term impacts could include drainage of wetlands/pools, or flooding of dry lands.





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Three river systems are in close proximity to the proposed Hwy 93N work area: the North Saskatchewan River, the Mistaya River, the Bow River and the headwaters of the Sunwapta River.

- Tributaries feeding the North Saskatchewan River include (but are not limited to) the headwaters of Nigel Creek, the confluence zone of the Alexandra River, Norman Creek, and Rampart Creek.
- The Mistaya River runs north, feeding the North Saskatchewan River. Tributaries feeding the Mistaya River include (but are not limited to) Bison Creek, Totem Creek, the Waterfowl Lakes, Noyes Creek, and Silverhorn Creek. Mistaya Lake and Peyto Lake are both fed by creeks that pass near or under Hwy 93N.
- Tributaries feeding the Bow River, include (but are not limited to) Bow Lake, Helen Creek, Noseeum Creek, Hector Creek, and the south end of Hector Lake. Herbert Lake is also located adjacent to Hwy 93N approximately 3 km north of the intersection with Hwy 1.
- A tributary of the Sunwapta River is located approximately 70 m northwest of the northernmost work area.

Three river systems are in close proximity to the proposed Hwy 93S work area: Vermilion River, Kootenay River, and Columbia River.

- Tributaries feeding the Vermilion River include (but are not limited to) Haffner Creek, Wardle Creek, Stanley Creek, Ochre Creek, Floe Creek, Hawk Creek, Serac Creek, Verendrye Creek, and Simpson River. Vermilion River runs south and feeds the Kootenay River.
- Other tributaries feeding the Kootenay River include (but are not limited to) Dolly Varden Creek, Meadow Creek, Nixon Creek, and Swede Creek. Kootenay Pond is also located adjacent to Hwy 93S approximately 1.3 km northeast of Kootenay Crossing.
- Tributaries feeding the Columbia River include (but are not limited to) Sinclair Creek, Kimpton Creek, and John McKay Creek.

Groundwater

Groundwater wells are used to source potable water along Hwy 93N and 93S. Impacts to these wells may result in discomfort or illness for park visitors or employees who consume the water.

- A total of 27 water wells are drilled within the vicinity of the proposed work area on Highway 93N work areas within Banff National Park (BNP).
- A total of 10 water wells are drilled within the vicinity of the proposed work area on Highway 93S within Kootenay National Park (KNP).
- There is also one water well drilled on the boundary of KNP and BNP on Hwy 93S.

Watercourse Crossings/Drainage

The planned work for 2016/2017 includes work on or near 80 watercourse crossings in Kootenay National Park on Hwy 93S, and 97 watercourse crossings in Banff National Park on Hwy 93N. Additional watercourses may be affected by construction activities in subsequent years.





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- Fish and Fish Habitats

Highway 93N, extending from km0 to km121, roughly parallels the Bow, Mistaya, and North Saskatchewan rivers, and the headwaters of the Sunwapta River. The headwaters and first 48.5 km of the North Saskatchewan River were designated as a part of the Canadian Heritage River System in 1989. The North Saskatchewan originates in the Columbia Icefield in Banff National Park.

Preliminary drive/walk reconnaissance surveys were conducted by Tetra Tech EBA (TTEBA) on September 16 and 17, 2015, to evaluate the potential for planned roadway rehabilitation projects to impact aquatic resources and fish communities (TTEBA, 2016). Sites were identified as locations with high sensitivity levels for disturbances related to roadway rehabilitation activities. 43 areas within the project reach were assessed by TTEBA with 18 identified as aquatically sensitive areas with potential for good fish habitat characteristics. Project areas are shown in Appendix 3, along with locations of aquatic surveys (when present in or near a particular project area).

Highway 93S, extending from km10 to km103, roughly parallels the Vermilion and Kootenay rivers and Sinclair Creek. Preliminary drive/walk reconnaissance surveys were conducted by TTEBA on September 13, 2015, to evaluate the potential for planned roadway rehabilitation projects to impact aquatic resources and fish communities (TTEBA, 2016). 20 areas within the project reach were assessed by TTEBA, with 16 identified as aquatically sensitive areas with potential for good fish habitat characteristics. Project areas are shown in Appendix 4, along with locations of aquatic surveys (when present in or near a particular project area).

Aquatic Species

A list was compiled of all aquatic species known to occur within KNP and BNP by consulting and/or querying the following data sources:

- Parks Canada Biotics Web Explorer (Parks Canada, 2013) queried for regularly occurring species listed under SARA Schedule 1 and/or identified by COSEWIC within the KNP and BNP;
- BC Ministry of Environment Species Ecosystems Explorer (BC MOE, 2015);
- BC Conservation Data Centre (BCCDC) Conservation Data Centre Mapping Service (BC CDC, 2008a);
- BC CDC Habitat Wizard, (BC CDC, 2008b);
- BC CDC iMAPBC, (BC CDC, 2013);
- Fish Inventory Data Base Queries (Government of BC, 2015);
- Alberta Environment and Parks Fish & Wildlife Internet Mapping Tool (AEP, 2015a); and
- Canadian Heritage Rivers System Background Study, North Saskatchewan River. (Milholland, 2005)

This list of species is shown in Table 6-1. The list of fish species known to occur in surface waters along the Highway 93N and Highway 93S alignments was further augmented by an interview with PCA Aquatic Specialist Shelley Humphries from the PCA LLYK field unit on January 20, 2016 (indicated in the third column of the table).





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No field surveys for fish or fish habitat have been conducted by Barr Engineering and Environmental Science Canada Ltd. (Barr) to date.

Table 6-1: Potential Fish Species in the Project Areas, with Known Locations (if available)

Common Name	Scientific Name	¹ PCA-Identified Locations (if available)
Highway 93N		
Lake trout	<i>Salvelinus namaycush</i>	North Saskatchewan River, confluence of Alexandra River
Rainbow trout	<i>Oncorhynchus mykiss</i>	Little Herbert Lake, Upper and Lower Waterfowl lakes, Waterfowl campground area
Mountain sucker pop 3. Saskatchewan- Nelson River pop.	<i>Catostomus platyrhynchus</i>	North Saskatchewan River
^{2,3} Westslope Cutthroat Trout AB pop. 9	<i>Oncorhynchus clarkii</i>	The Bow River, Mosquito Creek, Helen Creek, Bow Lake, Bow summit is the northernmost extent of native Westslope Cutthroat Trout. Some introduced cutthroats are present in the Mistaya River, but are not a protected species in that habitat.
³ Bull trout pop. 8- Saskatchewan.- Nelson R. pop.	<i>Salvelinus confluentus</i>	The Bow River, Noseeum Creek, Mosquito Creek, Bow Lake, Mistaya River, confluence of Alexandra River (important spawning area)
Longnose sucker	<i>Catostomus catostomus</i>	-
Mountain whitefish	<i>Prosopium williamsoni</i>	Bow Lake, potentially the Upper and Lower Waterfowl lakes
Brown trout	<i>Salmo trutta</i>	-
Brook trout	<i>Salvelinus fontinalis</i>	Little Herbert Lake, Bow Lake, Mistaya River, Upper and Lower Waterfowl lakes, Waterfowl campground area
Northern pike minnow	<i>Ptychocheilus oregonensis</i>	-
Largescale sucker	<i>Catostomus macrocheilus</i>	-
Redside shiner	<i>Richardsonius balteatus</i>	-
Dolly Varden	<i>Salvelinus malma</i>	-
Longnose dace	<i>Rhinichthys cataractae</i>	-
Torrent sculpin	<i>Cottus rhotheus</i>	-
Kokanee salmon	<i>Oncorhynchus nerka</i>	-
Burbot	<i>Lota lota</i>	-
Brook stickleback	<i>Culea inconstans</i>	-





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Flathead chub	<i>Platygobio gracilis</i>	-
Goldeye	<i>Hiodon alosoides</i>	-
Lake sturgeon	<i>Acipenser fulvescens</i>	-
Lake whitefish	<i>Coregonus clupeaformis</i>	-
Ninespine stickleback	<i>Pungitius pungitius</i>	-
Pearl dace	<i>Margariscus margarita</i>	-
River shiner	<i>Notropis blennius</i>	-
Shorthead redhorse	<i>Mosostoma macrolepidotum</i>	-
Spottail shiner	<i>Notropis hudsonius</i>	-
Walleye	<i>Sander vitreous</i>	-
Spoonhead sculpin	<i>Cottus ricei</i>	North Saskatchewan River
Highway 93S		
Slimy sculpin	<i>Cottus cognatus</i>	Below paint pots in Vermilion River, hawk creek
Rainbow trout	<i>Oncorhynchus mykiss</i>	Kootenay River, all streams from Dolly Varden Creek (spawning area) to Meadow Creek, Nixon Creek
^{2,3} Westslope Cutthroat Trout BC pop. 8	<i>Oncorhynchus clarkii</i>	Vermilion River (beginning between Numa Falls and Vermilion Crossing), unnamed streams near the pond opposite Verendrye Creek, unnamed creek at km 38.8, the ditches beside the highway between Vermilion Crossing and Simpson Trailhead, Kootenay River, all streams from Dolly Varden Creek to Meadow Creek, Nixon Creek,
Bull trout pop. 11- Pacific pop.	<i>Salvelinus confluentus</i>	Full length of Vermilion River beginning at Chickadee, Tokumm creek, paintpots section (spawning/rearing habitat), snow creek (spawning area), hawk creek, unnamed creek at km 36.5, the ditches beside the highway between Vermilion Crossing and Simpson Trailhead, Wardle Creek and the ditches at the nearby salt-lick, Kootenay River, all streams from Dolly Varden Creek (spawning area) to Meadow Creek, Nixon Creek
Longnose sucker	<i>Catostomus catostomus</i>	-
Redside shiner	<i>Richardsonius balteatus</i>	-
Mountain whitefish	<i>Prosopium williamsoni</i>	Tokumm Creek, Paintpots, Kootenay River, all streams from Dolly Varden Creek (spawning area) to Meadow Creek, Nixon Creek,
Dolly Varden	<i>Salvelinus malma</i>	-
Dace	(unspecified species)	-





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Longnose dace	<i>Rhinichthys cataractae</i>	-
Brook trout	<i>Salvelinus fontinalis</i>	Tokumm Creek, Paintpots, Kootenay River, all streams from Dolly Varden Creek (spawning area) to Meadow Creek, Nixon Creek, Swede Creek, Olive Lake, Sinclair Creek
Torrent sculpin	<i>Cottus rhotheus</i>	-
Northern pike minnow	<i>Ptychocheilus oregonensis</i>	-
Kokanee salmon	<i>Oncorhynchus nerka</i>	Kootenay River (below Dolly Varden Creek), all streams from Dolly Varden Creek (spawning area) to Meadow Creek, McLeod Meadows, Nixon Creek, Sinclair Creek,
Largescale sucker	<i>Catostomus macrocheilus</i>	-
Burbot	<i>Lota lota</i>	-
Splake	<i>Salvelinus fontinalis</i> and <i>Salvelinus namaycush</i>	-

¹Known locations as identified by Shelley Humphries, PCA (Humphries, 2016)

²SARA Schedule 1 species (Government of Canada, 2016)

³Identified by COSEWIC (Government of Canada, 2015)

PCA also noted that most of Sinclair Creek between the divide at Olive Lake to the area downstream of the Kimpton Creek confluence is not fish bearing. In the canyon outside the park boundary, the Sinclair Creek contains Kokanee salmon, and other fish from the Columbia River. Furthermore, there is probable fish presence in all ditches/associated areas on Hwy 93S where groundwater upwelling exists.

Groundwater upwelling feeds many of the smaller water features connected to tributaries and the primary rivers. Water temperatures and site specific conditions determine whether an area is primarily used by westslope cutthroat, bull trout, or other riverine fishes.

Westslope cutthroat trout

The westslope cutthroat trout (*Oncorhynchus clarkii*), AB population 9 in BNP is listed by SARA under Schedule 1 as Threatened and by COSEWIC as Threatened. The westslope cutthroat trout (*Oncorhynchus clarkii*), BC population 8 is the only fish species in KNP that is listed by SARA under Schedule 1 as Special Concern, and identified by COSEWIC as a Special Concern species.

Along Hwy 93N, native westslope cutthroat trout are found in the Bow River watershed, but not north of the Bow River Summit/Peyto Lake divide (km40). Along Hwy 93S, from Vermilion Pass (km10) to the divide at Olive Lake (km 91.1), all perennial flowing water or connected waterways are regularly used by westslope cutthroat. Olive Lake itself (km 91.3) and Sinclair Creek (km 91.9-103) were historical westslope cutthroat trout habitat; however, neither currently contain individuals.





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Westslope cutthroat trout spawn in glacial streams (or streams associated with mountain rivers) when the hydrograph rises and water temperatures rise above 10°C. This is typically from July to early August in higher elevations, and from May to late June for lower elevations. Hatching occurs 20-70 days after fertilization, depending upon temperature, with alevin emerging 1-2 months after hatching (McPhail 2007).

Bull trout

The bull trout (*Salvelinus confluentus*), AB population 8, Saskatchewan-Nelson River population in Banff National Park is identified by COSEWIC as Threatened. Bull trout population 11 is not listed under SARA or identified by COSEWIC in British Columbia.

Along Hwy 93N, the Alberta population 8 within BNP is located in the Saskatchewan River watershed north of Bow Summit (km 40). Along Hwy 93S, bull trout population 11 are found from Vermilion Pass (km10) to the divide at Olive Lake (km (91.1) in all perennial flowing water or connected waterways.

Bull trout spawn in the fall, typically beginning in September as water temperatures decline. Egg development and hatch are temperature dependent, with hatch times 50-126 days. Survival to hatching is much reduced at water temperatures >26.5°C. Alevin emerge near the beginning of June (McPhail 2007).

Aquatic Habitat Barriers

Barriers (perched culverts, logjams, rock debris) that are present in the vicinity of the construction limits of the roadway rehabilitation project, which are likely to preclude aquatic biota passage, are listed in Table 6-2 below.

Table 6-2: Fish passage barriers identified along the Highway 93S route¹.

Location Name (if given)	Type of Barrier	km	UTM Easting (if known)	UTM Northing (if known)
Highway 93N				
Noseeum Creek	culvert	22.70	547054	5719194
Silverhorn Creek	culvert	51.17	529060	5738828
Waterfowl Lakes campground	culvert	56.34	526482	5743292
Mistaya River just south of N. Sask River confluence	culvert		n/a	n/a
Rampart Creek	culvert	87.92	509412	5765646
Highway 93S				
Vermilion River	culvert	16.99	561435	5670768
Tokumm Creek confluence with Vermilion River	culvert		n/a	n/a
Snow Creek confluence with Vermilion River	culvert		n/a	n/a
Vermilion River	rock jam	24.47	560769	5664818





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Location Name (if given)	Type of Barrier	km	UTM Easting (if known)	UTM Northing (if known)
Verendrye Creek	log jam	39.65	570614	5653711
Downstream of Wardle Creek 49.2km from south park gate	culverts	53.86	569920	5642306
Dolly Varden Creek confluence with Kootenay River	culvert	67.72	569420	5631108

¹Barriers identified using Habitat Wizard (BC CDC, 2008b) and identified by Shelley Humphries, PCA (Humphries, 2016)

A positive barrier culvert on Hwy 93S (km 38.98: UTM 570132E, 5654213N) acts as a barrier for pure-strain westslope cutthroat trout living upstream of the culvert.

- Flora

The Biogeoclimatic Ecosystem Classification (BEC) is a land classification system that groups similar ecosystems based on climate, soils and vegetation. Vegetation of mature ecosystems is emphasized in BEC as it is considered to be the best integrator of the combined influence of the environmental factors affecting a site.

There are three BEC zones along the portion of Highway 93S between km10.0 and the southern terminus of the project. From km10.0 southward to approximately km46.4, the highway passes through the Engelmann Spruce/Subalpine Fir, Dry Cool BEC zone (ESSFdk2). This zone is typified by closed canopy stands of Engelmann spruce (*Picea engelmannii*) and subalpine fir (*Abies lasiocarpa*). At the higher elevations along the route, subalpine parklands are common, consisting of tree islands with herb-dominated meadows, black huckleberry (*Vaccinium membranaceum*), white-flowered rhododendron (*Rhododendron albiflorum*) and false azalea (*R. menziesii*) (Braumandl and Curran, 2002).

From km46.4 southward to km 103.0, Highway 93S passes through the Montane Spruce, Dry Cool BEC (MSdk2). This is a common BEC in the eastern half of the KNP. It is typified by hybrid white spruce (*Picea engelmannii* x *glauca*) and subalpine fir, with an understory of Utah honeysuckle (*Lonicera utahensis*), grouseberry (*Vaccinium scoparium*), twinflower (*Linnaea borealis*) and pinegrass (*Calamagrostis rubescens*). Early successional stands of lodgepole pine (*Pinus contorta*), resulting from past fires, are also present in this BEC (Braumandl and Curran, 2002).

From km103.0 to the southern terminus of the project, Highway 93S passes through the Interior Douglas Fir, Dry Mild (IDFdm2) and Interior Douglas Fir, Very Dry Cool (IDFvk) BEC zones. Interior Douglas Fir zones are typified by climax stands of Douglas fir (*Pseudotsuga menziesii*), with occasional seral stands of Douglas fir, western larch (*Larix occidentalis*) and lodgepole pine (*Pinus contorta*). Common understory species include pinegrass, birch-leave spirea (*Spirea betulifolia*), soopolallie (*Shepherdia canadensis*) and common snowberry (*Symphoricarpos albus*).

Sivak (1987) applied the British Columbia BEC system to Alberta. The majority of the Highway 93N alignment passes through the Engelmann Spruce Subalpine Fir zone, described above. However, poor map resolution restricts accurate determination of the highway alignment crosses an irregular transition





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between ESSFdk2 and an area classified as Aspen-Lodgepole Pine-White Spruce (ALPW). The ALPW BEC is the dominant type through the central portion of the Highway 93N alignment.

A list of vascular plant species known to occur within the KNP/BNP, and listed under SARA and by COSEWIC, was compiled by consulting and/or querying the following data sources:

- Parks Canada Biotics Web Explorer (Parks Canada, 2013);
- BC Conservation Data Centre Species Ecosystems Explorer (BC MOE, 2015);
- Alberta Conservation Information Management System (AEP, 2015b)

The Parks Canada Biotics Web Explorer was queried for regularly occurring species listed under SARA Schedule 1 and by COSEWIC within the KNP and BNP. The BC Species and Ecosystems Explorer was utilized to find provincially-listed wildlife species under SARA Schedule 1 and by COSEWIC in the appropriate environment region, forest district, regional district, and BEC zone within the KNP.

Queries to the databases included vascular plants as well as mosses and lichens. The results of the queries, however, indicated that no SARA Schedule 1 or COSEWIC moss or lichen species are considered present in either KNP or BNP. Therefore, further environmental analysis of the project's potential impact on flora focused only on vascular plant species.

The list of plant species known to occur along the Highway 93N and Highway 93S alignments was further augmented by the results of rare plant habitat assessments conducted by TTEBA, followed by field surveys conducted by TTEBA in August 2015 for vegetation elements of management concern (VEMC). The field surveys identified one federal VEMC species at 10 locations along Highway 93N. No federal VEMC species were identified along Highway 93S. Species in close proximity to the project sites are shown in Appendices 3 and 4.

Table 6-3: Federal VEMC in KNP/BNP – Vascular Plant Species

Common Name	Scientific Name	KNP/BNP Presence ¹	COSEWIC Status ²	SARA Legal Status ³	BC List Status ²	Potential Presence Along Roadway
Whitebark pine	<i>Pinus albicaulis</i>	R	Special Concern	Schedule 1, Special Concern	Blue	High – suitable breeding and foraging habitat present, species common in KNP. August 2015 TTEBA survey identified 10 locations along Hwy 93N, 0 locations along Hwy 93S
Limber Pine	<i>Pinus flexilis</i>	R	Endangered		Red	Low – One juvenile tree was observed on a cliff near km101. There may be previously unobserved individuals, or other occurrences of limber pine higher up on the cliffs above Hwy 93S

¹R - Regularly-occurring species in the listed park (Parks Canada, 2013)

²Blue - special concern species (BC MOE, 2015)

Whitebark pine (*Pinus albicaulis*) is typically found in cold, windy, high elevation or high latitude sites and as a result, many stands are geographically isolated. It is a stress-tolerant pine and its hardness allows it to grow where other conifer species cannot. Whitebark pine is ecologically very significant in





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maintaining snow pack and regulating runoff, initiating succession after fire or other disturbance events, and providing seeds that are a high-energy food source for many species of wildlife (USFWS, 2014).

The August 2015 field surveys and the results of the database queries also identified ten provincial VEMC species adjacent to the full Highway 93N alignment and two provincial VEMC species adjacent to the Highway 93S alignment. These are presented in Table 6-4 below. Species in close proximity to the project sites are shown in Appendices 3 and 4.

Table 6-4: Non-federal VEMC in KNP/BNP – Vascular Plant Species

Common Name	Scientific Name	KNP ¹	BNP ¹	BC Status ²	AB Status ³	Description ⁴
Highway 93N						
Spatulate grape fern	<i>Botrychium spathulatum</i>	-	R	-	S3-Tracked	Two locations; several (i.e. <20) individuals located
Yellow sedge	<i>Carex flava</i>	-	R	-	S2S3-Tracked	Five locations; numerous individuals located throughout wetlands and/or gravel banks in floodplains adjacent to the highway.
woolly willow	<i>Salix calcicola</i>	-	R	-	S2	Numerous individuals located in gravel banks in flood plain adjacent to the highway.
Aspen/hairy wild rye/showy aster Ecological Community	<i>Populus tremuloides</i> / <i>Leymus innovates</i> / <i>Eurybia conspicua</i>	-	All R	-	All S5	Ecological community is located in the ditch adjacent to the highway.
Hooker's cinquefoil	<i>Potentilla hookeriana</i>	-	R	-	SU-Tracked	Two locations; site-specific details are not available.
Blackened sedge	<i>Carex epapillosa</i>	-	NR	-	S1-Tracked	Several plants at low density
Porsild's whitlow grass	<i>Draba porsildii</i>	-	R	-	S3-Tracked	Three locations; several plants in each, small (<.1 m ² area), located in close proximity to the highway.
Western false-asphodel	<i>Triantha occidentalis</i>	-	NR	-	S1-Tracked	Two locations; several plants, in a 10 m x 10 m area, located in close proximity to the highway.
Corymbose everlasting	<i>Antennaria corymbosa</i>	-	R	-	S2-Tracked	Numerous plants located in close proximity to the highway.
Trifid-leaved fleabane	<i>Erigeron trifidus</i>	-	R	-	S3-Tracked	Two locations; several plants located in close proximity to the highway.
Highway 93S						
Gaston's cliff brake	<i>Pellea gastonyi</i>	R	-	NL	-	Two plants observed in a rock crevice within the exposed cliff face.

¹R - Regularly-occurring species and NR - Non-regularly occurring species in the listed park (Parks Canada, 2013)

²Red - Extirpated, endangered, or threatened species, blue - special concern species, yellow - secure species and not at risk of extinction (BC MOE, 2015) Note: NL – not listed

³S1 - Known from five or fewer occurrences or especially vulnerable to extirpation because of other factor(s),





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S2 - Known from twenty or fewer occurrences or vulnerable to extirpation because of other factors,

S3 - Known from 100 or fewer occurrences, or somewhat vulnerable due to other factors, such as restricted range, relatively small population sizes, or other factors,

S4 - Apparently secure: taxon is uncommon but not rare and there is potentially some cause for long term concern due to declines or other factors,

S5 - Secure - taxon is common, widespread, and abundant,

SU - Taxon is currently unrankable due to lack of information or substantially conflicting information (AEP, 2015b)

⁴This column summarizes the field survey results of the August 2015 TTEBA survey (TTEBA, 2015)

Spatulate grapefern is a small fern known to occur in open to partially open habitats, mostly in montane and lakeshore areas. Habitats are often associated with moderate disturbance and/or have sparse or grassy vegetation. Since spatulate grapefern often exists in a habitat that is early successional due to disturbance, it may be present in some roadside ditches.

Yellow sedge is a perennial sedge which occurs primarily at the margins of small rivers and streams, and has occasionally also been found in a variety of early successional habitats not associated with streams, such as roadside ditches.

Woolly willow is a low, dwarf subalpine shrub found on calcareous riverbanks, floodplains and meadows (Kershaw et al. 2001).

Hooker's cinquefoil is a multi-stem perennial found in alpine areas, bluffs, valleys and limestone cliffs.

Blackened sedge is a sedge species found in alpine and subalpine meadows, from moist to dry habitats.

Porsild's whitlow grass is a perennial herb found on scree slopes and in meadows along ridges and slopes in the alpine zone.

Western false asphodel (sticky tofieldia) is a plant found in moist subalpine and alpine ridges, wet meadows, streams and wet rock ledges.

Corymbose everlasting is a thin woolly perennial herb with flower heads that are whitish with dark spots. This is a species found in wet or moist alpine and subalpine meadows. (Kershaw et al. 2001)

Trifid fleabane is a densely tufted perennial with a white flower head, which becomes purple in maturity. Trifid fleabane is a species that inhabits alpine slopes. (Kershaw et al. 2001)

Gaston's cliff brake is a delicate, perennial fern, which inhabits calcareous cliffs and ledges. (Kershaw et al. 2001)

Limber pine is typically a high-elevation pine, usually found at the tree line either on its own or with whitebark pine. It is a slow-growing species that does not compete well with other conifers, and therefore tends to be found in difficult habitats such as cliff edges and talus slopes.





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Finally, problem areas for invasive species were identified in the following locations in KNP (Kinley, 2016):

- Sinclair Canyon (common mullein, common tansy, houndstongue, knapweed, leafy spurge, oxeye daisy, toadflax),
- Intermediate Hill (orange hawkhead, knapweed)
- Hawk Creek/Floe Lake (orange hawkweed, knapweed, tall buttercup)
- Between Numa and Snow Creek (knapweed, orange hawkweed)
- Truck pull off near Verendrye Creek (knapweed)
- Vermilion Crossing (orange hawkweed, knapweed, tall buttercup)
- Simpson River Trailhead (Knapweed, common tansy)

Problem areas for invasive species were identified in the following location in BNP:

- Lake Herbert (oxeye daisy, thistle)

- Fauna

Wildlife habitats within the project areas are located primarily within the MSdk2 and ESSFdk2 BEC zones of the Nelson Forest Region. Moderate terrain and good habitat conditions within the ESSFdk2 zone make it one of the most productive wildlife habitats in the Nelson Forest Region (Braumandl and Curran, 2002). Old growth forests are important in the maintenance of wildlife populations in this area. Seral stages provide highly productive summer range habitat for deer (*Odocoileus hemionus*, *O. virginianus*), elk (*Cervus elaphus*), and moose (*Alces americanus*). In addition, early seral vegetation in avalanche and riparian areas provides good habitat for the grizzly bear (*Ursus arctos*).

The Montane Spruce (MSdk) zone includes important autumn and early winter range habitat for deer (*O. hemionus*, *O. virginianus*), elk (*Cervus elaphus*), moose (*Alces americanus*), and bighorn sheep (*Ovis canadensis*). The remaining old growth forest pockets are key to the maintenance of insect-feeding, cavity-nesting birds which aid in the control of forest insect pests. In the portion of the MSdk traversed by Highway 93S, fire suppression has led to a loss of early seral vegetation communities in favor of mid to late-seral in the MSdk. This has the potential to alter the desirability of autumn and early winter habitat to wildlife species.

A list of wildlife species listed under SARA and by COSEWIC that are known to occur within the BNP and KNP, or their nearby forest districts, was compiled by querying species ranges assembled by the following data sources:

- Parks Canada Biotics Web Explorer (Parks Canada, 2013);
- BC Ministry of Environment Species Ecosystems Explorer (BC MOE, 2015);
- BC Conservation Data Centre web application (BC CDC, 2008a);
- Threatened bird, amphibian, mammal, and reptile ranges as assembled by the International Union for Conservation of Nature (IUCN, 2015); and





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- Recovery planning species lists for BNP and KNP as developed by the Banff and LLYK field units (Appendix 5).
- Alberta Fish and Wildlife Management Information System mapping tool (AEP, 2015a)

Each data source was searched to find the most site-specific data possible. The Parks Canada Biotics Web Explorer was queried for regularly occurring species listed under SARA Schedule 1 and identified by COSEWIC within BNP and KNP (Appendix 6). The BC Species and Ecosystems Explorer was utilized to find provincially-listed wildlife species under SARA Schedule 1 and identified by COSEWIC using the appropriate environment region, forest district, regional district, and BEC zone within KNP (Appendix 6). To locate documented species occurrences within 5 km of the Project area within KNP, the BC CDC iMap (BC CDC, 2013) was used (Appendix 6). The IUCN data set was queried to find threatened bird, amphibian, mammal, and reptile species ranges for British Columbia and Alberta by habitat type (e.g. temperate forests, rocky areas, and alpine wetlands). Finally, the Alberta Fish and Wildlife Management Information System mapping tool was queried for wildlife species ranges.

Fauna in Banff National Park

A total of 18 wildlife species of management concern were identified within the BNP. Wildlife species included one amphibian, nine birds, one arthropod, six mammals, and one mollusc (Table 6-5). Eight of these species are listed under SARA and 18 species are identified by COSEWIC as special concern, threatened, or endangered species. The Parks Biotics Web Explorer confirmed the presence of all 18 of these species within the BNP.

Table 6-5: Wildlife Species in BNP listed under SARA and listed by COSEWIC, with Additional Species of Concern

Common Name	Scientific Name	BNP Presence ¹	COSEWIC Status ²	SARA Status ³	Alberta Status ^{4 and 5}	Potential Presence in Project Area
Amphibians						
Western toad	<i>Anaxyrus boreas</i>	R	Special Concern	Special Concern	No Status ⁴ / Sensitive ⁵	High – suitable breeding and foraging habitat present, species common in BNP
Birds						
Bank swallow	<i>Riparia riparia</i>	(data not provided)	Threatened	No status	No status ⁴ / Secure ⁵	Moderate - suitable breeding and nesting habitat in close proximity
Barn swallow	<i>Hirundo rustica</i>	R	Threatened	No status	No status ⁴ / Sensitive ⁵	Moderate – suitable foraging and nesting habitat present
Black swift	<i>Cypseloides niger</i>	(data not provided)	Endangered	No status	No status ⁴ / Undetermined ⁵	Low – foraging and nesting habitat nearby at higher elevations Localized occurrence in both Parks, esp. Johnston Canyon (Kinley, 2016)
Common nighthawk	<i>Chordeiles minor</i>	R	Threatened	Threatened	No status ⁴ / Sensitive ⁵	Moderate – nesting habitat present





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Common Name	Scientific Name	BNP Presence ¹	COSEWIC Status ²	SARA Status ³	Alberta Status ^{4 and 5}	Potential Presence in Project Area
Harlequin duck AB	<i>Histrionicus histrionicus</i>	R	Special Concern	Special Concern	Special Concern ⁴ / Sensitive ⁵	Moderate – suitable breeding habitat present nearby
Olive-sided flycatcher	<i>Contopus cooperi</i>	R	Threatened	Threatened	No status ⁴ / May Be At Risk ⁵	Moderate – suitable habitat in close proximity
Rusty blackbird	<i>Euphagus carolinus</i>	R	Special Concern	Special Concern	No status ⁴ / Sensitive ⁵	Low – lack of breeding habitat (farther north), suitable foraging habitat in close proximity
Peregrine falcon <i>anatum/ tundrius</i>	<i>Falco peregrinus</i> pop. 1	R	Special Concern	Special Concern	Threatened ⁴ / At Risk ⁵	Low – nesting habitat (50-meter cliffs) in close proximity
Western grebe	<i>Aechmophorus occidentalis</i>	(data not provided)	Special Concern	No status	Threatened ⁴ / Sensitive ⁵	Moderate – habitat in close proximity
Arthropods						
Vivid dancer	<i>Argia vivida</i>	R	Special Concern	No status	No status ⁴ / Sensitive ⁵	Moderate – suitable habitat (e.g. open forest, streams and pools) in close proximity
Mammals						
American badger, taxus subspecies	<i>Taxidea taxus taxus</i>	R	Special Concern	No status	(Data deficient) ⁴ / Sensitive ⁵	Moderate – suitable habitat present
Plains bison	<i>Bison bison</i>	R ⁶	Threatened	No status	No status ⁴ / Extirpated or Extinct ⁵	None – lack of suitable habitat, no wild herds currently present (Kinley, 2016)
Grizzly bear, western population	<i>Ursus arctos</i> pop. 3	R	Special Concern	No status	Threatened ⁴ / At Risk ⁵	Moderate – dens at higher elevations, but forage habitat present
Wolverine, western population	<i>Gulo</i> pop. 1	R	Special Concern	No status	(Data deficient) ⁴ / May Be At Risk ⁵	Moderate – suitable habitat present
Woodland caribou - southern mountain population	<i>Rangifer tarandus</i> pop. 1	R	Endangered	No status	Threatened ⁴ / At Risk ⁵	Very Low – species extirpated, critical habitat present outside project area
Little brown myotis	<i>Myotis lucifugus</i>	(data not provided)	Endangered	Endangered	No status ⁴ / Secure ⁵	Low - potential roost trees present, but generally found in low densities with patchy distribution
Molluscs						
Banff springs snail	<i>Physella johnsoni</i>	R	Endangered	Endangered	Endangered ⁴ / At Risk ⁵	None – micro-distribution within BNP at Sulphur Mountain, south of Project

¹R - Regularly-occurring species and NR - Non-regularly occurring species in the BNP (Parks Canada, 2013)

²COSEWIC - Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2015)

³SARA - Species at Risk Act (Government of Canada, 2002)

⁴Species Assessed by Alberta's Endangered Species Conservation Committee (GAFWPB, 2014)

⁵Alberta Wild Species General Search: 2010 Status (AEP, 2011)





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⁶Although the Parks Canada Biotics Web Explorer (Parks Canada, 2013) indicates Plains Bison is regularly-occurring species in BNP, Kinley (2016) indicated that there are no current wild herds in the BNP.

Fauna in Kootenay National Park

A total of 15 wildlife species of management concern were identified within KNP. Wildlife species included one amphibian, eight birds, five mammals, and one reptile (Table 6-6). Nine of these species are listed under SARA and 14 species are identified by COSEWIC as special concern, threatened, or endangered species.

Table 6-6: Wildlife Species in KNP listed under SARA and identified by COSEWIC, with Additional Species of Concern

Common Name	Scientific Name	KNP Presence ¹	COSEWIC Status ²	SARA Legal Status ³	BC List Status ⁴	Potential Presence in Project Area
Amphibians						
Western toad	<i>Anaxyrus boreas</i>	R	Special Concern	Special Concern	Blue	High – suitable breeding and foraging habitat present, species common in KNP
Birds						
Bank swallow	<i>Riparia rustica</i>	(data not provided)	Threatened	No status	Yellow	Moderate – suitable breeding and nesting habitat in close proximity
Barn swallow	<i>Hirundo rustica</i>	R	Threatened	No status	Blue	Moderate – suitable foraging and nesting habitat present
Black swift	<i>Cypseloides niger</i>	(data not provided)	Endangered	No status	Blue	Low – foraging and nesting habitat nearby at higher elevations
Common nighthawk	<i>Chordeiles minor</i>	R	Threatened	Threatened	Yellow	Moderate – nesting habitat present
Olive-sided flycatcher	<i>Contopus cooperi</i>	R	Threatened	Threatened	Blue	Moderate – suitable habitat in close proximity
Rusty blackbird	<i>Euphagus carolinus</i>	NR	Special Concern	Special Concern	Blue	Low – lack of breeding habitat (farther north), suitable foraging habitat in close proximity
Peregrine falcon <i>anatum/ tundrius</i>	<i>Falco peregrinus</i> pop. 1	NR	Special Concern	Special Concern	Red	Low – nesting habitat (50-meter cliffs) in close proximity
Short-eared owl	<i>Asio flammeus</i>	R	Special Concern	Special Concern	Blue	Low – potentially suitable habitat in project vicinity
Mammals						
American badger jeffersonii subspecies	<i>Taxidea taxus jeffersonii</i>	R	Endangered	Endangered	Red	Moderate - documented occurrence in Project area but highly localized
Grizzly bear, northwestern population	<i>Ursus arctos</i> pop. 2	R	Non-active	No status	Blue	High – dens at higher elevations, but forage habitat present





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Common Name	Scientific Name	KNP Presence ¹	COSEWIC Status ²	SARA Legal Status ³	BC List Status ⁴	Potential Presence in Project Area
Rocky Mountain bighorn sheep	<i>Ovis canadensis</i>	(data not provided)	No status	No status	Blue	Very High – documented continuous presence in Sinclair Canyon
Wolverine, western population	<i>Gulo gulo</i> pop. 1	R	Special Concern	No status	Blue ⁵	Moderate – suitable habitat present
Little brown myotis	<i>Myotis lucifugus</i>	(data not provided)	Endangered	Endangered	Yellow	Low - potential roost trees present, but generally found in low densities with patchy distribution
Reptiles						
Northern rubber boa	<i>Charina bottae</i>	R	Special Concern	Special Concern	No status	Moderate - documented presence in project vicinity (i.e. Radium Hot Springs) but highly localized

¹R - Regularly-occurring species and NR - Non-regularly occurring species in the KNP (Parks Canada, 2013)

²COSEWIC - Committee on the Status of Endangered Wildlife in Canada (Government of Canada, 2015)

³SARA - Species at Risk Act (Government of Canada, 2002)

⁴Red - Extirpated, endangered, or threatened species, blue - special concern species, yellow - secure species and not at risk of extinction (BC MOE, 2015)

⁵*luscus* subspecies

The following species habitat descriptions were provided by the SARA registry website (Government of Canada, 2016) or the BC Conservation Data Centre Species Ecosystems Explorer (BC MOE, 2015).

Western toads breed in wetlands including shallow, sandy margins of ponds, streams, rivers, geothermal springs, and roadside ditches. Adults may forage in breeding areas or they disperse to other wetlands, riparian areas, or upland sites. In KNP, amphibian habitat was noted by PCA Aquatics Specialist Shelley Humphries between Simpson Trailhead and Simpson Monument, as well as at Kootenay Pond.

Bank swallow habitat includes open and partly open situations, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks, in burrows dug near the top of the bank, along the edge of inland water, along the coast, in gravel pits, or road embankments.

Barn swallows nest mostly in artificial structures, including road culverts. Barn swallows prefer open habitats for foraging, including river shorelines, cleared rights-of-way, and wetlands.

Black swifts often forage at high altitude, fly over open areas and forests in mountainous areas and lowlands, pursuing aerial insects. They nest in canyons (near or behind waterfalls and in caves) and occasionally in limestone caves. Their nest sites are characterized by presence of flowing water, high relief, inaccessibility, darkness, and an unobstructed flight path.

Common nighthawks nest in a wide range of open, vegetation-free habitats, including recently harvested forests, burnt-over areas, logged areas, rocky outcrops, rocky barrens, grasslands, marshes, and river banks. This species also inhabits mixed and coniferous forests.





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Olive-sided flycatchers are most often associated with open areas containing tall live trees or snags for perching. Open areas may be forest clearings, forest edges located near natural openings (such as rivers or swamps) or human-made openings (such as logged areas).

Rusty blackbirds nest in the boreal forest and favour the shores of wetlands such as slow-moving streams, marshes, swamps, and beaver ponds. In wooded areas, the rusty blackbird only rarely enters the forest interior.

Peregrine falcons usually nest alone on cliff ledges or crevices, preferably 50 to 200 meters in height, but sometimes on bridges. They primarily feed on birds that they catch in flight.

Western grebes typically inhabit marshes. During migration and the winter months, this species can be found along rivers. The western grebe nests on large inland bodies of water, usually in or very close to water deep enough to allow the bird to swim submerged. Nests are typically anchored to, or build up over, living vegetation.

Harlequin ducks move inland from coastal marine environments in the spring to breed along fast-flowing turbulent rivers.

Short-eared owls breed in unforested Arctic areas, coastal marshes, and interior grasslands, where voles and other small rodents proliferate. Preferred nesting sites are dense grasslands with areas of small willows.

Vivid dancer damselflies are found in southern British Columbia and Banff, Alberta, mostly restricted to thermal springs. Vivid dancer larvae develop in small spring-fed streams and pools. In the Banff area, adults are more frequently found in sunny, open areas along trails and thinned areas compared to closed forest with less sunlight penetration.

American badger habitat requirements are not well understood, however friable soil suitable for badgers to burrow in appears to be a key element. Open habitats, whether natural (e.g. forest clearings, alpine areas) or human-made are generally used. Suitable habitat in British Columbia is limited and fragmented. Badgers have recently expanded into logged areas at higher elevations, but this habitat is insecure. The SARA-listed *Taxidea taxus jeffersonii* subspecies range extends into British Columbia (including KNP), and the *Taxidea taxus taxus* subspecies range extends into Alberta.

Grizzly bears occupy many habitats including subalpine forests in Alberta and British Columbia. In mountainous areas vegetation emerges earlier at lower elevations; therefore grizzlies will descend from their denning sites to feed in the spring, and return later in the season to higher elevations. Grizzlies are found on valley bottoms during the snow-free period, and commonly forage on roadsides.

Rocky Mountain bighorn sheep habitat includes mesic to xeric, alpine to desert grasslands, or shrub-steppe in mountains, foothills, or river canyons. In winter, Rocky Mountain bighorns spend as much as 86 percent of their time within 100 meters of escape terrain (e.g. cliffs, talus slopes). Populations typically migrate between an alpine or montane summer range and a lower elevation winter range.





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Woodland caribou winter habitat is typically mature and old-growth coniferous forests that contain large quantities of lichens. These forests are generally associated with marshes, bogs, lakes, and rivers. In summer, the caribou occasionally feed in young stands, after fire or logging. Woodland caribou rely on strong spatial separation from predators. The North Banff subpopulation once used some areas adjacent to Hwy 93N (in the vicinity of Bow Summit). This subpopulation is now extirpated, therefore there will be no disturbance to individuals. However, Critical Habitat remains designated along the Highway 93N corridor. If clearing and construction remains within the footprint of earlier highway clearing, no impact to important biophysical attributes of the Critical Habitat is anticipated.

Wolverines need vast undisturbed areas to maintain viable populations. They inhabit a variety of tree and treeless areas at all elevations including the northern forested wilderness, and the alpine tundra of the western mountains. The wolverine is most abundant where large ungulates are common.

Little brown myotis bats use a wide range of natural habitats (e.g. caves and hollow trees) as well as human-made structures for resting and maternity sites. Foraging usually occurs in woodlands near water. Winter hibernation sites include caves, tunnels, abandoned mines, and similar sites. Maternity colonies are commonly in warm sites in buildings and other structures, but also infrequently in hollow trees.

Northern rubber boa snakes occupy a variety of habitats including streambanks, thickets, grasslands, and montane forests. They need rocky outcrops and abundant coarse woody debris to hide from predators and thermoregulate. Mostly active at night, they spend about 25 percent of their time above ground (under cover), and the remaining 75 percent underground in abandoned rodent burrows and rock crevices. The population of importance to this project is located at Radium Hot Springs and the adjacent area, however, there are few scattered observations of northern rubber boas from the Iron Gates tunnel down to the final canyon near the west park gate.

Cultural Resources

- Heritage Resources

An archeological survey provided by PCA (Langemann, 2016b) identified heritage resources in proximity to planned project areas along Hwy 93N. Their locations are described in Table 6-7.

Table 6-7: Heritage Resources Located in Proximity to Hwy 93N

Start km	End km	Common Name	Site Number
45.90	45.98	"North end of the SB climbing lane to Bow Summit" – 10 m west of highway	Site 2034R
46.92	46.98	"North end of the SB climbing lane to Bow Summit" – 55 m west of highway	Site 2032R
48.04	48.17	"North end of the SB climbing lane to Bow Summit" – outside of disturbance area	Site 2107R32
70.78	70.90	"Mistaya Canyon viewpoint"	Site 2107R2, Site 2107R3





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An archeological survey provided by PCA (Langemann, 2016a) identified heritage resources in proximity to planned project areas along Hwy 93S. Their locations are described in Table 6-8.

Table 6-8: Heritage Resources Located in Proximity to Hwy 93S

Start km	End km	Common Name	Site Number
10.04	10.15	"Continental Divide/Vermilion Pass"	Site 363T
16.73	-	"Marble Canyon Campground"	Site 373T
40.60	40.83	"Kootenay Park Lodge"	Site 383T
57.6	58.1	N/A – climbing/passing lane	Site 2071T
59.30	59.35	"Kootenay Pond"	Sites 399, 400, 401, 433T
60.03	60.09	"Kootenay River Crossing"	Site 361, 370T
76.40	76.61	"Meadow Creek"	Site 1623T
91.1	-	"Olive Lake"	Site 358T
99.1	101.3	"Sinclair Canyon"	Sites 357, 423, 356, 444, 426, 425, 424, 365, 429

- Visitor Experience

Anticipated negative effects to visitor experience will likely be associated with noise disturbance during construction, and occasional temporary traffic delays and difficulty accessing some roadside turnoffs during construction from May to December, 2016. Minor and temporary traffic delays may be needed to accommodate equipment mobilization or demobilization during the project staging and construction phases. Anticipated positive effects include improvements to visitor comfort and safety.





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7. EFFECTS ANALYSIS

Tables 7-1 and 7-2 below highlights how each of the Valued Components are anticipated to be affected during the project phases.

Table 7-1: Possible Effects on VCs During Preparation/Construction

Valued Components		Possible Effects
Air Quality and Noise	<i>General</i>	Excavation, grading, backfilling, use of machinery, transportation of materials and equipment may result in increased road dust and vehicle emissions above baseline.
		Preparation of asphalt and cement mixtures, curing, and painting of road surfaces may release VOCs and other chemicals.
Soil and Landforms	<i>General</i>	Excavation, grading, backfilling, rock and soil cuts, and cut and fill activities may result in slope instability and increased susceptibility to erosive forces.
		Stripping and/or compaction of the existing soils during construction and installation may negatively affect vegetation communities, wildlife, and invertebrates.
		Accidental spills or leaks during transportation, construction, or installation may adversely affect soils.
		Asphalt improperly stored, applied, or disposed of has the potential to contaminate soils with oil.
		Traffic paint improperly stored, applied, or disposed of has the potential to leach into soils.
		Undersized culverts may increase water flow rate, creating areas of high erosion and scouring at the outlet.
Water (surface/ground/crossings)	<i>General</i>	Accidental spills or leaks during construction and installation may adversely affect ground and surface water.
		Fuels and materials stored at temporary staging areas have the potential to leak and leach into groundwater.
		Asphalt improperly stored, applied, or disposed of has the potential to release oil contamination into the groundwater.
		Traffic paint improperly stored, applied, or disposed of has the potential to migrate to surface water or leach into surface water.
		Stripping, handling, or storing of soils, or drilling into rock has the potential to create sedimentation, which can be released into watercourses downstream, potentially creating harm for fish and fish habitat.
		Increased sediment deposition in culverts during pre-disturbance and construction may result in reduced drainage capacity and flooding.
		Undersized culverts may be more easily blocked, resulting in reduced drainage capacity and flooding.
		Removal of blockages from existing culverts may result in excess water conveyance and drainage of established wetlands.
		Riparian areas may be temporarily disrupted between construction and re-vegetation.
Fish and Fish Habitat	<i>General</i>	Construction operations (particularly work on culverts) have the potential to release deleterious substances into fish habitat.
		Construction operations have the potential to involve heavy machinery within or adjacent to the Vermilion River, riparian areas, and fish spawning habitat. This may have temporary or permanent effects.





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Valued Components		Possible Effects
		Increased sediment deposition in culverts during pre-disturbance and construction may result in blockages preventing fish passage.
		Aquatic habitat may be destroyed or harmfully altered if construction activities occur within or adjacent to a watercourse (i.e. the riparian zone).
		Culvert improvements may promote increased fish habitat connectivity.
		Fish may be negatively affected (e.g. physiological response, behavioral avoidance) by blasting activities that occur close to a watercourse.
	<i>Westslope cutthroat trout, BC population 8 and AB population 9.</i>	Construction activities that have the potential to release sediment into streams during spawning and rearing periods (potentially as early as May to mid-August) may cause disproportionate impacts during other times of year.
		Construction activities will avoid repairing a barrier culvert (at UTM 570132N, 5654213E in KNP), which prevents migration of pure-strain Westslope cutthroat trout living upstream of the culvert.
Flora	<i>Bull trout AB population 8.</i>	Construction activities that have the potential to release sediment into streams during spawning and rearing periods (after September 1) may cause disproportionate impacts during other times of year.
	<i>General</i>	Vegetation clearing, grading and widening of ditches may disturb rare plant species.
		Soil disturbance related to highway construction and staging areas may create habitat conducive to non-native invasive species, in competition with native and/or uncommon species.
		Removal of trees may disturb birds and other wildlife especially if clearing is done during breeding, nesting, roosting or rearing seasons
		Alteration of slopes to accommodate widening may temporarily or permanently remove habitat for slope-dependent species
	Whitebark pine	Widening of the highway may require alteration of slopes where whitebark pine is present.
Fauna	Limber pine	Rock re-capitalization and shoulder widening may require alteration of slopes where limber pine is present.
	<i>General</i>	Accidental fuel or oil spills from construction equipment may negatively affect wildlife and habitat quality through contamination of soil, vegetation, or water resources.
		Noise from construction operations may cause avoidance behaviors from wildlife, which would otherwise occupy the land adjacent to roads, use the Kootenay River as a water source, or use the previously installed wildlife crossings.
		Dust generated during construction activity may affect local air quality and nearby aquatic habitats when dust settles.
		Garbage and food waste generated by construction activities may attract wildlife and lead to human-wildlife encounters.
		Construction staging and stockpile areas may temporarily impact wildlife habitats.
		Increased traffic during the project construction period may increase species mortality along 93N and 93S.
	Western toad	Impact to breeding and foraging habitat (e.g. roadside ditches) from ditch re-grading and culvert excavation.
		Species mortality along 93S and 93N due to increases in traffic during the project construction period.
	Birds	Clearing of trees, shrubs, and vegetation within roadway corridor could result in destruction of nesting habitat.





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Valued Components		Possible Effects
		Blasting work may affect bird nesting.
	Vivid dancer	Potential impact to larval habitat (i.e. roadside ditches) from ditch re-grading.
	Little brown myotis	Clearing of trees and brush within roadway corridor could result in destruction of bat roost trees and maternity sites.
	American badger, grizzly bear, and wolverine	Potential disturbance of habitat and movement patterns during construction; effects are anticipated to be short term in duration.
	Rocky Mountain bighorn sheep	Potential disturbance of movement patterns; ewes move from low elevations to high elevations from early May to late May. Rams will move to higher elevations afterwards. After giving birth, some ewes will bring their lambs back to low elevations. Animals will potentially be on the highway throughout construction period.
	Northern rubber boa	Species mortality along 93S due to increases in traffic during the project construction period. Excavation/rock slope work may result in destruction of individuals or habitat.
Historical Resources	<i>General</i>	Unidentified historical resource areas identified near the Project Sites may be disturbed during both construction and operations.
	Site 2071T (km 57.6)	Widening of the passing land shoulder and/or slope contouring may uncover isolated structures or artefacts similar to the timber box.
	Site 385T (km 91.1)	Intersection improvements at Olive Lake may affect the known pre-contact site immediately south of the highway.
	Unnamed site from km 45.90-45.98	Shoulder widening and ditch construction may disturb the known archeological area.
Visitor Experience	<i>General</i>	Construction operations (ie/ machinery use, excavation, grading, backfilling, and culvert replacement) may disrupt regular visitor traffic and may result in a negative experience for park visitors.
		Dust, smells, and noise from construction may result in short-term nuisance to backcountry park visitors.
		Staging and material storage may be considered unpleasant by park visitors.
		Work conducted in the early mornings near campgrounds may result in visitor nuisance.

Table 7-2: Possible Effects on VCs During Operation/Maintenance

Valued Components		Possible Effects
Air Quality	<i>General</i>	Improved intersections may result in shorter idling times while waiting to merge into traffic, leading to fewer emissions.
Water (surface/ground/crossings)	<i>General</i>	Until slopes are fully stabilized and vegetation has established, increased erosion and sedimentation into ditches and/or surface water may occur.
Fish and Fish Habitat	<i>General</i>	Reconstructed perched and hanging culverts, or those subject to repetitive debris jams, has the potential to improve connectivity of habitat for aquatic biota and reduce maintenance requirements for the future.
		Undersized or culverts installed in a perched manner may result in increased flow rates or elevation drops, which can impede fish passage.





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Valued Components		Possible Effects
Flora	General	Increased road width may also increase the amount of de-icing salt in road runoff, which may affect adjacent plant populations.
Fauna	Western toad	Increase in surface water runoff from greater impervious area may alter breeding and foraging habitat (e.g. roadside ditches) quality by increasing bank erosion and sedimentation.
Historical Resources	Site 2034R (93N km 45.9)	If vegetation was compromised during staging on roadside or construction, the historic cabin may experience increased tourist traffic.
Visitor Experience	General	Wider roads and roads in better condition have the potential to reduce the number of traffic accidents and increase overall visitor safety and comfort.
		The anticipated reduction in the number of accidents on the highway has the potential to reduce economic losses from traffic delays.
		Wider merging lanes at crossings may entice more visitors to utilize rest and campground areas.
		Reconstructed perched and hanging culverts, or those subject to repetitive debris jams, has the potential to improve aesthetics and minimize inconveniences associated with temporary road closures due to water and debris overtopping the roadway during high flow events at culvert locations.





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8. MITIGATION MEASURES

All relevant mitigation measures outlined in the *Parks Canada National Best Management Practices for Roadway, Highway, Parkway and Related Infrastructure* (BMPs; PCA, 2015) will be followed. These allow an identified suite of well-understood project activities to proceed such that there will not be resulting significant adverse environmental effects. The BMPs are applicable when the project activities are routine and repetitive with well understood and predictable effects.

Specific mitigation measures to be followed during the rehabilitation work on Highway 93N and 93S are numbered and divided into categories below:

General Mitigation Measures

1. The contractor is required to prepare an Environmental Protection Plan (EPP) in accordance with Parks Canada Environmental Procedures before initiation of construction. The EPP will outline:
 - Details on how the work limits will be marked and procedures to ensure operations will remain within the clearing boundaries to minimize damage to vegetation and soil damage.
 - A Spill Response Plan will be prepared and will detail the containment and storage, security, handling, use and disposal of empty containers, surplus fuels or other hydrocarbon products to the satisfaction of the Departmental Representative and LLYK Field Unit Environmental Surveillance Officer (ESO) and in accordance with all applicable federal and provincial legislation. The Spill Response Plan will include a list of products and materials to be used or brought to the work site that are considered or defined as hazardous or toxic to the environment. Such products may include, but are not limited to, fuels and lubricants. The Material Safety Data Sheets (MSDS) for all chemicals used will be made available on-site. Appropriately sized and stocked spill kits will be on site capable of dealing with 110% of the largest potential spill. All of the contractor's staff must be aware of their location(s) on site and must be trained on spill response procedures.
 - An Emergency Response Plan that outlines procedures to follow in the case of an emergency (e.g. wildlife encounter, equipment malfunction/failure, fire).
 - A Fire Prevention Plan which describes the fire prevention equipment (e.g. fire extinguishers) and procedures on-site in the event of a fire. Should a fire occur, the Banff Dispatch and the Fire Duty Officer must be notified immediately.
2. To prevent spills, equipment fueling will not occur at the Project Sites; instead it will take place at an impermeable roadside area away from watercourses, or at staging areas with spill catchment countermeasures in place.
3. Prior to use on the Project Sites and daily during use, equipment and fuel lines will be inspected for leaks and structural integrity, and inspections will be recorded. Any detected leaks will be addressed immediately, and spills over 5 L or any spill quantity in water will be reported to Banff





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- Dispatch and the Environmental Surveillance Officer (ESO) immediately. Equipment stored overnight in staging areas will be stored on tarps with appropriate containment if required.
4. All spills (e.g. hydraulic fluids) will be responded to immediately in accordance with the construction contractor's Spill Response Plan. In the event of any fluid spills or leaks exceeding 5 L or any spill quantity in or near water, the Spill Response Plan will be followed, including immediate containment, cleanup/mitigation, and immediate reporting to Banff Dispatch and the ESO. Any absorbent materials used in the clean-up or soils contaminated by the spill will be disposed of in the appropriate facilities and transported in accordance with the Transportation of Dangerous Goods Regulations. All spills, regardless of size or location, will be reported to the ESO.
 5. Dust generated by Project activities, both on Project Sites and the TCH, will be controlled as necessary by watering down surfaces and ongoing cleanup/maintenance.
 6. No equipment (motor vehicle or construction equipment) motor will idle when not in use, unless required under extenuating circumstances, and carpooling will be encouraged to reduce air emissions and noise pollution. Propane storage and fuel lines will be checked for structural integrity during annual maintenance visits.
 7. Any necessary permit applications will be prepared by the LLYK field unit for work that may affect SARA-listed species, if necessary.
 8. No garbage or debris of any kind will be left onsite.

Air Quality and Noise

9. Dust-generating activities will be minimized as much as possible during windy periods.
10. Any asphalt plants will be situated at least 500 meters away from buildings with human habitation.
11. No oils, rubber, tires nor any other material will be burned on site.
12. Stationary emission sources such as portable diesel generators, compressors, etc. will only be used when necessary.
13. Equipment and vehicles will be turned off when not in active use to reduce noise and air pollution.
14. All equipment, vehicles and stationary emission sources will be well maintained and used at optimal loads for minimal noise and air emissions.

Soil and Landforms

15. Project activities will be planned and scheduled for dry weather whenever possible. If significant wet weather is encountered, additional measures will be taken to minimize erosion potential.
16. Construction and equipment travel will be minimized during periods of heavy precipitation and excavation activities halted during heavy rainfall events.
17. The area of exposed soil at any given time will be minimized by using techniques such as phased construction activities, retaining vegetation as much as possible, and, following construction works completion, stabilizing the exposed soils as soon as possible using temporary measures (e.g. mulch,





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- erosion sediment control blankets, hydroseeding, plastic sheeting, planting long-term vegetation, etc.).
18. Erosion- and sediment-control materials will be readily available on-site. Materials may include (but are not limited to) rock, gravel, grass seed (seed mix to be approved by the Field Unit), silt fencing, staking, and polyethylene sheeting.
 19. Slope stabilization methods including, but not limited to, catchment and wire netting and grading will be used if appropriate, to help reduce any potential slope failures.
 20. To minimize soil compaction, all equipment will be stored either on the road or on previously disturbed or hardened surfaces

Water (surface/ground/crossings)

21. Work on or adjacent to watercourses will be monitored by a Qualified Aquatic Environmental Specialist.
22. An Erosion and Sedimentation Management Plan will be prepared by the construction contractor for the components of the work undertaken in proximity to watercourses, wetlands or riparian environments. If sediment ponds are required, they shall be designed to settle all sediment particles 0.02 mm or larger. The ponds shall also be designed to handle 1:5 year storm events, with overflow spill capacity for 1:10 year storm events and emergency spillway capacity for 1:100 year storm events. All components will be regularly maintained to ensure effectiveness.
23. Project activities will be planned for dry weather (e.g. summer) to allow easier control of contaminated runoff and sediment. However, if any scheduled activity requires working in the rain, the area of work will be isolated and appropriate sediment controls installed to prevent the release of sediment-laden water or any other deleterious substances into surface waters, particularly for surface repair works requiring the application of patching and sealing compounds, tar, asphalt, and chemical surface sealants.
24. At Project Sites where watercourses are present silt fences will be erected in watercourses downstream of the active work area. They will be monitored to prevent collapse under heavy sediment loading.
25. Silt fences will be erected in ditches/channels upstream from culverts and culvert inlets to minimize sediment deposition in culverts. They will be monitored to prevent collapse under heavy sediment loading.
26. Culverts will be designed to accommodate high-flow conditions such that average flow rates will not impede fish passage. Rip-rap will be used to prevent scouring during high flow events. Culverts will not be designed with hanging outlets.
27. Fuels, gases, or other deleterious substances will be contained within the appropriate and approved containers. Secondary containment large enough to hold 110% of the volume of the containers will be used, and will not be stored at Project Sites where leaks and spills have the





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potential to seep into groundwater, or enter surface waterbodies. Fuels, gases, or other deleterious substances will be transported according to the Transportation of Dangerous Goods Regulations.

28. If accidental spills or leaks occur from equipment on the Project Sites, the Spill Response Plan will be followed, and Banff Dispatch and the ESO will be notified immediately (see mitigation pertaining to spills under 'General Mitigations' above).

Fish and Fish Habitat

General

Impacts to fisheries resources will be avoided or mitigated through application of BMPs for working in or around water. In-water work (i.e. culvert replacement) will adhere to avoidance and mitigation measures as identified by Fisheries and Oceans Canada (DFO) and specific *Fisheries Act* criteria.

29. Disturbance to natural materials and vegetation that contribute to fish habitat or stream channel stability will be minimized. If vegetation that contributes to fish habitat needs to be removed, a restoration plan that meets PCA requirements for re-vegetation will be compiled subject to LLYK field unit review and acceptance.
30. Natural hydrology will be maintained during all phases of the project, where possible.
31. If the work schedule requires working during high precipitation periods or high runoff periods, the area of work will be isolated and appropriate sediment and erosion controls will be installed to prevent the release of sediment laden water or any other deleterious substance into fish habitats.
32. Where work will be conducted in areas below the ordinary high water mark, a project self-assessment will be undertaken by a Qualified Environmental Professional, in coordination with appropriate PCA natural resources and aquatics specialists, in order to accurately assess the need (if any) for DFO project review under the *Fisheries Act*.
 - It will be structured to initially utilize existing park-specific data regarding fish species present where work is anticipated to occur below the ordinary high water mark.
 - Data and park-specific information will be used to identify important habitat features to be evaluated during site visits and the applicable seasonal work timing restrictions for fish species present in the river reach.
 - A site visit to each work area will be scheduled in the early spring of 2016 as soon as site conditions allow for visual inspection of instream habitat at the work sites.
 - Observations and data collected during the site inspections will be used to identify options for site-specific mitigation measures necessary to avoid causing harm to fish and fish habitat (DFO 2015).
33. Mitigation measures to avoid harm to fish and fish habitat will be developed on a site-specific basis depending upon the type of concurrent nearby roadway work and number of culvert replacements,





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- and will include consideration of project timing (with respect to fish windows), appropriate erosion and sediment control plans, and procedures and fish protection as identified by DFO (DFO, 2015). If necessary, any additional Species at Risk considerations will be incorporated.
34. As necessary, work areas will be isolated from flowing water using appropriate means (including, but not limited to, the temporary placement of pre-cast concrete barriers or water bags in the river at the toe of the slope) and follow fish protection guidance identified by DFO (DFO, 2015).
 35. In order to avoid causing harm to fish, the extension or replacement of the culverts will occur during dry or frozen conditions, or in isolation of flowing water and only after the work zone has been isolated and a fish salvage has been completed by the Departmental Representative. The site will be isolated from flows by pumping flow around the work zone to ensure downstream habitat is not dewatered. A Restricted Activity Permit (RAP) will be secured from PCA before any pumping/extraction takes place, and screened intakes will be used to eliminate potential entrainment and serious harm to fish.
 36. Any water intakes will be screened to prevent entrainment or impingement of fish. Entrainment occurs when a fish is drawn into a water intake and cannot escape. Impingement occurs when an entrapped fish is held in contact with the intake screen and is unable to free itself. Measures for freshwater design and installation of intake end-of-pipe-fish screens will be utilized to protect fish where water is extracted from fish-bearing waters (DFO, 2015)
 37. Deleterious substance control and spill management will be incorporated into the project Environmental Protection Plan (EPP) and will include, but not be limited to, a Spill Response Plan, an Erosion and Sediment Control Plan and a Hazardous Waste Management Plan, all of which will be prepared by the construction contractor. The EPP will be submitted to LLYK field unit for review.
 38. Contractors will identify equipment and vehicle fueling locations for approval by PCA and the ESO. Vehicles and equipment will not be serviced or refueled within 100 m of any watercourse, tributary or drainage ditch which connects to fish habitat. Tanks, hoses and connections will be inspected prior to use. All hose connections will be wrapped and secured with absorbent pads during fuel/oil transfers. All hoses, valves and equipment are to be kept in a containment area whenever possible. Hose length and the number of connections shall be minimized - use dripless connections if possible. Drain hoses when finished. Gravity fed systems are not permitted within the parks, manual or electric pump delivery systems shall be used.

Westslope cutthroat trout

39. The culvert located at KNP km 38.98 (UTM 570132E, 5654213N) will ideally not be repaired. If repairs/maintenance/replacement are absolutely necessary, they will be done in such a way to ensure the culvert continues to act as a barrier to fish passage in order to maintain the isolated population of pure-strain westslope cutthroat trout living upstream of the culvert.





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Flora

The rare plant habitat assessment and rare plant surveys conducted by TTEBA in August 2015 included consideration of historically identified occurrences of rare plant species. However, the absence of historical occurrences does not preclude their presence within the Project footprint.

40. Pre-construction rare plant field surveys for 2016 project sites will be conducted at those areas identified as “medium” or “high” risk in TTEBA’s August 2015 survey. No late season surveys will be conducted for 2016 sites.
41. Rare plant field surveys for post-2016 project sites will be conducted as work progresses such that:
 - Assessments for future project sites are conducted in the previous year (i.e. 2017 sites are surveyed in 2016);
 - Two rare plant surveys are conducted annually: early season and late season;
 - Individuals and populations of listed plant species are identified; and
 - Survey results are used to develop site-specific mitigation measures such as avoiding potentially affected plants, adjusting construction plans, or salvaging/translocating affected individuals.
42. No clearing of any rare vegetation species will occur without authorization by the LLYK field unit and the acquisition of any appropriate permits (e.g. SARA).
43. To minimize disturbance of vegetation, all equipment will be stored either on the road or on previously disturbed or hardened surfaces.
44. There will be no brushing within 30m of any waterbody without the approval of the ESO.
45. Efforts will be made to ensure minimum amount of vegetation is cleared or disturbed at each site. Areas to be cleared will be visibly delineated to avoid unnecessary vegetation removal. Such areas will be clearly marked with highly visible materials such as flagging tape to ensure equipment operators are aware of the area they are to work in. Equipment operators will take extra caution to ensure no mechanical damage is caused to trees and other vegetation outside the designated clearing area.
46. Prior to accessing either BNP or KNP, contractors will ensure that construction equipment is clean to prevent introduction of invasive species, noxious weeds and soils from off-site.
47. Should invasive vegetation species be identified on-site, the Field Unit will be notified and the appropriate removal measures taken.
48. To minimize migration of invasive species from project sites located in areas identified in Section 6 as being of concern for invasive species:
 - To isolate vehicles from the seedbed, topsoil shall be excavated separately from subsoil where possible and be stored separately from excavated subsoil for the duration of the project. Upon completion of the highway improvements the subsoil will be backfilled followed by the topsoil.





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- Prior to entry onto new segments of the project area, all equipment that came into contact with soil at previous segments (i.e. clearing, grading, decompaction, or restoration equipment) must be cleaned (blow down/scrape down), and approved by the Field Unit, where possible and appropriate.
 - Permanent and/or mobile cleaning stations will be set up on site to remove soil and plant material from vehicles and equipment before being moved. Cleaning stations will be inspected, photographed, documented, and approved by the Field Unit, where possible and appropriate, during setup and prior to entry/exit. Materials removed from the vehicles and equipment, and the water used for cleaning will be collected and disposed in a manner dictated by the LLYK field unit.
 - Only certified weed-free straw bales will be used.
 - Construction staff and others entering the project site will be required to scrape mud off their boots and brush seeds and dirt from their clothing before entering the project site.
 - Discussion about sites of concern where special attention must be paid to invasive species control will take place between the contractor and the Field Unit before work commences.
49. Any incidental disturbance to vegetation in areas temporarily disturbed by heavy equipment and other construction-phase related activities (including lay-down sites, temporary work sites, and material stock pile sites) will be restored as quickly as possible by planting grass seed or hydroseeding (using certified “weed free” mixtures approved by PCA).
50. Should surrounding vegetation be disturbed, appropriate measures to re-vegetate and rehabilitate will be implemented using PCA approved methods and seed mix.
51. All vegetation debris will be removed from the park unless the ESO approves burning.

Fauna

General Wildlife

52. Construction phases will be scheduled in a manner that minimize disturbance to wildlife from construction noise.
53. Staging areas will be selected in consultation with the LLYK field unit to reduce the potential for impacts to wildlife species and their habitats.
54. Construction vehicles shall yield to wildlife.
55. Food and food waste will be securely stored to avoid access by animals. Daily off-site disposal of food wastes and other wildlife attractants will be mandatory.
56. Feeding, harassment, or destruction of wildlife is strictly prohibited. Any wildlife encountered within or near the Project area will be allowed to passively disperse without harassment.





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57. The Traffic Safety Plan will be developed to include protocols for addressing wildlife encounters. Banff Dispatch will be notified immediately if a human-wildlife encounter occurs with a bear, wolf, cougar, bighorn sheep, wolverine, or any wildlife species of management concern.
58. The EPP will include a plan to minimize wildlife disturbance, including the time of work, and potentially stopping all activities while potentially dangerous and/or sensitive wildlife is in the immediate vicinity. Contractors will consult with the LLYK field unit to determine whether there are reports of wildlife in the immediate vicinity of the Project area.
59. If any active nests, roosts, or dens of species protected by SARA or the Migratory Birds Convention Act (MBCA; Government of Canada, 1994) are identified, the contractor will immediately consult with the LLYK field unit to determine appropriate mitigation measures.

Amphibians (i.e. western toad)

60. Project activities correspond with key breeding, activity, and migration times for the western toad (April to October). As such, a qualified aquatic environmental specialist will conduct a pre-disturbance survey to identify potential habitat or species presence within the Project area.
61. Where road ditch re-grading and culvert excavation/installation are required, ditches containing water will be inspected for breeding amphibians by a qualified ecologist. Any locations deemed permanent amphibian habitat will be avoided if possible. The LLYK field unit will be consulted to determine appropriate actions to avoid amphibian mortality.

Arthropods (i.e. vivid dancer)

62. Where road ditch re-grading and culvert excavation/installation are required in possible vivid dancer habitat along Highway 93N, activities will be scheduled to avoid sedimentation when larvae may be destroyed (i.e. after early August when peak emergence to adult phase occurs). Where scheduling cannot accommodate this time frame, an aquatics specialist will be consulted to determine if suitable habitats (spring-fed streams) exist. If found, locations deemed probable vivid dancer larvae habitat will be avoided, and the LLYK field unit will be consulted to determine appropriate actions to avoid vivid dancer mortality.

Bats (i.e. little brown myotis)

63. Tree and shrub removal will be avoided during restricted activity period (April to August) when bats utilize maternity sites or roosting.
64. If removal of vegetation must occur between April and August, a qualified ecologist will conduct pre-disturbance surveys for suitable bat roost trees. Should bat roosts be detected, the LLYK field unit will be consulted to determine the need for bat presence surveys.





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65. Artificial lighting, increased noise, and increased activity near dead and dying trees, which serve as potential bat roost trees will be avoided to the extent possible.

Birds

66. Any removal of vegetation used by birds (either migratory or non-migratory) will be conducted prior to the nesting period wherever possible. Environment Canada's General Regional Nesting Period for the Northern Rockies, Zones A3 and A4 is mid-April to mid-August (Environment Canada, 2014).
67. Where removal of vegetation cannot occur outside of the restricted activity period, pre-clearance nest surveys will be conducted by contracted Qualified Environmental Professionals with an appropriate level of experience identifying birds and conducting nest sweeps. Should active nests be detected during surveys, consultation will occur with LLYK FU staff to determine the appropriate course of action which may include species-specific setback distances until nestlings have fledged. Deterrents approved by LLYK FU may also be used. Most migratory birds, their nests and eggs are protected under the MBCA (Government of Canada 1994).

Mammals (i.e. American badger, grizzly bear, and wolverine)

68. If any active burrows or dens are identified within the Project area, the LLYK field unit will be consulted to determine an appropriate course of action.

Reptiles (i.e. northern rubber boa)

69. Northern rubber boas are localized to the area between km 100.4 and 102.2 (i.e. the Radium Hot Springs area). As northern rubber boas may bask on roadways at night, work in this area will be conducted during daylight hours to avoid species mortality. If this is not possible due to the project schedule, a pre-disturbance survey will be conducted by a qualified ecologist to identify potential habitat or species presence in areas of known occurrence within the Project area. For rubber boa habitat that is identified, special conditions will be prescribed for any alterations of habitat (e.g. excavations).

Rocky Mountain Bighorn Sheep

70. Rocky Mountain bighorn sheep use Sinclair Canyon (km 99 - 103) to travel between summer and winter ranges, particularly during the spring and fall months. Construction activities will be avoided from May 1 to June 15, as pregnant female sheep are particularly susceptible to loud noises and movement disturbance. Construction in this area will also be avoided during the fall rutting period





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(November to early December). If avoidance is not possible, the LLYK field unit will be consulted to determine a course of action.

Woodland Caribou

71. All clearing and construction on Highway 93N will remain within the footprint of earlier highway clearing to prevent impacts to important biophysical attributes of the area identified as Critical Habitat. If construction is to extend into areas not previously cleared and disturbed, the LLYK field unit will be consulted to determine a course of action.

Historical Resources

72. Work will be conducted outside areas of known historical or architectural importance.
73. If workers accidentally find any significant isolated cultural resources while they are working, work will cease in the immediate area. The project manager, a Parks Canada archaeologist, and/or a cultural resource advisor will be contacted to discuss any protective actions that might be needed. Isolated historic items include historic cabin foundations or dumps, concentrations of turn-of-the-century bottles or cans, structural features, or pre-contact resources such as concentrations of butchered animal bone, hearths, stone features, or artefacts.
74. For work in the Olive Lake and Sinclair Canyon areas, a field level archaeological impact assessment (AIA) and an as-found recording of the highway views and features will be conducted by a qualified assessor before work begins. All mitigation measures recommended by the assessor will be followed.

Visitor Experience

75. The LLYK field unit will be kept apprised of timelines, work periods and construction activities so that their staff (e.g. visitor centre and media) can provide information to the public to prevent additional safety risks for recreational users in the vicinity of the Project Sites during construction. A traffic accommodation plan will be prepared and submitted to the LLYK field unit, which addresses effects on traffic from this and other projects.
76. The contractor will post road signage (e.g. trucks turning, reduced speed) to improve public safety.
77. To reduce noise and air pollution, contractor vehicles, construction equipment, and material haulers will be turned off when not in use, equipment and vehicles will be operated at optimal efficiency and performance, and carpooling of personnel to/from staging areas and Project sites will be encouraged.
78. Aesthetically displeasing visual impacts of the work site and staging areas will be reduced by minimizing clearing of vegetation to the extent possible (i.e. only what is necessary to ensure stable slopes and a safe work environment). Construction staging and materials stockpiling will ideally be





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confined to existing pits to be discussed with the field unit, as these areas are physically and visually obstructed from the public.

79. During construction and operation periods, the contractor will follow McElhanney's protocols around lane closure and delay, including closing the highway and/or recreational areas when required for public safety.
80. Work will be scheduled to avoid early morning, late evening, and after-sundown periods when working near campgrounds.

9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

- 9 a)** Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:
- ☒ No
- ☐ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).
- 9 b)** Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:
- ☒ No
- ☐ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

After following identified mitigation measures, there will be no significant residual adverse effects.

11. SURVEILLANCE

- ☒ Surveillance is not required
- ☐ Surveillance is required (provide details such as the proposed schedule and the focus of inspections)

The construction contractor will coordinate with the field unit to ensure the appropriate oversight is on hand during construction. If necessary, as identified in the mitigation measures, work on or adjacent to watercourses will be monitored by a Qualified Aquatic Environmental Specialist.





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12. FOLLOW-UP MONITORING

Follow-up monitoring is:

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

We do not anticipate any need for follow-up monitoring to verify the predictions of impacts within this BIA.

13. SARA NOTIFICATION

Notification is:

- ☒ not required
- ☐ required under the *Species at Risk Act* (outline the nature of and response to any notification).

14. EXPERTS CONSULTED

Department/Agency/Institution: Banff, Yoho and Kootenay National Parks	Date of Request: 2016-01-20
Expert's Name & Contact Information: Shelley Humphries, 250-343-6108, shelley.humphries@pc.gc.ca	Title: Aquatics Specialist
Expertise Requested: Fish and Fish Habitat Data	
Response: A phone interview was conducted with Shelley Humphries. First-hand accounts of fish presence and fish habitat along Hwy 93N and 93S were communicated, and areas of particular concern were noted. Some wildlife occurrences were also noted. A database of culverts as previously inspected was provided.	
Department/Agency/Institution: Highway Engineering Services	Date of Request: multiple requests
Expert's Name & Contact Information: Trevor Kinley, 250-347-6634, trevor.kinley@pc.gc.ca	Title: Environmental Assessment Scientist
Expertise Requested: Flora/Fauna Data	
Response: Phone interviews were conducted with Trevor Kinley, as well as email exchange of data and comments on an earlier draft of this BIA. The quality and source of PCA provided data was discussed. First-hand knowledge of flora and fauna along Highway 93S was discussed.	
Department/Agency/Institution: McElhanney Consulting Services Ltd.	Date of Request: multiple requests
Expert's Name & Contact Information: Selina Fong, 604-424-4849, sfong@mcelhanney.com	Title: Project Manager
Expertise Requested: background environmental and cultural data, project descriptions	
Response: Background data and project description data was shared, including work previously performed by Tetra tech EBA.	





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15. DECISION

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


- ☒ not likely to cause significant adverse environmental effects.
☐ likely to cause significant adverse environmental effects.

FOR SARA REQUIREMENTS:

- ☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required

16. RECOMMENDATION AND APPROVAL

(Add additional blocks as required)

Prepared by: EIA author (name & position):	Date: YYYY-MM-DD
Recommended by: Functional manager of the project (name):	Date: YYYY-MM-DD
Approved by: Name & position: (Field Unit Superintendent, Director of a Waterway): A. KOLESCH	Date: YYYY-MM-DD 2016/04/15
Signature: 	

17. ATTACHMENTS

1. Original Project Description
2. Environmental Impact Analysis Tools: Effects Identification Matrix
3. Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Locations
4. Hwy 93S 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Locations
5. Recovery Planning Species Lists for Banff National Park and Kootenay National Park
6. Species at Risk Database Search Results

18. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

- ☐ Project registered in [tracking system](#)
☐ Not yet registered (CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system **by the end of April** to enable reporting.





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References

- Alberta Environment and Parks (AEP). 2015a. Fish & Wildlife Internet Mapping Tool. Available at <http://esrd.alberta.ca/fish-wildlife/fwmis/access-fwmis-data.aspx>. (Accessed: January 21, 2016)
- AEP. 2015b. Alberta Conservation Information Management System. Available at <http://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/> (Accessed: February 19, 2016)
- AEP. 2011. Wild Species Status Search. Available at <http://esrd.alberta.ca/fish-wildlife/species-at-risk/wild-species-status-search.aspx> (accessed: February 22, 2016)
- B.C. Conservation Data Centre (BC CDC) 2008a. Conservation Data Centre Mapping Service [web application]. Victoria, BC, Canada. Available at <http://maps.gov.bc.ca/ess/sv/cdc/> (Accessed: January 11, 2016).
- BC CDC. 2008b. Habitat Wizard [web application]. Victoria, BC, Canada. Available at <http://maps.gov.bc.ca/ess/sv/habwiz/> (Accessed: February 10, 2016).
- BC CDC. 2013. Conservation Data Centre Internet Mapping Service (iMAPBC). Victoria, BC, Canada. Available at <http://maps.gov.bc.ca/ess/hm/imap4m/> (Accessed: January 11, 2016).
- BC Ministry of Environment (BC MOE). 2015. BC Species and Ecosystems Explorer. Available at <http://a100.gov.bc.ca/pub/eswp/> (Accessed: February 12, 2016).
- Braumandl, T.F. and Curran, M.P. 2002. A Field Guide for Site Identification and Interpretation for the Nelson Forest Region – Land Management Handbook Number 20. Ministry of Forests Forest Science Program.
- Department of Fisheries and Oceans Canada (DFO). 2015. Measures to avoid causing harm to fish and fish habitat. Available at: <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>. Accessed March 4, 2016
- Environment Canada. 2014. General Nesting Periods of Migratory Birds in Canada. Available at www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#_fig01 (Accessed: January 21, 2016)
- Government of Alberta, Fish and Wildlife Policy Branch (GAFWPB). 2014. Species Assessed by Alberta's Endangered Species Conservation Committee. Alberta, Canada. Available at: <http://esrd.alberta.ca/fish-wildlife/species-at-risk/documents/SpeciesAssessed-Endangered-Jul18-2014.pdf> (Accessed: February 19, 2016).





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Government of Canada. 1994. Migratory Birds Convention Act (MBCA), An act to implement a Convention for the protection of migratory birds in Canada and the United States. Available at <http://laws.justice.gc.ca/PDF/Statute/S/S-15.3.pdf> (Accessed: February 22, 2016)

Government of Canada. 2002. Species at Risk Act (SARA), Bill C-5, An act respecting the protection of wildlife species at risk in Canada. Available at <http://laws.justice.gc.ca/PDF/Statute/S/S-15.3.pdf> (Accessed: January 8, 2016)

Government of Canada. 2015. Committee on the Status of Endangered Wildlife in Canada (COSEWIC). (Accessed: January 8, 2016).

Government of Canada. 2016. Species at Risk Public Registry. Available at www.registrelep-sararegistry.gc.ca/ (Accessed: January 18, 2016)

Government of British Columbia. 2015. Fisheries Inventory Data Queries Tool. Available at <http://www.env.gov.bc.ca/fish/fidq/queries.html> (Accessed: January 20, 2016)

Humphries, S., personal communication, January 20, 2016.

International Union for Conservation of Nature (IUCN). 2015. The IUCN Red List of Threatened Species – Amphibian, Birds Mammal, and Reptile Ranges – Version 2015-4. Available at www.iucnredlist.org (Accessed: January 15, 2016).

Kershaw, L.J. Gould, J., Johnson, J.D., and Lancaster, J. 2001. Rare vascular plants of Alberta. University of Alberta Press, Edmonton, Alberta, and Canadian Forest Service, Northern Forestry Centre, Edmonton, Alberta.

Langemann, G. January 15, 2016a. Archaeological Overview Assessment: 2016 Highway 93S Safety Improvements. Archaeology and History Branch. Parks Canada, Calgary, AB.

Langemann, G. January 29, 2016b. Archaeological Overview Assessment: 2016 Highway 93N Safety Improvements. Archaeology and History Branch. Parks Canada, Calgary, AB.

McPhail, J.D. 2007. Freshwater fishes of British Columbia. University of Alberta Press.

Ministry of Forests, Forest Science Program. 1992, 2002 Reprint. Land Management Handbook Number 20, Part 1. British Columbia, Canada.

Milholland, B.L. 2005. Canadian Heritage Rivers System Background Study North Saskatchewan River Alberta 2005. North Saskatchewan Watershed Alliance. Edmonton, Alberta.

Kinley, T., multiple personal communications, January/February, 2016.





April 2016

Parks Canada Agency (PCA). 2013. Parks Canada Biotics Web Explorer. Quebec, Canada. Available: http://www.pc.gc.ca/apps/bos/BOSMain_e.asp (Accessed: January 8, 2016).

PCA. 2015. Parks Canada National Best Management Practices Roadway, Highway, Parkway and Related Infrastructure

Ridgely, R.S., Allnutt, T.F., Brooks, T., McNicol, D.K., Mehlman, D.W., Young, B.E., and Zook, J.R. 2007. Digital Distribution Maps of the Birds of the Western Hemisphere, Version 3.0. NatureServe, Arlington, Virginia.

Sivak, B. 1987. Biogeoclimatic Ecosystem Classification of the Forested Portion of Southwestern Alberta. Alberta Forest Service. Spruce Grove, AB.

Tetra Tech EBA (TTEBA). December 22, 2015. Rare Plant Habitat Assessment – Highways 16 and 93 N/S. Tetra Tech EBA Inc. Vancouver, British Columbia.

TTEBA. January 26, 2016. Aquatic Habitat Assessment – Highways 16 and 93 N/S. Tetra Tech EBA Inc. Vancouver, British Columbia.

U.S. Fish and Wildlife Service (USFWS), April 10, 2014. Whitebark Pine. Available at <http://www.fws.gov/mountain-prairie/species/plants/whitebarkpine/> (Accessed: January 28, 2016)





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Appendix 1 Original Project Description

Project Title: Highway 93 North Roadway Rehabilitation, km 0 to km 121

Project Contact(s):

Proponent: Parks Canada Agency	Zachary Boles (Project Manager)	Phone: (403) 760-1355 Email: zachary.boles@pc.gc.ca
Consultant: McElhanney Consulting Services Ltd.	Selina Fong (Project Manager)	Phone: (604) 424 4849 Email: sfong@mcelhanney.com
	Jim Tait (Construction Manager)	Phone: (604) 424 4939 Email: jtait@mcelhanney.com
Contractor:	TBD	

Date of Request: November 30 2015

Proposed Project Start: Spring/Summer 2016

PROJECT DESCRIPTION
<p>Project objective: Roadway widening, pavement structure and surface rehabilitation and roadway drainage improvements on Highway 93 North. Areas with deficient shoulder widths will be widened approximately 2-3 meters. The objective of this project is to improve roadway safety (at locations with high traffic volumes and/or high instances of vehicle collisions), reliability (slope rehabilitation) and to bring the road to meet current Canadian roadway design and construction standards.</p>
<p>Project rationale: Addressing high-accident locations and deficient intersections (improve safety), potentially unstable rock slopes (improve reliability) and narrow shoulders (update roadway standards) will assist in ensuring safe and reliable road infrastructure for visitors and the general motoring public. Highway 93N is a key transportation route and helps attract 5 million visitors to the Mountain Parks each year. Deficiencies to be identified, analyzed and addressed include but are not limited to: road surface deterioration; insufficient shoulder width; sub-standard intersection laning; drainage issues effecting the stability of the road structure; rock and soil slope instabilities; retaining wall instability or deficiencies; insufficient sight distance and clear zones; and highway signing.</p>
<p>Project location: <u>Primary Location:</u> Highway 93 North in Banff National Park, km 0 to km 121 (km 0 at the TCH Interchange, increasing towards Jasper). Locations for rehabilitation work will be selected based on approved funding, scheduling and environmental considerations.</p>





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Footprint size: Within previously disturbed areas (roadway surface, shoulders, ditches and embankments). Project footprint will include areas for maneuvering construction equipment, approximately 15 meter width off the edge of pavement. Locations and footprints for rehabilitation work may include the following:

Location	From (km)	To (km)	Length (km)*	Est. Footprint (ha)**
Hwy 93N Toll Booth	0.7	+/- 0.3	0.6	1.8
Mosquito Creek Hostel Access	23.8	+/- 0.3	0.6	1.8
Mosquito Creek Campground Access	23.9	+/- 0.3	0.6	1.8
Crowfoot Glacier Viewpoint Access	32.7	+/- 0.3	0.6	1.8
Helen Lake Trailhead /Crowfoot Glacier Viewpoint Access	32.8	+/- 0.3	0.6	1.8
Bow Lake Viewpoint / Picnic Site Access	34.2	+/- 0.3	0.6	1.8
Num-Ti-Jah Lodge / Bow Glacier Access	35.5	+/- 0.3	0.6	1.8
Bow Summit / Peyto Lake Viewpoint and Trailhead Access	40.3	+/- 0.3	0.6	1.8
SB Climbing Lane	40.5	46.0	5.5	16.5
Silverhorn Creek Campground Overflow	51.2	+/- 0.3	0.6	1.8
Mistaya Canyon Viewpoint / Howse Pass Trailhead Access	70.7	+/- 0.3	0.6	1.8
Saskatchewan Crossing Warden Station	74.0	+/- 0.3	0.6	1.8
Rest Area	75.6	+/- 0.3	0.6	1.8
Hwy 11 Intersection	76.0	+/- 0.3	0.6	1.8
The Crossing Resort East Access	76.1	+/- 0.3	0.6	1.8
The Crossing Resort Exit	76.3	+/- 0.3	0.6	1.8
Rampart Creek Hostel Access	88.0	+/- 0.3	0.6	1.8
Rampart Creek Campground Access	88.5	+/- 0.3	0.6	1.8
Sunset Pass and Sunset Lookout Trailhead	92.5	+/- 0.3	0.6	1.8
Coleman Creek Picnic Site	98.9	+/- 0.3	0.6	1.8
Wilcox Creek Campground Access	112.7	+/- 0.3	0.6	1.8
Sunwapta Pass East Access	120.8	+/- 0.3	0.6	1.8
Sunwapta Pass West Access	120.9	+/- 0.3	0.6	1.8

* Location and length of each site is approximate (mapping-level) and may be subject to change based on site conditions such as existing and required lane configuration, topography and roadway/safety standards requirements.

** Area of disturbance includes an approximate 15m swath on either side of the existing pavement.

Total estimated footprint = 56.1 ha within the existing roadway corridor (not including existing pavement area).

Off-site Location(s): Construction staging and materials/stockpiling to come from Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or an off-site location as directed by the Departmental Representative. Off-site location for materials supply may be outside the National Parks.

Footprint size: Asphalt plant and aggregate stockpiles, estimated 5ha.





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Project phases and activities:

Site preparation/access activities:

Stripping and grubbing of existing surface in locations of roadway widening. Re-grading existing roadway embankments in preparation for road base materials placement.

Dimensions of structures, size of excavation, area of disturbance, fill requirements

Total approximately 56.1 ha area of disturbance along Hwy 93N from km 0 to km 121 (15 meters on either side of existing edge of pavement, not including existing pavement width). Where required for road structure repairs, existing roadway surface and shoulders will be excavated for placement and compaction of new road base materials. Where required for roadway widening, aggregates and road base materials will be placed and compacted on the stripped and grubbed existing roadway shoulders. Excavation may be required for drainage culvert replacement. Ditch re-grading may be required for drainage improvements.

Construction activities, methods, materials, equipment to be used

Excavators will be used to strip, grub and grade the existing roadway embankments in preparation for roadway widening. Culvert replacements will require trench excavation across the roadway, excavators and cranes will be used to lift/replace the culverts with CSP pipe. Dump trucks will haul road base materials from outside the Park or from Mannix, Niblock, Mosquito or David Thompson Pit to site on Hwy 93N- for placement, grading and compaction on the roadway embankments by excavators and vibration compaction equipment. Conventional paving for roadway surface restoration once road structure rehabilitation/construction is complete. Paving requires a paving machine, steel and rubber tired rollers (compactors) and dump trucks for hauling asphalt. Construction wastes (excavated road base, asphalt and stripping/grubbing wastes) will be hauled off-site by dump trucks.

Associated project work (e.g. paving, vegetation removal, excavation, etc.)

Excavation, stripping/grubbing, grading, placement and compaction of road base materials, paving.

Changes to utilities, capacity or demand, new lines (i.e. water, electric, natural gas, wastewater)

None.

Toxic or hazardous materials (e.g. cast in place concrete, chemicals, fuels, paints, solvents, explosives)

Asphalt Cement in asphaltic concrete, fuel and oil for construction equipment and vehicles. Non-toxic water based traffic paint.

Operational requirements: (materials, maintenance procedures, monitoring, waste & wastewater management requirements)

On-going monitoring and maintenance of the roadway by Parks Canada.

Site modifications, structure removals, site reclamation activities

Increase roadway width as required to meet current roadway safety standards.

Plans & drawings attached.

See attached Sketch Plan and Typical Section for discussion purposes only.





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Project Environment

Other facilities that may be affected:

None of which we are aware.

Site history (previous use, contamination, buried tanks, lines, cables):

A line and utility locate will be conducted prior to the commencement of construction to ensure that there are no buried utility lines within the project area. We have no reason to suspect contamination exists along the project corridor (km0 through km121) stretch. If any contaminated sites are brought to our attention by LLYK staff, the BIA will include mitigations to avoid or limit interaction with those sites.

Known cultural resources (e.g. buildings, engineering works, landscapes and landscape features, historical and archaeological objects):

A screening of the proposed project area against an available database of cultural resource sites was conducted. In some locations there are several archaeological sites or cultural areas identified at close proximity to the project. Reasonable care will be taken to conserve the heritage value of any of these historical sites. As much as possible, no historical structure will be removed, replaced or its character-defining elements substantially altered. The project will be referred to National Office Cultural Resource Management staff to conduct an Archeological Overview Assessment or similar analysis, and recommendations from that will be included in the BIA.

Distance to nearest water body, water crossings, shoreline work:

In some locations several rivers (North Saskatchewan river, Mistaya river and Bow river) and lakes (Waterfowl lakes, Mistaya lake and Bow lake) are in close proximity to the proposed project. Appropriate measures will be taken to ensure minimal impacts on these water bodies. Mitigation measures will include proper erosion and sediment control measures, and shoreline re-vegetation and stabilization if necessary.

Impacts to fish habitat:

The proposed project area contains about 3 areas that are fish bearing habitats, 4 areas that are good fish habitat but uncertain if those areas bear fish, 10 potential fish habitats with no fish and 26 aquatically sensitive areas though not fish habitats. All these areas will be assessed and appropriate mitigation measures taken to avoid adverse effects on fish and fish habitat. Fish passage will be maintained or improved where applicable. Use of explosives in or near water will be avoided. If fish relocation will be imminent, a qualified professional will be retained to ensure applicable permits for relocating fish are obtained and proper fish handling procedures are followed. We will examine any culverts on fish-bearing streams that might need to be replaced, to consider potential impacts to fisheries and incorporate that assessment into planning for culvert replacement. Approvals will be sought from Fisheries and Oceans Canada as appropriate.

Species at risk, critical habitat, and residence of individuals (if any):

A screening of proposed project area against available database of Federally protected species at risk and Provincial rare species or ecological communities identified federally protected Species At Risk at approximately km101.2 km107.2, km111.2, km112.2, km112.8, km113.4, km113.5, km113.7 and Provincial rare plant species/ ecological community between km91 and km94 and approximately at km40.4. A ground truthing survey will be conducted and exact location of the rare plant marked out to ensure minimal impact on its habitat. The entire Hwy 93N corridor falls within mapped Critical Habitat for woodland caribou of the Southern Mountain population. Any activities with the potential to affect SARA-listed species or CH will be compliant with SARA requirements.





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Site photos or map attached:

Project sites are shown on the attached map.

Red flags/ issues:

No significant red flags were identified.

Project timing:

Environmental Impact Analysis will be conducted in the winter/spring of 2016. Construction will begin in spring/summer 2016 and construction will be complete by fall 2016 (pending weather/seasonal considerations and contractor's schedule).

Tender and construction will proceed each fiscal year until program completion in 2019/20 given available funding.

Additional details (as required):

Potential for project to affect use of lands or resources by aboriginal persons (as relevant):

None.

Other jurisdictions or departments involved in project development, review & approval (as relevant):

None.





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Project Phases and Activities Table

	Phases	Examples of Associated Activities	Y / N	Details
Project Components	Construction / Site Preparation	Supply and storage of materials	Y	Construction staging and materials/stockpiling in Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or as directed by the Departmental Representative. Construction material supply may come from outside the National Parks, pending availability within the Parks.
		Burning	N	
		Clearing	N	
		Demolition	N	
		Disposal of waste	Y	Construction waste will be hauled to Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or removed from the National Parks as directed by the Departmental Representative.
		Blasting/ Drilling	N	
		Dredging	N	
		Drainage	Y	Roadway ditch re-grading and culvert replacement as directed by the Departmental Representative.
		Excavation	Y	Roadway embankments and road structure excavation for rehabilitation.
		Grading	Y	Roadway embankments for preparation for roadway widening.
		Backfilling	Y	Backfilling for culvert and road structure repair excavations.
		Use of machinery	Y	Typical road construction equipment. Excavators, dump trucks, cranes, roller and vibration compaction equipment, paving machine, vehicles.
		Transport of materials/ equipment	Y	Transport of construction materials to site (aggregates, asphalt, construction equipment) and removal of construction wastes.
		Building of fire breaks	N	
		Use of Chemicals	Y	Asphalt cement in asphalt concrete pavement, fuel and oil for construction equipment and vehicles, non-toxic traffic paint.
		Set up of temporary facilities	Y	Asphalt plant (if supplied from within the Park) and construction management facilities (trailer) in Mannix Pit, Niblock Pit, Mosquito Pit or David Thompson Pit or as directed by the Departmental Representative.
		Traffic control	Y	Traffic controllers and signs will be present on the roadway during construction activities.
		Other...		
	Operation/Implementation Decommissioning	Waste disposal	N	
		Wastewater disposal	N	
		Maintenance	Y	On-going monitoring and maintenance of the roadway by Parks Canada.
		Use	Y	General public, visitors and commercial vehicles.
		Use/Removal of temp. fac.	N	
		Use of Chemicals	N	
		Active fire stage	N	
		Clean-up of prescribed burn	N	
		Planting	N	
		Culling	N	
		Vehicle Traffic	Y	General public, visitors and commercial vehicles.
		Other...		





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Project Title: Highway 93 South Roadway Rehabilitation, km 10 to km 103

Project Contact(s):

Proponent: Parks Canada Agency	Zachary Boles (Project Manager)	Phone: (403) 760-1355 Email: zachary.boles@pc.gc.ca
Consultant: McElhanney Consulting Services Ltd.	Selina Fong (Project Manager)	Phone: (604) 424 4849 Email: sfong@mcelhanney.com
	Jim Tait (Construction Manager)	Phone: (604) 424 4939 Email: jtait@mcelhanney.com
Contractor:	TBD	

Date of Request: December 01 2015

Proposed Project Start: Spring/Summer 2016

PROJECT DESCRIPTION

Project objective:

Roadway widening, pavement structure and surface rehabilitation and roadway drainage improvements on Highway 93 South. Areas with deficient shoulder widths will be widened approximately 2-3 meters. The objective of this project is to improve roadway safety (at locations with high traffic volumes and/or high instances of vehicle collisions), reliability (slope rehabilitation) and to bring the road to meet current Canadian roadway design and construction standards.

Project rationale:

Addressing high-accident locations and deficient intersections (improve safety), potentially unstable rock slopes (improve reliability) and narrow shoulders (update roadway standards) will assist in ensuring safe and reliable road infrastructure for visitors and the general motoring public. Highway 93S is a key transportation route and helps attract 5 million visitors to the Mountain Parks each year. Deficiencies to be identified, analyzed and addressed include but are not limited to: road surface deterioration; insufficient shoulder width; sub-standard intersection laning; drainage issues effecting the stability of the road structure; rock and soil slope instabilities; retaining wall instability or deficiencies; insufficient sight distance and clear zones; and highway signing.

Project location:

Primary Location: Highway 93 South in Kootenay National Park, km 10 to km 103 (km 0 at the Castle TCH Interchange, increasing towards Radium). Locations for rehabilitation work will be selected based on approved funding, scheduling and environmental considerations.

Footprint size: Within previously disturbed areas (roadway surface, shoulders, ditches and embankments). Project footprint will include areas for maneuvering construction equipment, approximately 15 meter width off the edge of pavement. Locations and footprints for rehabilitation work may include the following:





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Location	From (km)	To (km)	Length (km)*	Est. Footprint (ha)**
NB / SB Climbing and Passing Lanes	10.0	16.6	6.6	19.8
Continental Divide / Vermilion Pass	10.0	+/- 0.3	0.6	1.8
Marble Canyon Campground / Trailhead	17.0	+/- 0.3	0.6	1.8
Paint Pots Trailhead	19.7	+/- 0.3	0.6	1.8
Numa Falls Day-Use Area Access	24.2	+/- 0.3	0.6	1.8
Floe Lake / Hawk Creek Access	32.5	+/- 0.3	0.6	1.8
Kootenay Park Lodge Access	40.7	+/- 0.3	0.6	1.8
Vermillion Crossing	40.8	+/- 0.3	0.6	1.8
Simpson River Day-Use Area Access	46.4	+/- 0.3	0.6	1.8
NB / SB Climbing Lanes	55.9	60.2	4.3	12.9
Kootenay Crossing (PCA Facility) Access	60.7	+/- 0.3	0.6	1.8
Dolly Varden Picnic Area Access	67.8	+/- 0.3	0.6	1.8
McLeod Meadows Campground Access	76.4	+/- 0.3	0.6	1.8
Kootenay River Picnic Site Access	80.3	+/- 0.3	0.6	1.8
Settler's Road Access	84.2	+/- 0.3	0.6	1.8
Olive Lake Picnic Area Access	91.1	+/- 0.3	0.6	1.8
Operations Centre and McKay Pit Access	99.0	+/- 0.3	0.6	1.8
Radium Hot Springs Overflow Parking	100.7	+/- 0.3	0.6	1.8
Radium Hot Springs Parking / Access	101.3	+/- 0.3	0.6	1.8

* Location and length of each site is approximate (mapping-level) and may be subject to change based on site conditions such as existing and required lane configuration, topography and roadway/safety standards requirements.

** Area of disturbance includes an approximate 15m swath on either side of the existing pavement.

Total estimated footprint = 63.3 ha within the existing roadway corridor (not including existing pavement area).

Off-site Location(s): Construction staging and materials/stockpiling to come from Mannix Pit, Settlers Pit, Hector Pit or an off-site location as directed by the Departmental Representative. Off-site location for materials supply may be outside the National Parks.

Footprint size: Asphalt plant and aggregate stockpiles, estimated 5ha.

Project phases and activities:

Site preparation/access activities:

Stripping and grubbing of existing surface in locations of roadway widening. Re-grading existing roadway embankments in preparation for road base materials placement.

Dimensions of structures, size of excavation, area of disturbance, fill requirements

Total approximate 63.3 ha area of disturbance along Hwy 93S from km 10 to km 103 (15 meters on either side of existing edge of pavement, not including existing pavement width). Where required for road structure repairs, existing roadway surface and shoulders will be excavated for placement and compaction of new road base materials. Where required for roadway widening, aggregates and road base materials will be placed and compacted on the stripped and grubbed existing roadway shoulders. Excavation may be required for drainage culvert replacement. Ditch re-grading may be required for drainage improvements.





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Construction activities, methods, materials, equipment to be used

Excavators will be used to strip, grub and grade the existing roadway embankments in preparation for roadway widening. Culvert replacements will require trench excavation across the roadway, excavators and cranes will be used to lift/replace the culverts with CSP pipe. Dump trucks will haul road base materials from outside the Park or from Mannix, Settler's or Hector Pit to site on Hwy 93S for placement, grading and compaction on the roadway embankments by excavators and vibration compaction equipment. Conventional paving for roadway surface restoration once road structure rehabilitation/construction is complete. Paving requires a paving machine, steel and rubber tired rollers (compactors) and dump trucks for hauling asphalt. Construction wastes (excavated road base, asphalt and stripping/grubbing wastes) will be hauled off-site by dump trucks.

Associated project work (e.g. paving, vegetation removal, excavation, etc.)

Excavation, stripping/grubbing, grading, placement and compaction of road base materials, paving.

Changes to utilities, capacity or demand, new lines (i.e. water, electric, natural gas, wastewater)

None.

Toxic or hazardous materials (e.g. cast in place concrete, chemicals, fuels, paints, solvents, explosives)

Asphalt Cement in asphaltic concrete, fuel and oil for construction equipment and vehicles. Non-toxic water based traffic paint.

Operational requirements: (materials, maintenance procedures, monitoring, waste & wastewater management requirements)

On-going monitoring and maintenance of the roadway by Parks Canada.

Site modifications, structure removals, site reclamation activities

Increase roadway width as required to meet current roadway safety standards.

Plans & drawings attached.

See attached Sketch Plan and Typical Section for discussion purposes only.

Project Environment:

Other facilities that may be affected:

None of which we are aware.

Site history (previous use, contamination, buried tanks, lines, cables):

A line and utility locate will be conducted prior to the commencement of construction to ensure that there are no buried utility lines within the project area. We have no reason to suspect contamination exists along the 10-103 km stretch. However ground truthing will be conducted.

Known cultural resources (e.g. buildings, engineering works, landscapes and landscape features, historical and archaeological objects):

A screening of proposed project area against an available database of cultural resource sites was conducted. There are several archaeological sites or cultural areas identified at close proximity to the project in some locations. Reasonable care will be taken to conserve the heritage value of any of these historical sites. As much as possible, no historical structure will be removed, replaced or its character-defining elements substantially altered.





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Distance to nearest water body, water crossings, shoreline work:

Kootenay river runs at close proximity to the proposed project area in some locations. Appropriate measures will be taken to ensure minimal impacts on the watercourse. Mitigation measures will include proper erosion and sediment control measures, and shoreline re-vegetation and stabilization if necessary.

Impacts to fish habitat:

The proposed project area contains about 13 areas with potential fish habitat. All these areas will be assessed and appropriate mitigation measures taken to avoid adverse effects on fish and fish habitat. Fish passage will be maintained or improved where applicable. Use of explosives in or near water will be avoided. If fish relocation will be imminent, a qualified professional will be retained to ensure applicable permits for relocating fish are obtained and proper fish handling procedures are followed. We will examine any culverts on fish-bearing streams that might need to be replaced, to consider potential impacts to fisheries and incorporate that assessment into planning for culvert replacement.

Species at risk, critical habitat, and residence of individuals (if any):

A screening of proposed project area against available database of Federally protected species at risk and Provincial rare species or ecological communities identified a rare plant species at km101. A ground truthing survey will be conducted and exact location of the rare plant marked out to ensure minimal impact on its habitat.

Site photos or map attached:

See attached site location sketch.

Red flags/ issues:

No significant red flags were identified.

Project timing:

Environmental Impact Analysis will be conducted in the winter/spring of 2016. Construction will begin in spring/summer 2016 and construction will be complete by fall 2016 (pending weather/seasonal considerations and contractor's schedule).

Tender and construction will proceed each fiscal year until program completion in 2019/20 given available funding.

Additional details (as required):

Potential for project to affect use of lands or resources by aboriginal persons (as relevant):

None.

Other jurisdictions or departments involved in project development, review & approval (as relevant):

None.





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Project Phases and Activities Table				
	Phases	Examples of Associated Activities	Y / N	Details
Project Components	Construction / Site Preparation	Supply and storage of materials	Y	Construction staging and materials/stockpiling in Mannix, Settler's or Hector Pit or as directed by the Departmental Representative. Construction material supply may come from outside the National Parks, pending availability within the Parks.
		Burning	N	
		Clearing	N	
		Demolition	N	
		Disposal of waste	Y	Construction waste will be hauled to Mannix, Settler's or Hector Pit or removed from the National Parks as directed by the Departmental Representative.
		Blasting/ Drilling	N	
		Dredging	N	
		Drainage	Y	Roadway ditch re-grading and culvert replacement as directed by the Departmental Representative.
		Excavation	Y	Roadway embankments and road structure excavation for rehabilitation.
		Grading	Y	Roadway embankments for preparation for roadway widening.
		Backfilling	Y	Backfilling for culvert and road structure repair excavations.
		Use of machinery	Y	Typical road construction equipment. Excavators, dump trucks, cranes, roller and vibration compaction equipment, paving machine, vehicles.
		Transport of materials/ equipment	Y	Transport of construction materials to site (aggregates, asphalt, construction equipment) and removal of construction wastes.
		Building of fire breaks	N	
		Use of Chemicals	Y	Asphalt cement in asphalt concrete pavement, fuel and oil for construction equipment and vehicles, non-toxic traffic paint.
		Set up of temporary facilities	Y	Asphalt plant (if supplied from within the Park) and construction management facilities (trailer) in Mannix, Settler's or Hector Pit or as directed by the Departmental Representative.
		Traffic control	Y	Traffic controllers and signs will be present on the roadway during construction activities.
		Other...		
	Operation/Implementation Decommissioning	Waste disposal	N	
		Wastewater disposal	N	
		Maintenance	Y	On-going monitoring and maintenance of the roadway by Parks Canada.
		Use	Y	General public, visitors and commercial vehicles.
		Use/Removal of temp. facil.	N	
		Use of Chemicals	N	
		Active fire stage	N	
		Clean-up of prescribed burn	N	
		Planting	N	
		Culling	N	
		Vehicle Traffic	Y	General public, visitors and commercial vehicles.
		Other...		





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Appendix 2 Environmental Impact Analysis Tools: Effects Identification Matrix

Section A focuses on direct effects of the project and **Section B** on indirect effects that are caused by changes to the environment.

▪ Direct Effects									
			Valued components potentially directly affected by the proposed project						
			Natural Resources					Cultural Resources	
			Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Historical Resources	Visitor Experience
Phase	Examples of Associated Activities								
Project Components	Preparation & Construction – Highway 93 North	Supply and storage of materials	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Clearing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Disposal of waste	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Drainage	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Excavation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		Grading	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Backfilling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Use of machinery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		Transport of materials/ equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Use of Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Set up of temporary facilities	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





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➤ Direct effects continued									
			Valued components potentially directly affected by the proposed project						
			Natural Resources					Cultural Resources	
			Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Historical Resources	Visitor Experience
	Phase	Examples of Associated Activities							
Project Components	Preparation & Construction – Highway 93 South	Supply and storage of materials	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Clearing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Disposal of waste	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Drainage	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Excavation	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		Grading	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Backfilling	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Use of machinery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
		Transport of materials/ equipment	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Use of Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
		Set up of temporary facilities	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project Components	Hwy 93N/S Operation & Maintenance	Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use/Removal of temporary facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Vehicle Traffic	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>





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Section B of the matrix should be used to identify potential indirect effects that may result from impacts of the project to components of the environment you have identified on the preceding pages (see Section A - direct effects to natural resources). Consideration of indirect effects is required under CEEA 2012 Sections 5(1)(c) and 5(2)(b), and by the PCA mandate. For example:

- o if the proposed project could lead to adverse effects to water quality and quantity, could this then effect the quantity and quality of water resources (e.g. potable water) used by an Aboriginal community?
- o could there also be adverse socio-economic effects to a community that relies on recreational fishing tourism?
- o could changes to the environment (e.g. digging, clearing) affect visitor access, opportunities, or safety?

B. Indirect Effects (all phases)							
		Impacts as a result of changes to the environment					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:		With respect to visitor experience		
		Health and socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & services	Recreation & accommod'n opportunities	Safety
Phase	Natural resource components affected by the project						
Preparation /construction operation/implementation/decommissioning	Could impacts to <u>air</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>soils</u> and <u>landforms</u> lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>flora</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

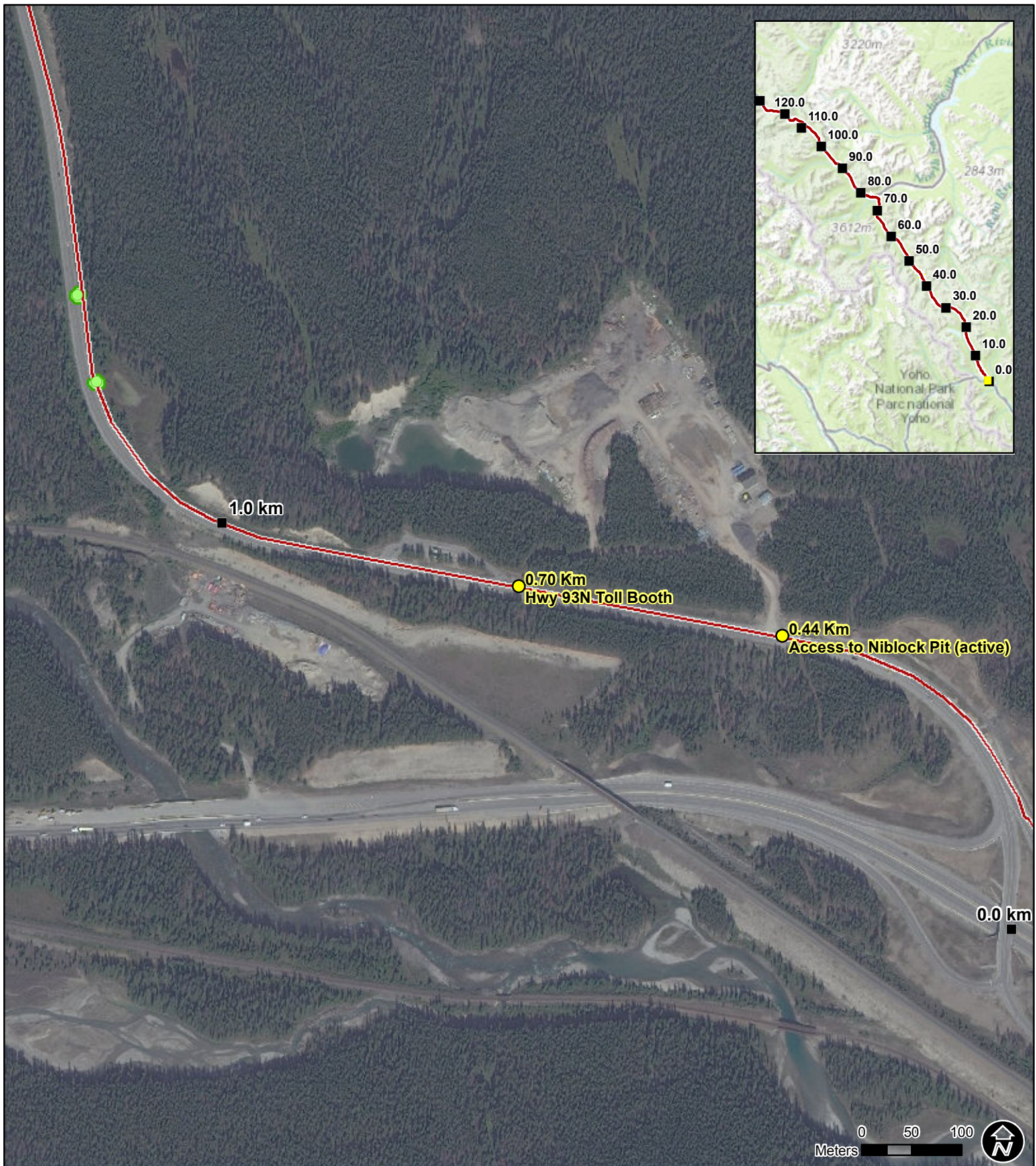




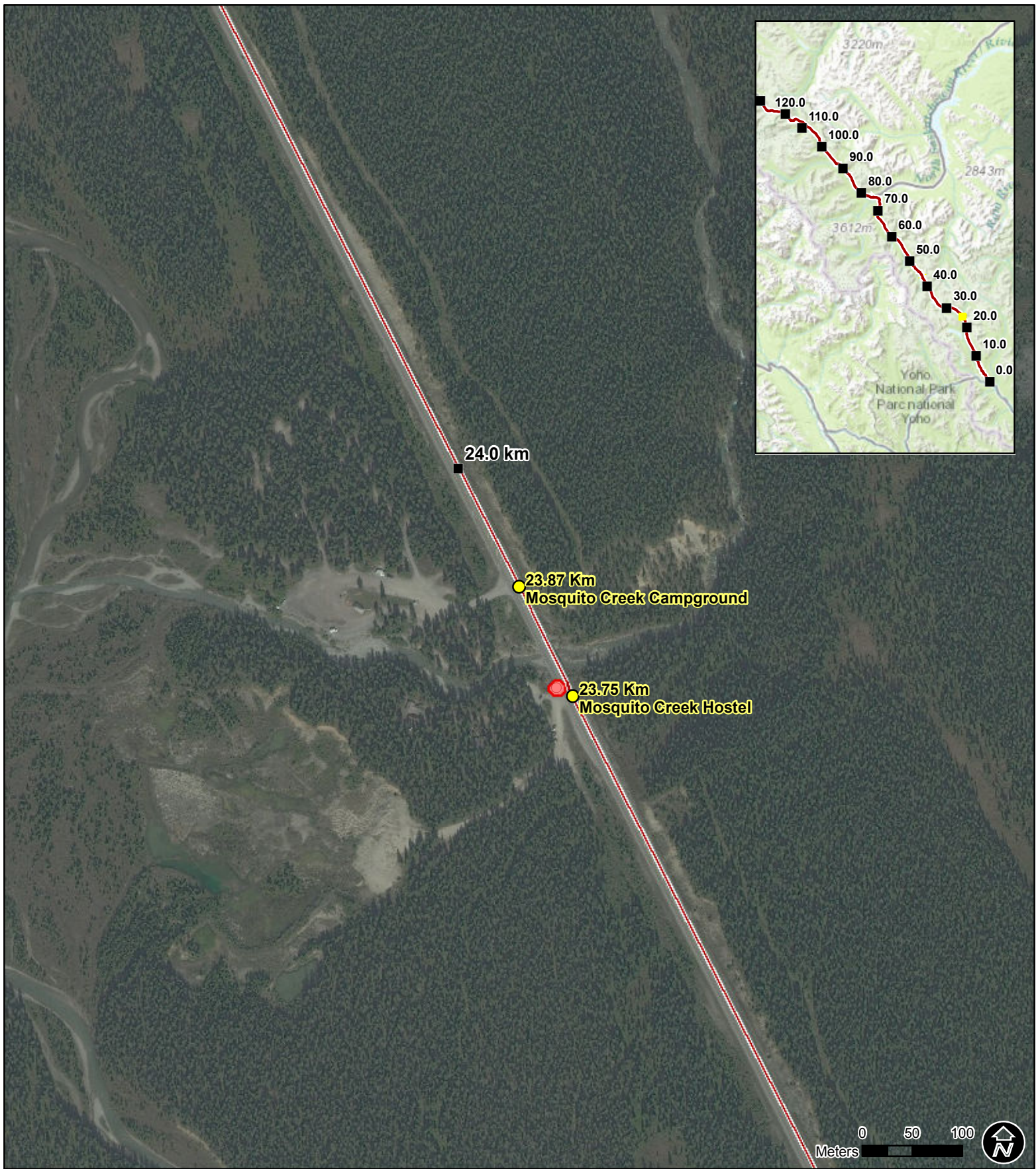
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Appendix 3 Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Locations





Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 1



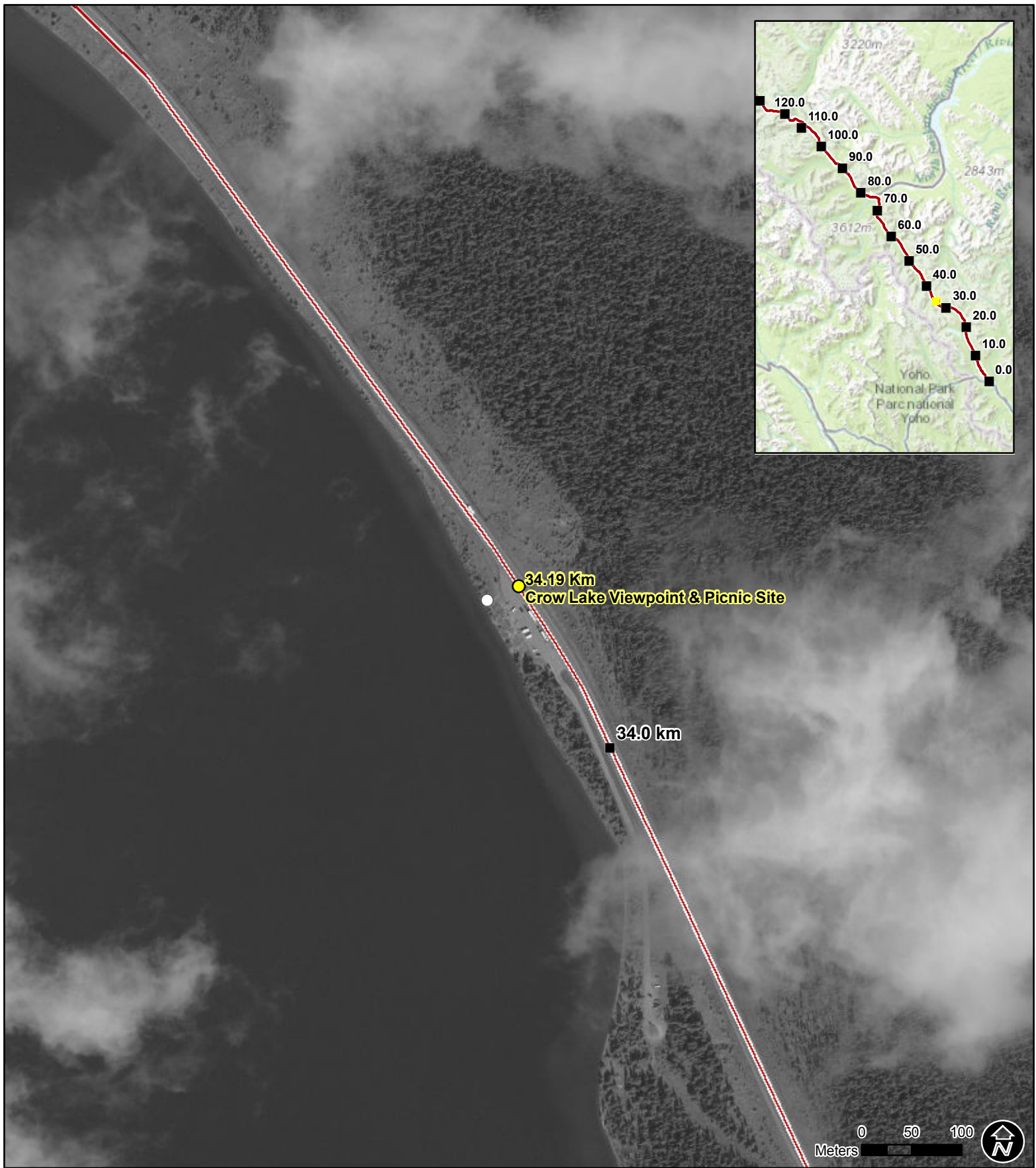
- | | |
|--|--|
| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|--|--|

Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 2



- Approximate Locations of Localized Highway Improvements
 - Approximate Locations of Uninterrupted Highway Improvements
 - Kilometer Marks
 - Highway 93N Alignment
 - Rare Plant Occurrence
- Watercourse Sensitivity Level
- 1 - High: Fish-bearing, good habitat
 - 2 - High: Good habitat, fish-bearing uncertain
 - 3 - Moderate: Not fish-bearing, connected to downstream habitats
 - 4 - Negligible: No habitat present
 - Not Assessed by TTEBA

Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 3



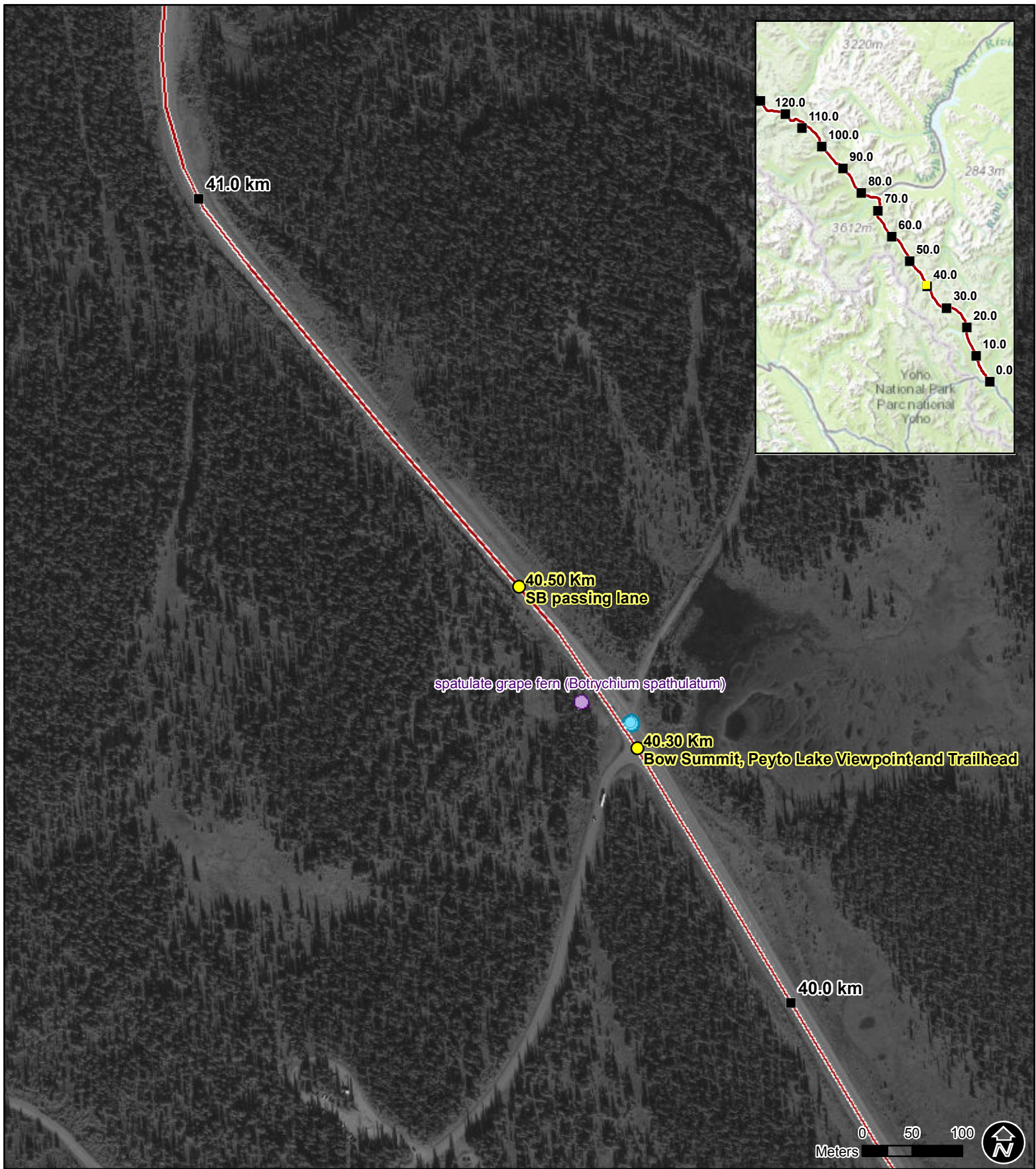
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|--|--|

Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 4



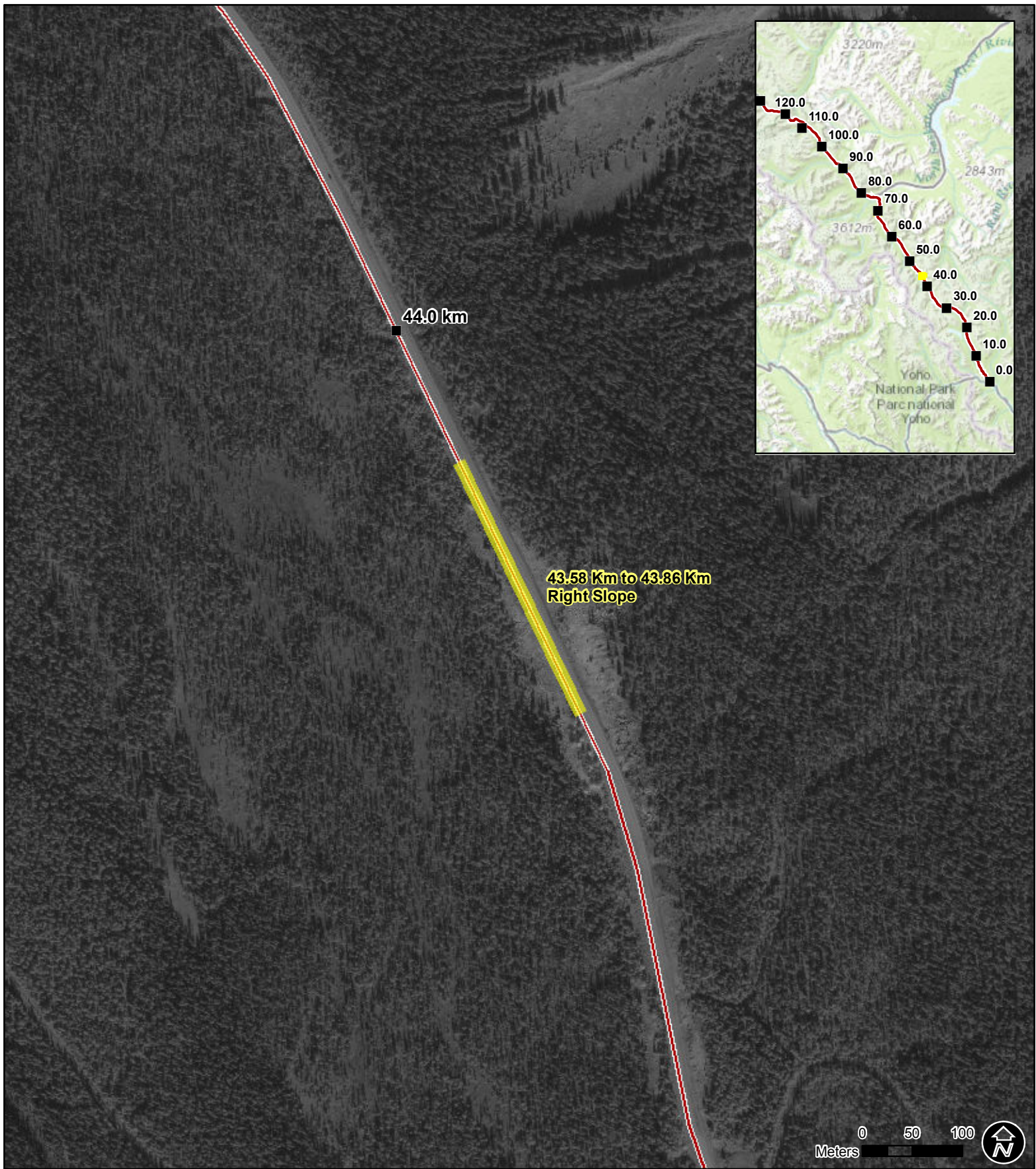
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|---|--|
| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|---|--|

Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 5



- | | |
|--|--|
| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|--|--|

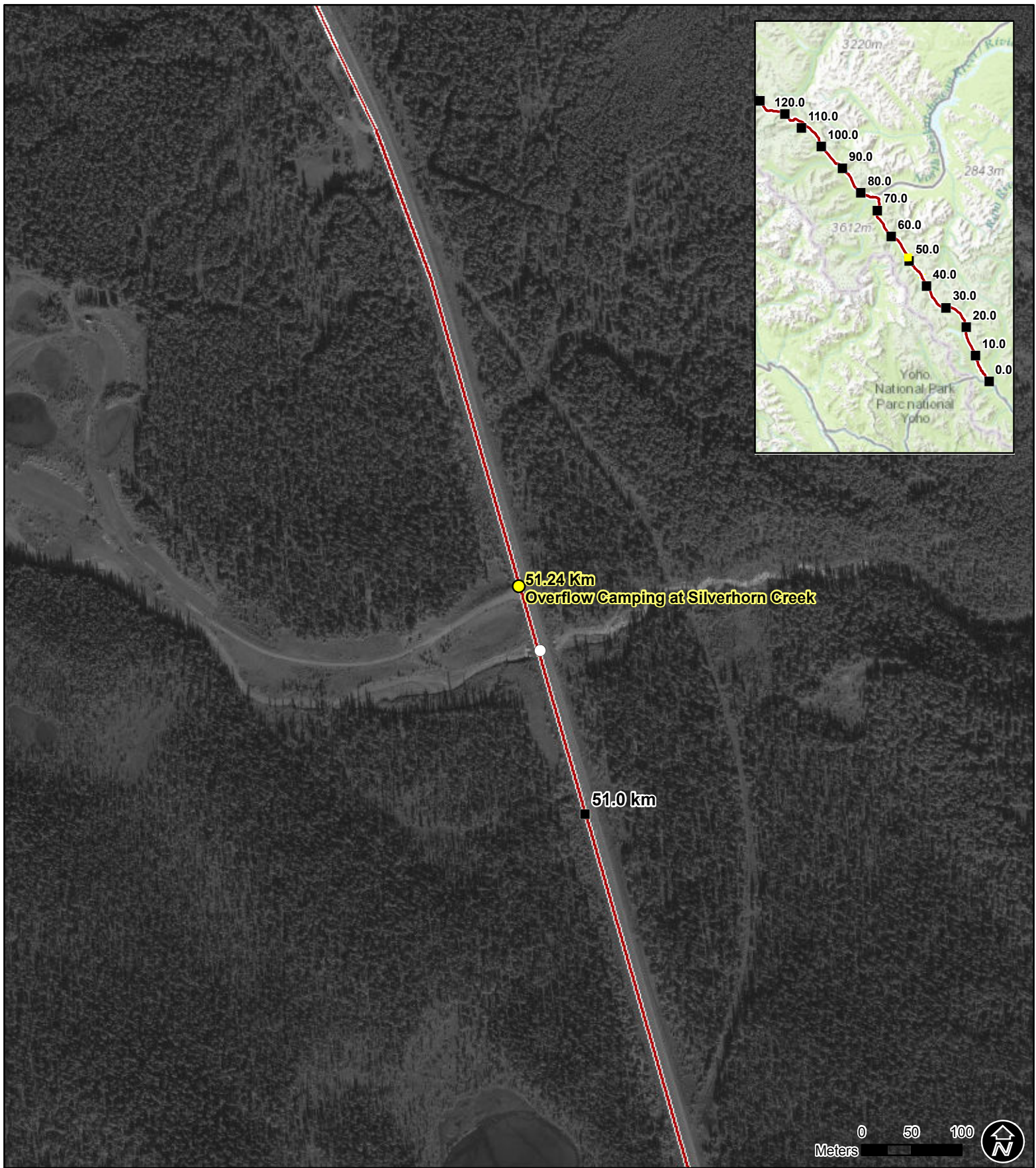
Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 6



- | | |
|--|--|
| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|--|--|

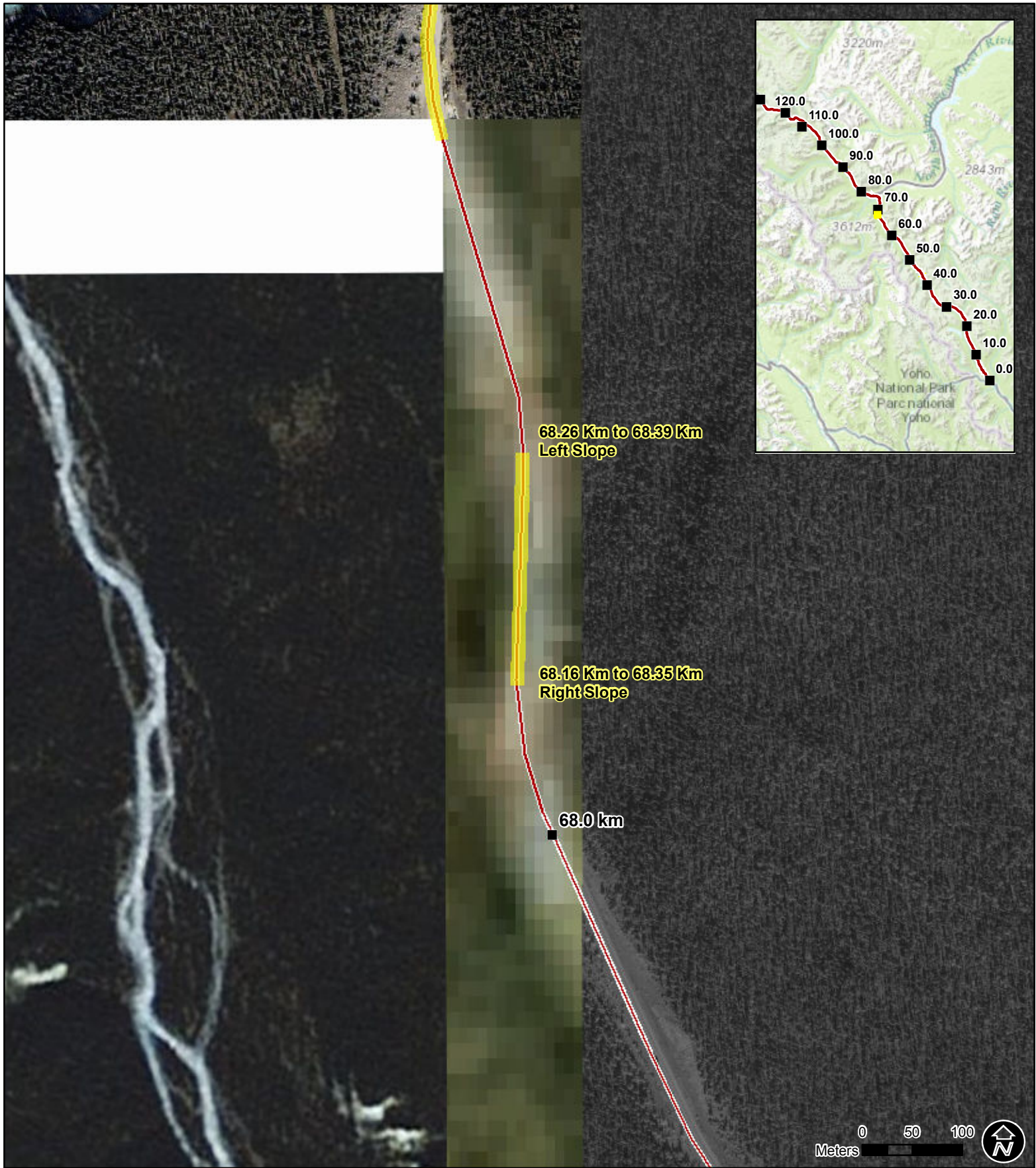


Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 7



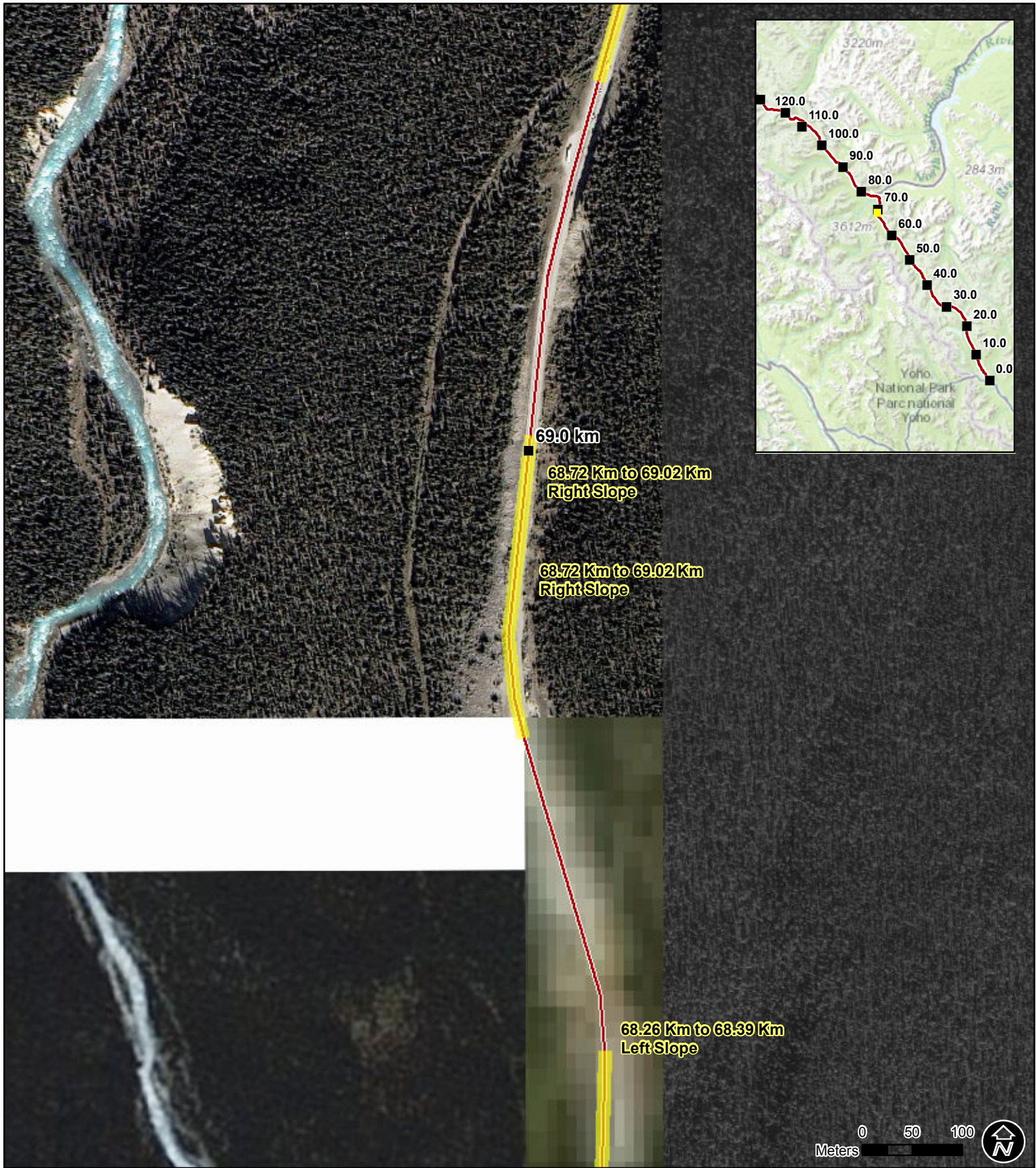
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 8



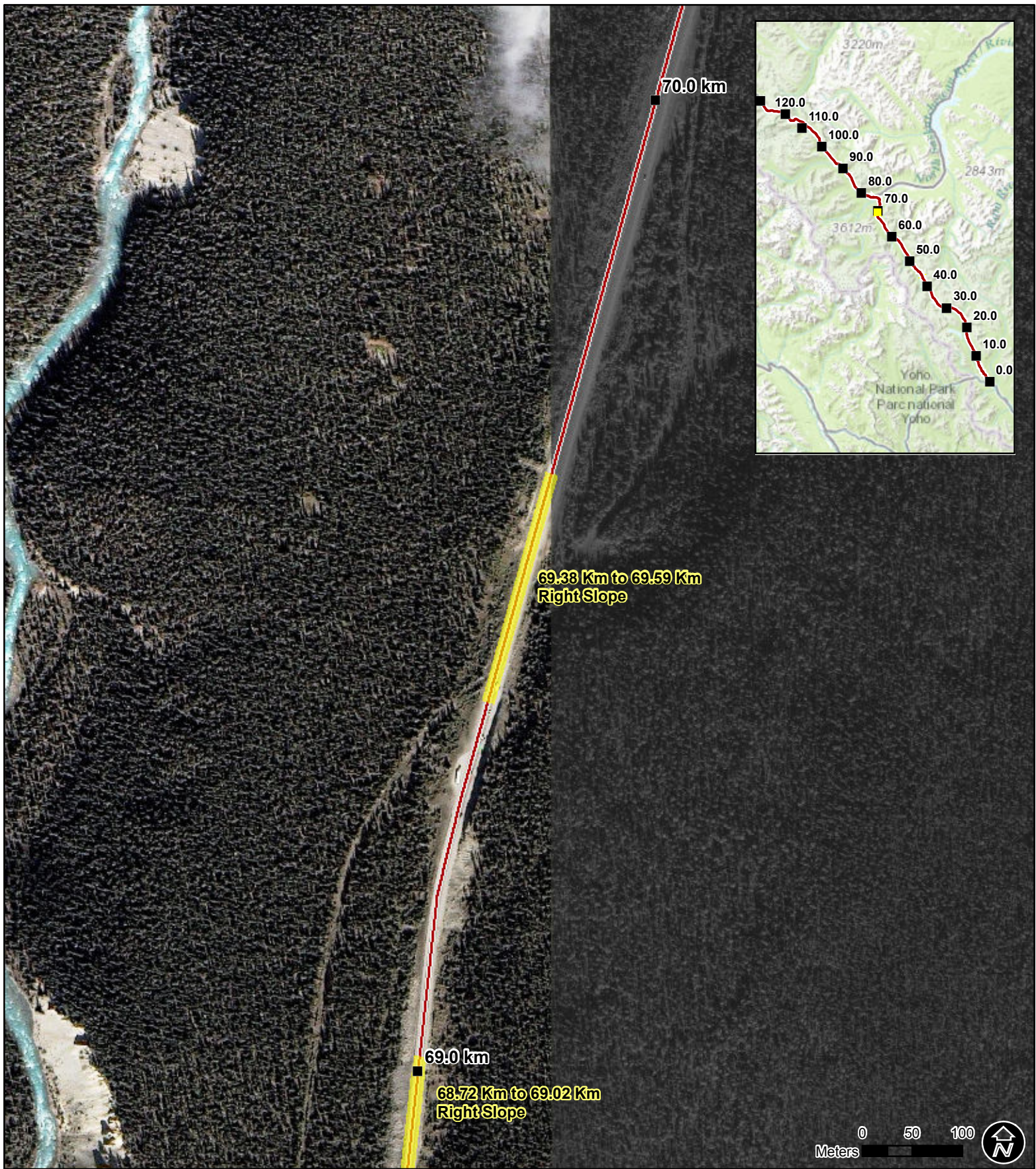
- Approximate Locations of Localized Highway Improvements
 - Approximate Locations of Uninterrupted Highway Improvements
 - Kilometer Marks
 - Highway 93N Alignment
 - Rare Plant Occurrence
- | Watercourse Sensitivity Level | |
|---------------------------------------|--|
| ● | 1 - High: Fish-bearing, good habitat |
| ● | 2 - High: Good habitat, fish-bearing uncertain |
| ● | 3 - Moderate: Not fish-bearing, connected to downstream habitats |
| ● | 4 - Negligible: No habitat present |
| ○ | Not Assessed by TTEBA |

Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 9



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 10



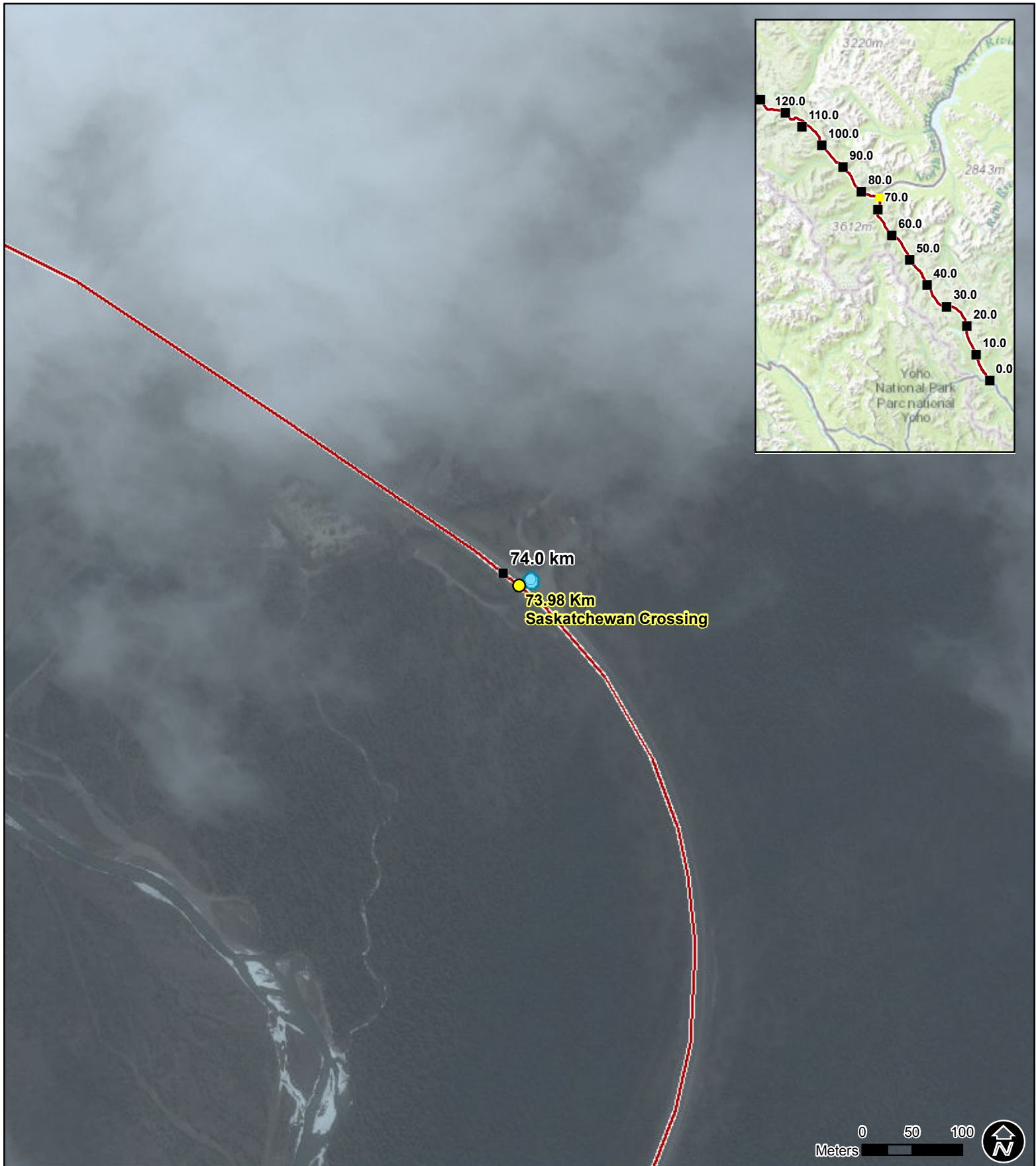
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 11



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 12



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 13





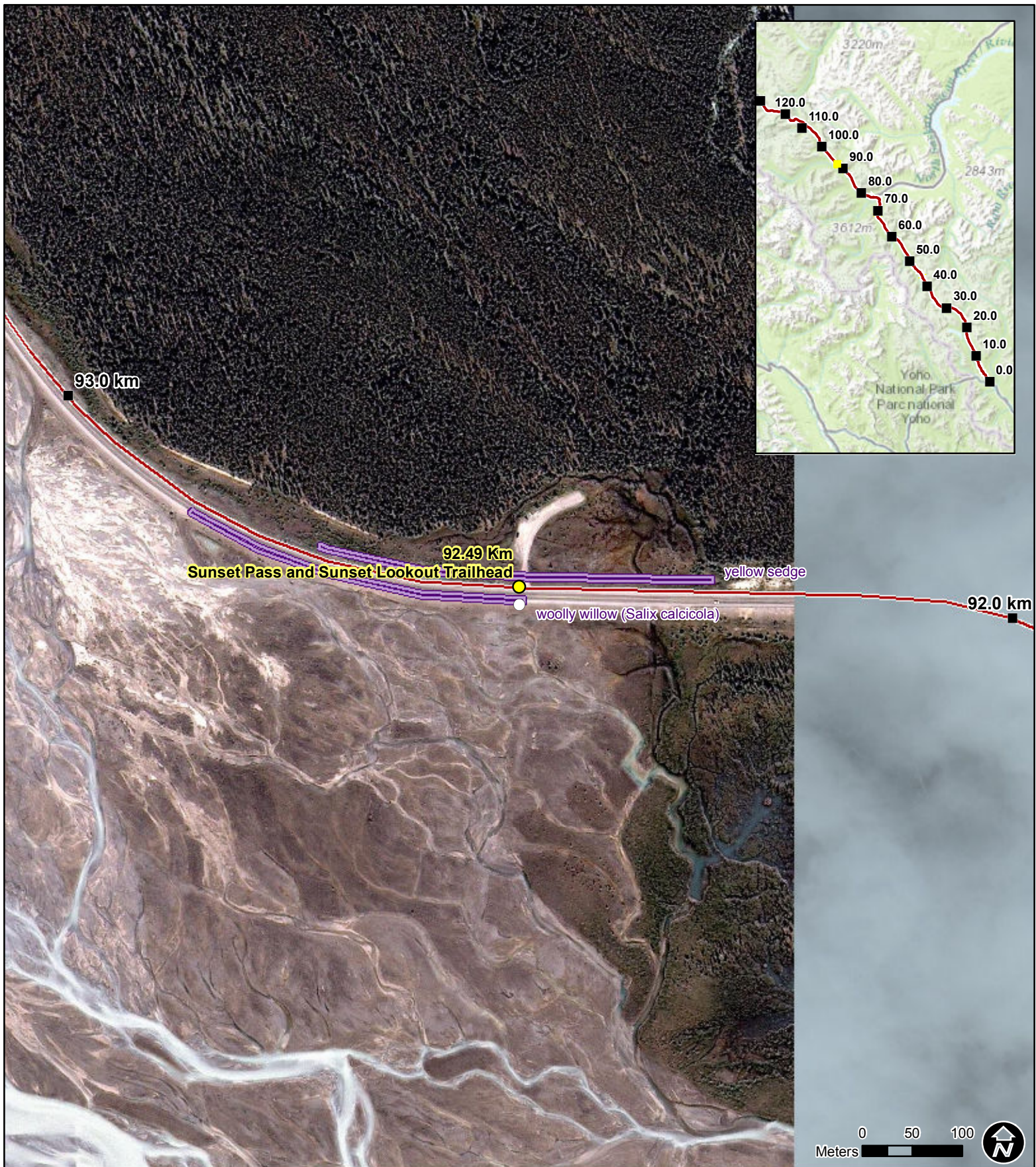
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 15



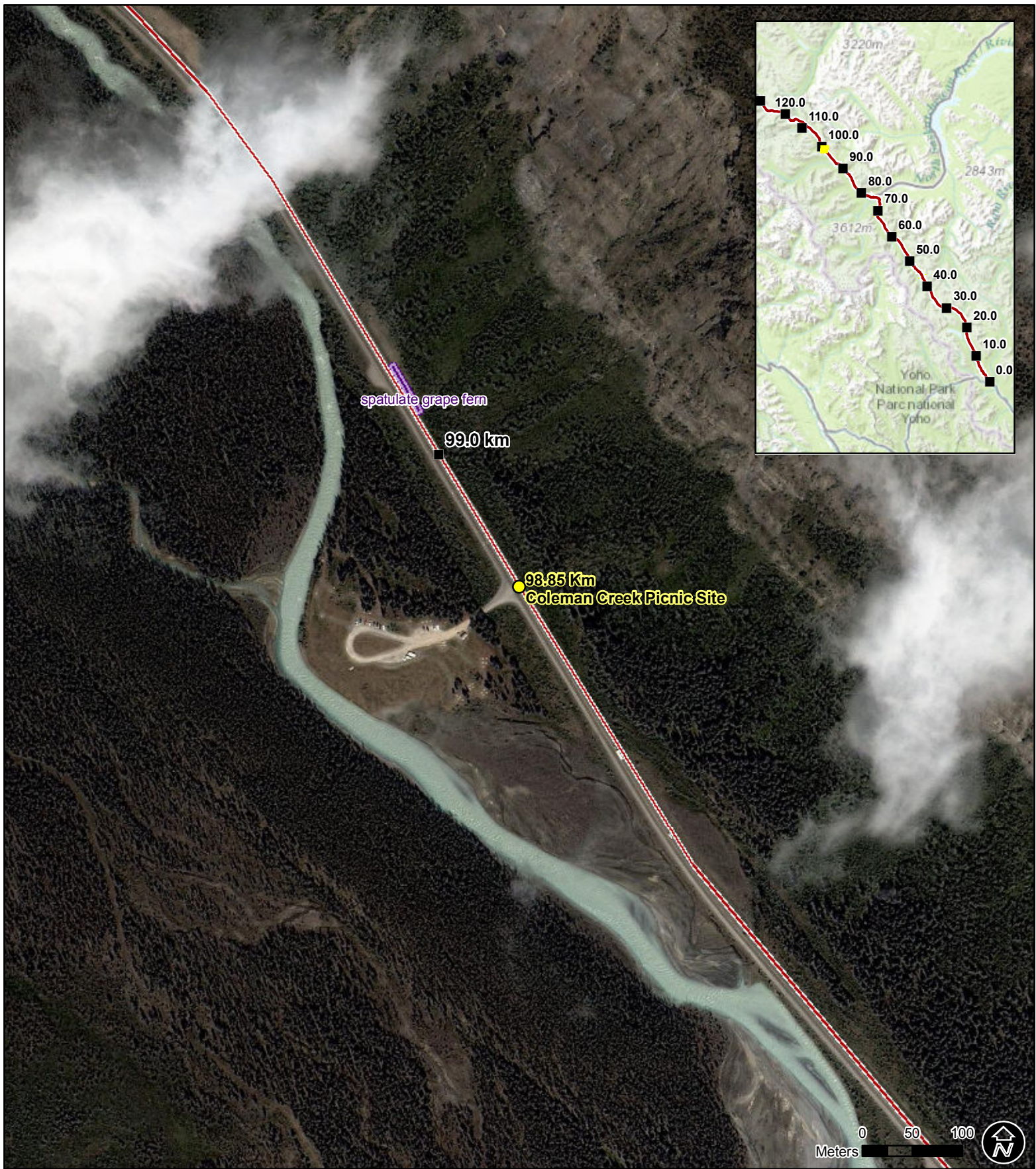
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 16



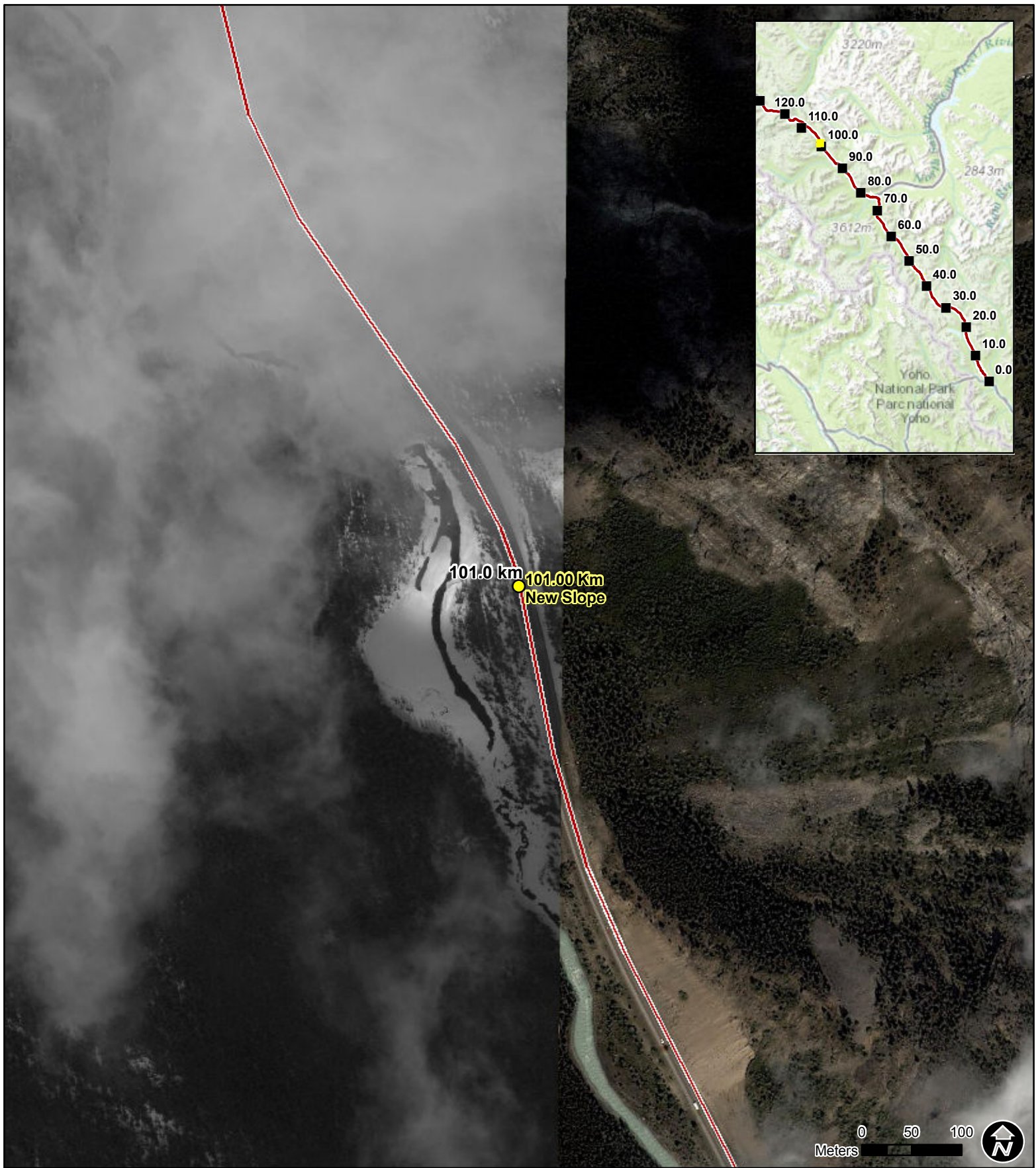
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment — Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 17



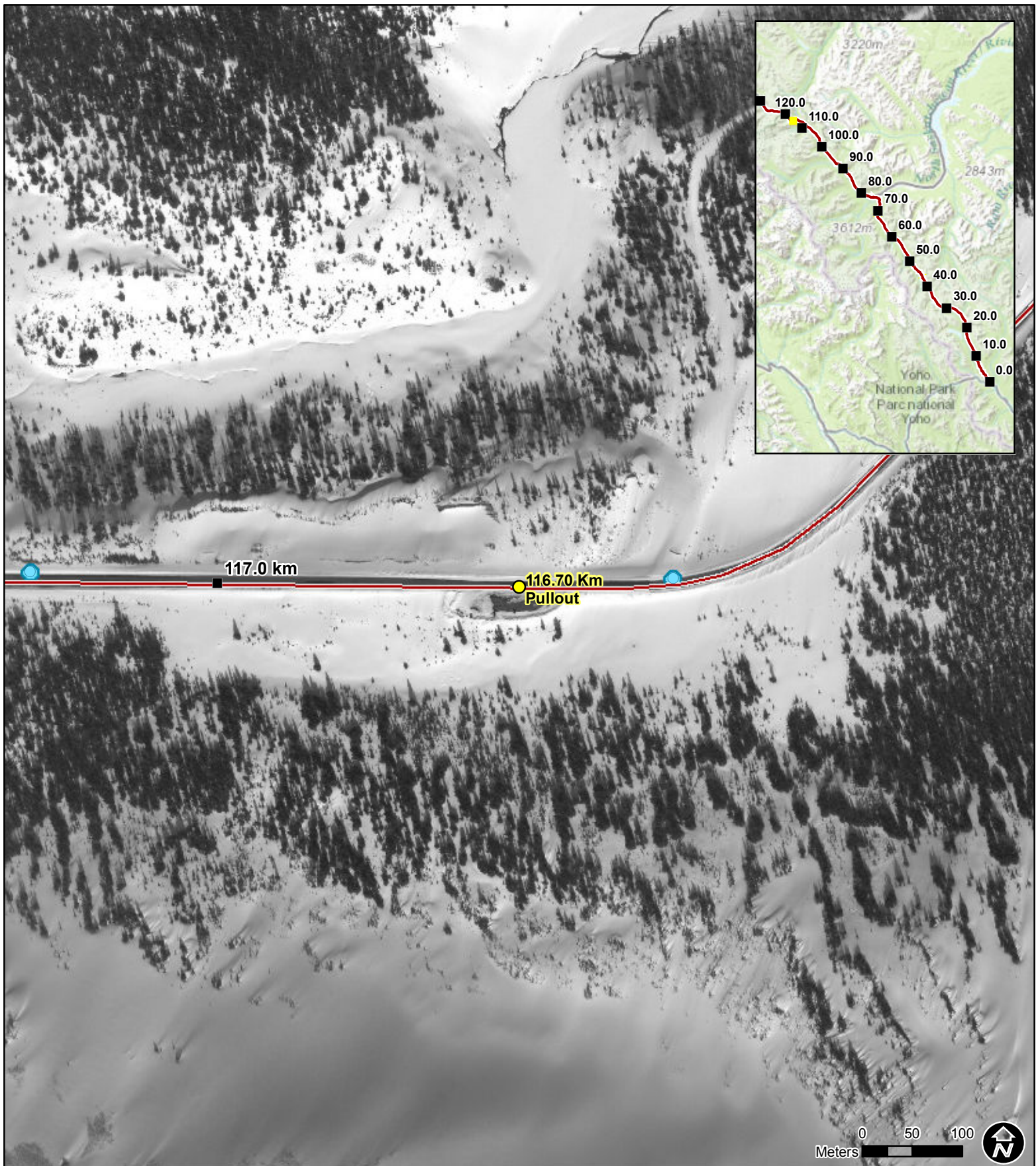
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment — Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 18



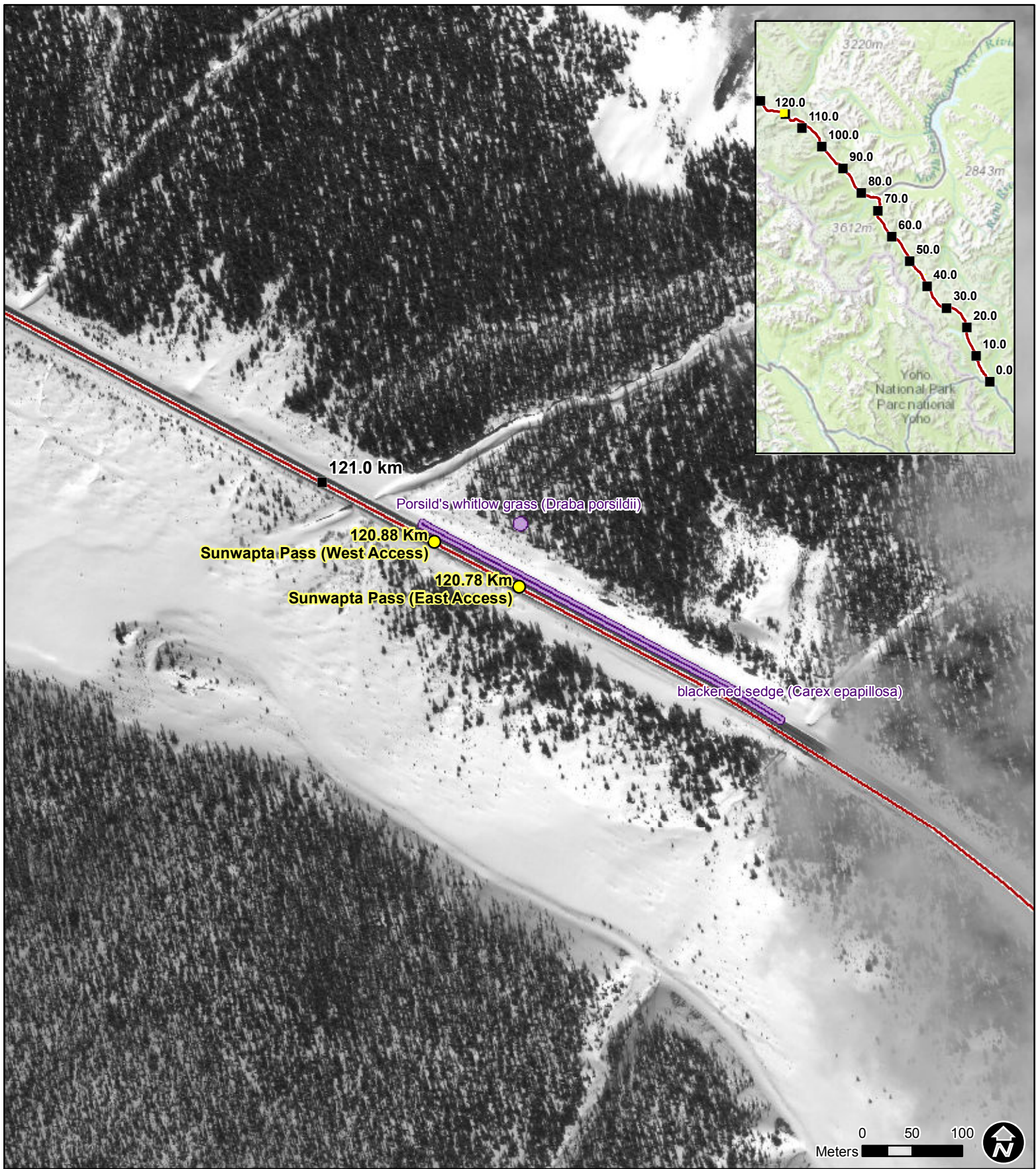
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Location
Map: 19



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Location Map: 20



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93N Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93N 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Location
 Map: 21



April 2016

Appendix 4 Hwy 93S 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Locations





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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements — Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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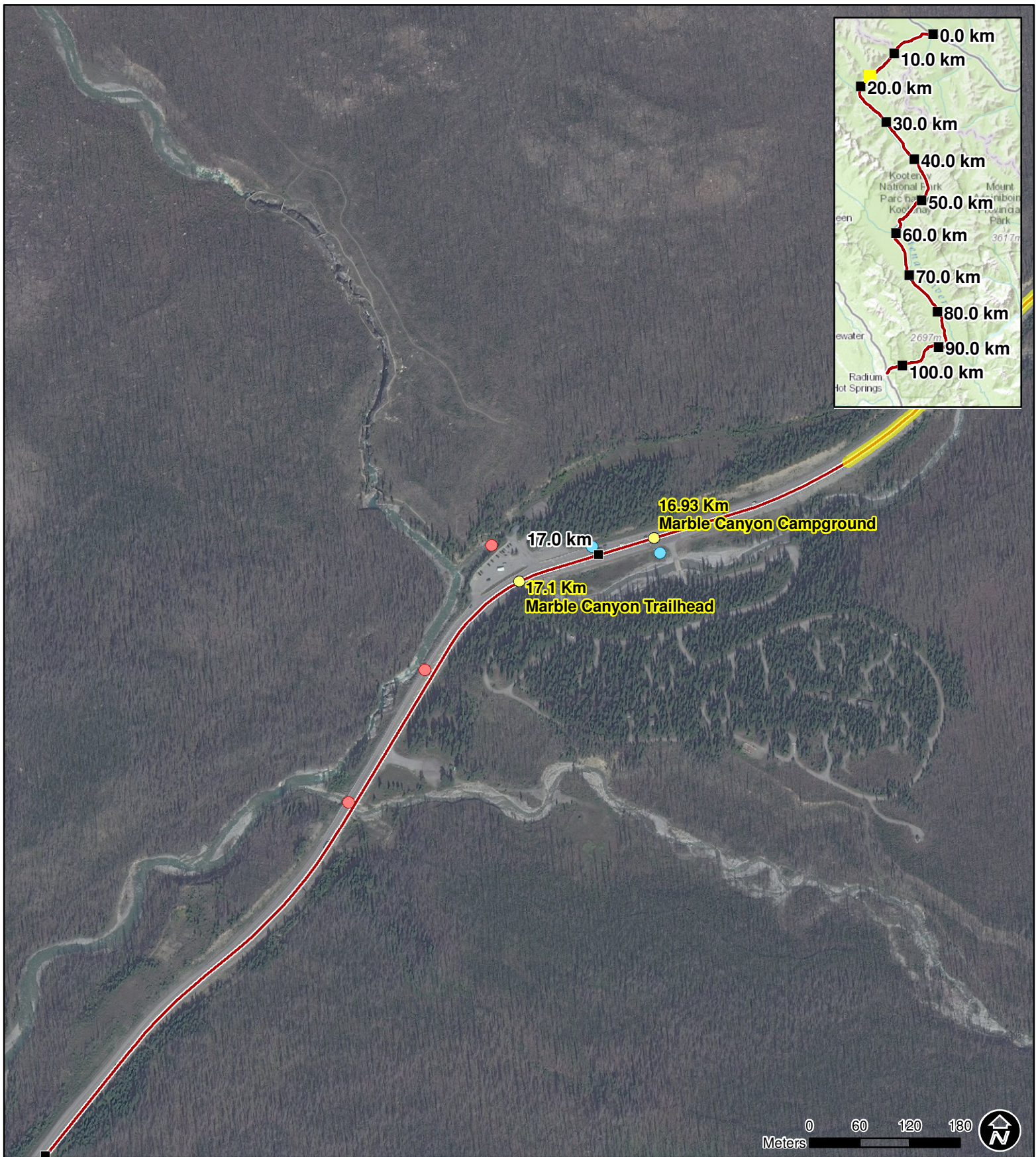
Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 1



- Approximate Locations of Localized Highway Improvements
- Approximate Locations of Uninterrupted Highway Improvements
- Kilometer Marks
- Highway 93S Alignment
- Rare Plant Occurrence

- Watercourse Sensitivity Level**
- 1 - High: Fish-bearing, good habitat
 - 2 - High: Good habitat, fish-bearing uncertain
 - 3 - Moderate: Not fish-bearing, connected to downstream habitats
 - 4 - Negligible: No habitat present
 - Not Assessed by TTEBA

Hwy 93S 2015 Tetra Tech EBA Aquatic Sensitivity and Rare Plant Survey Locations Map: 2



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 3



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 4



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 5



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 6



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 7



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 8



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 9



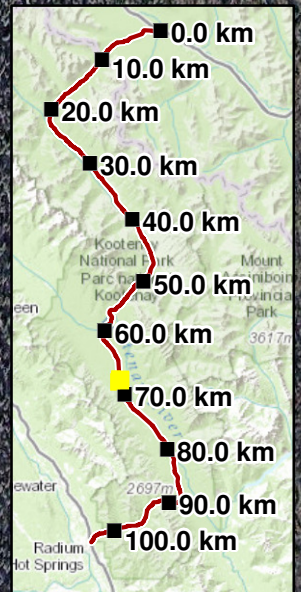
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 10



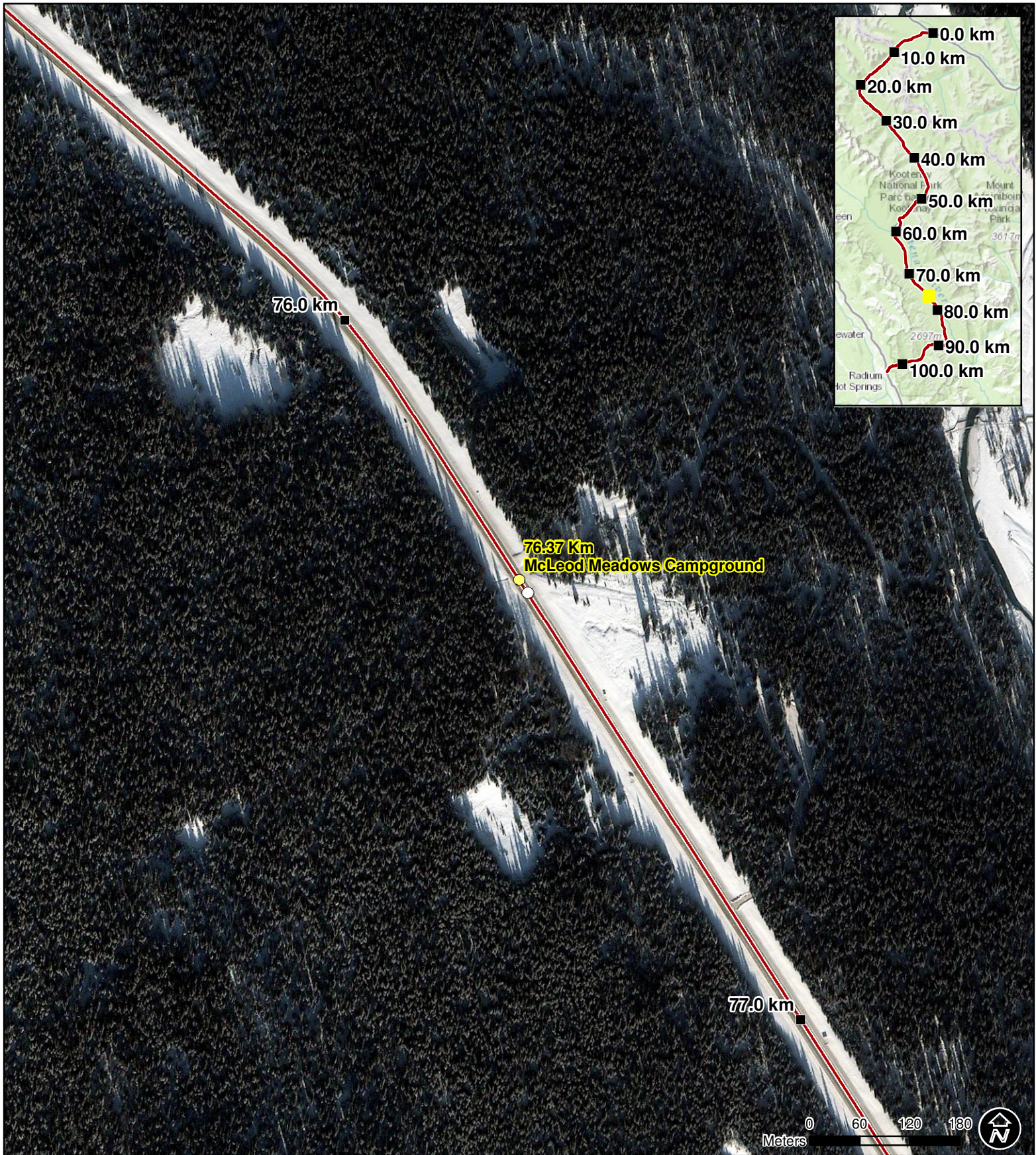
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 11



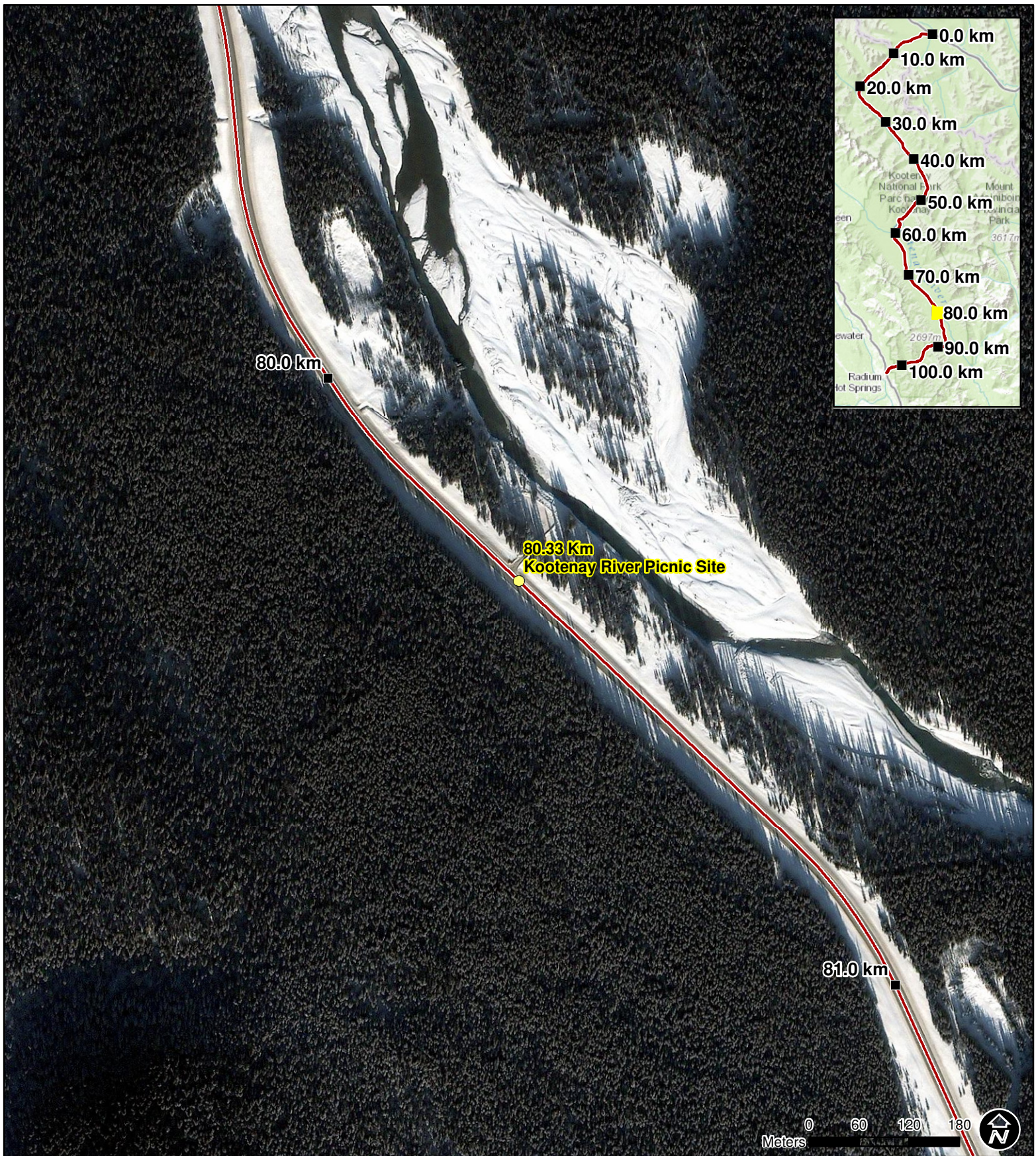
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 12



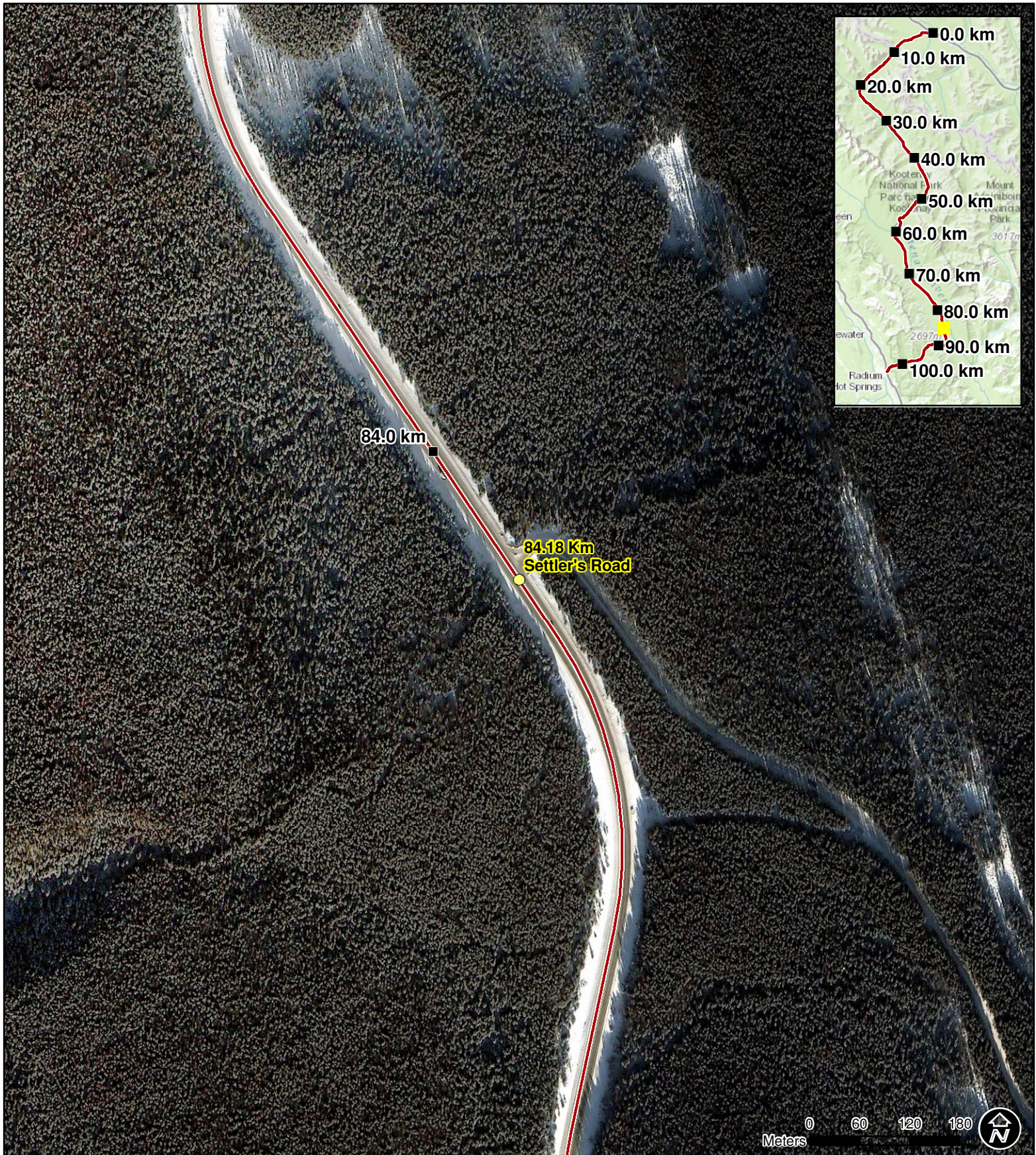
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 13



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 14



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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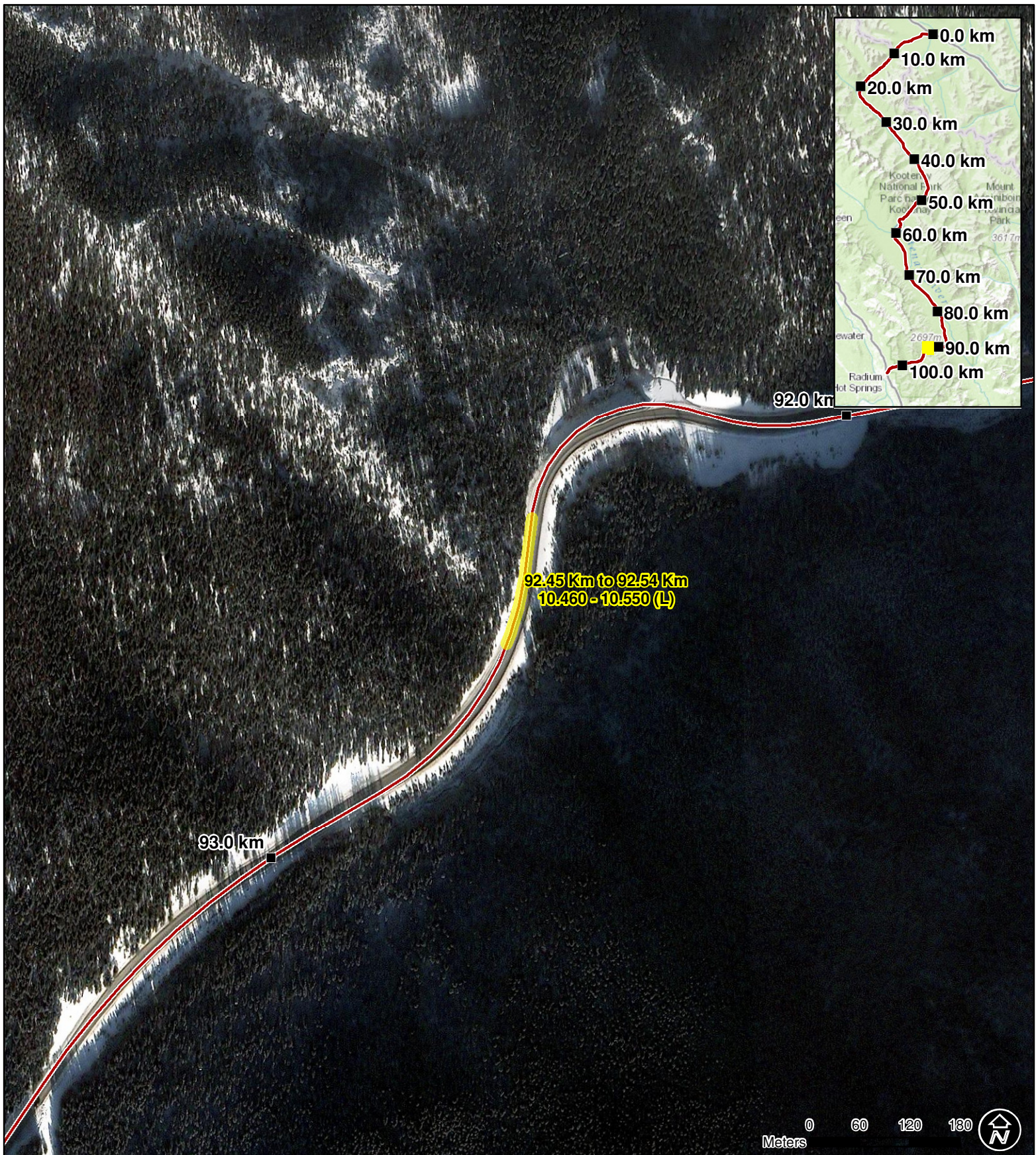
Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 15



- Approximate Locations of Localized Highway Improvements
- Approximate Locations of Uninterrupted Highway Improvements
- Kilometer Marks
- Highway 93S Alignment
- Rare Plant Occurrence

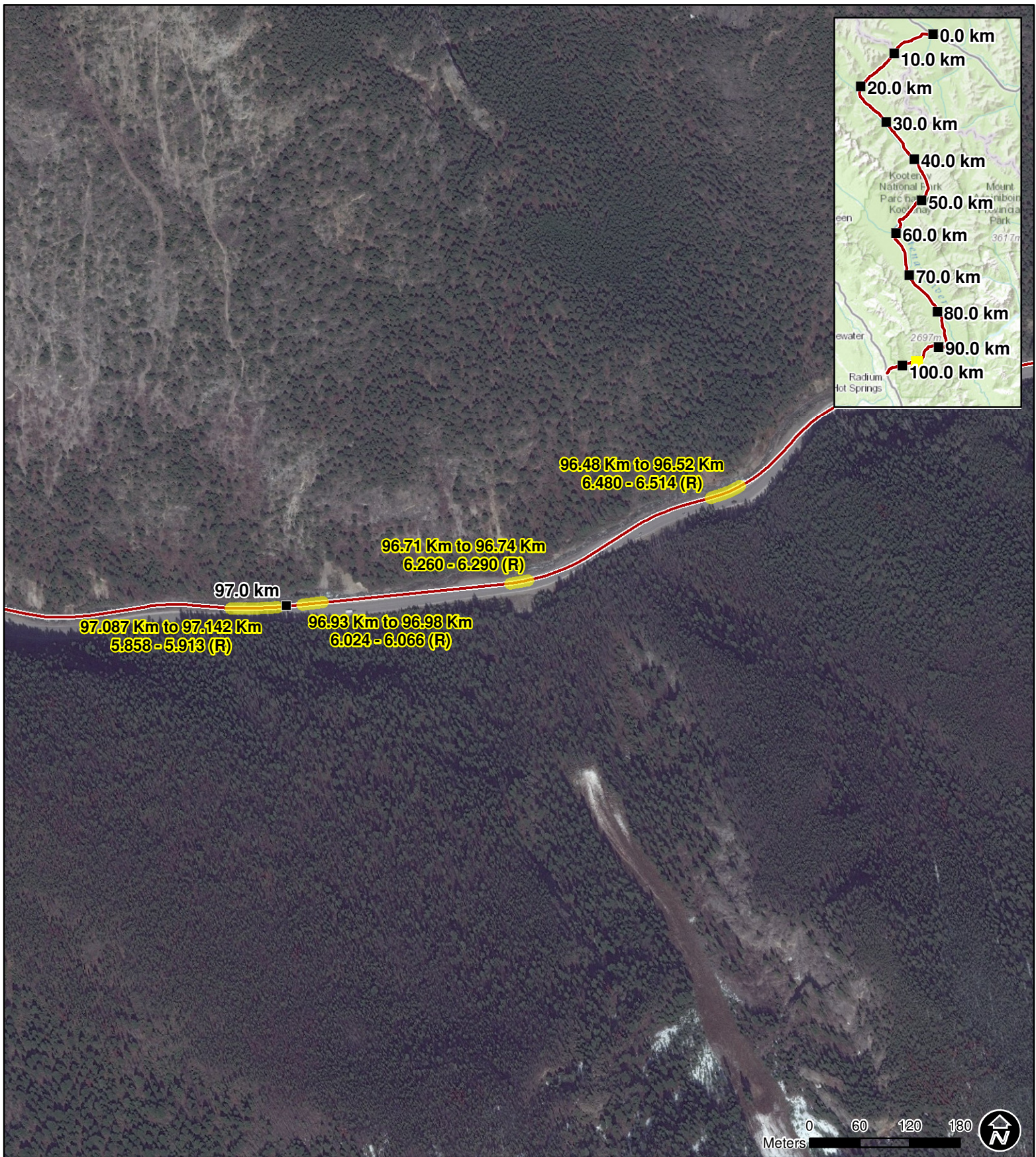
- Watercourse Sensitivity Level
- 1 - High: Fish-bearing, good habitat
 - 2 - High: Good habitat, fish-bearing uncertain
 - 3 - Moderate: Not fish-bearing, connected to downstream habitats
 - 4 - Negligible: No habitat present
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 16



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 17



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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 18



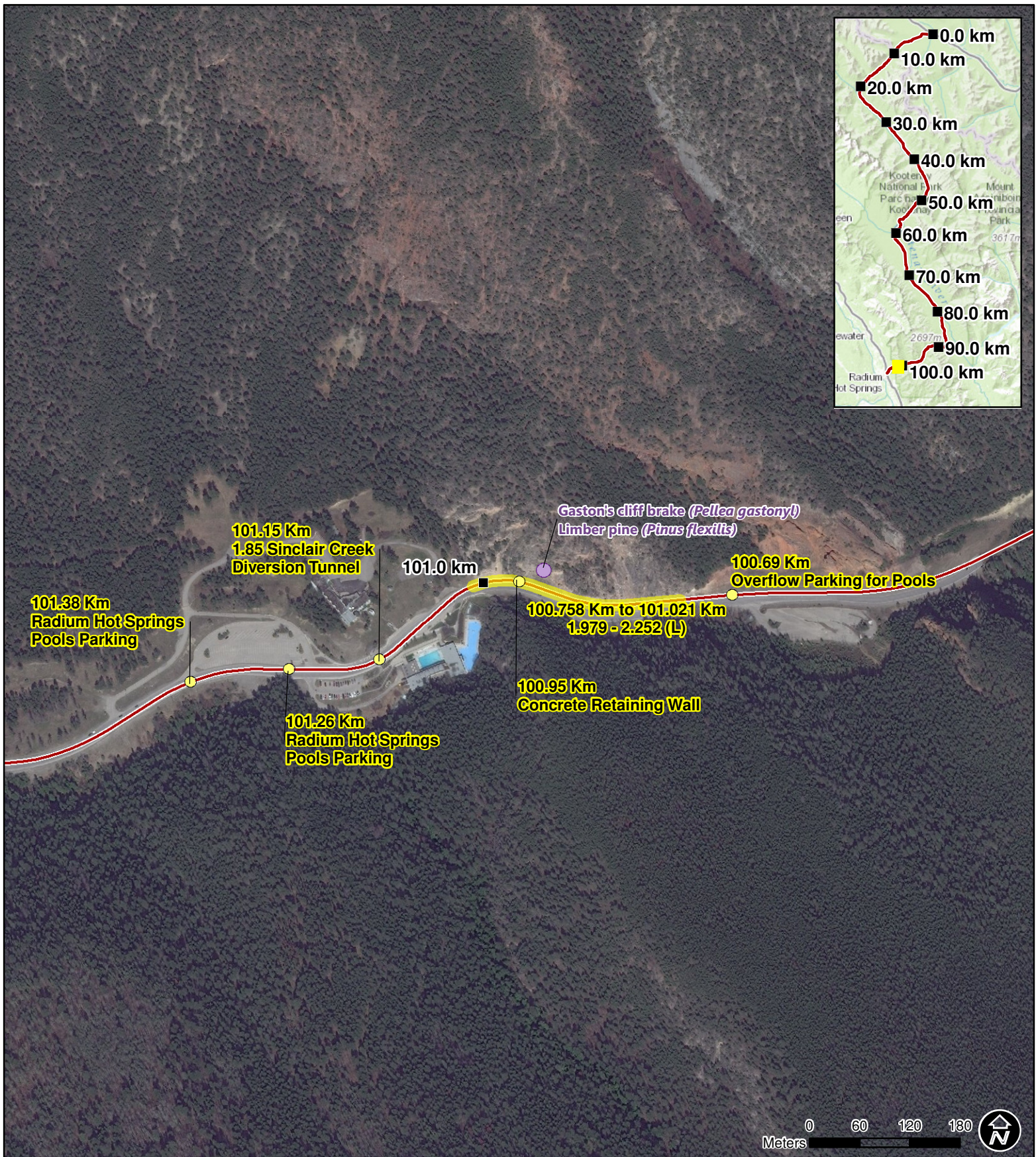
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 19



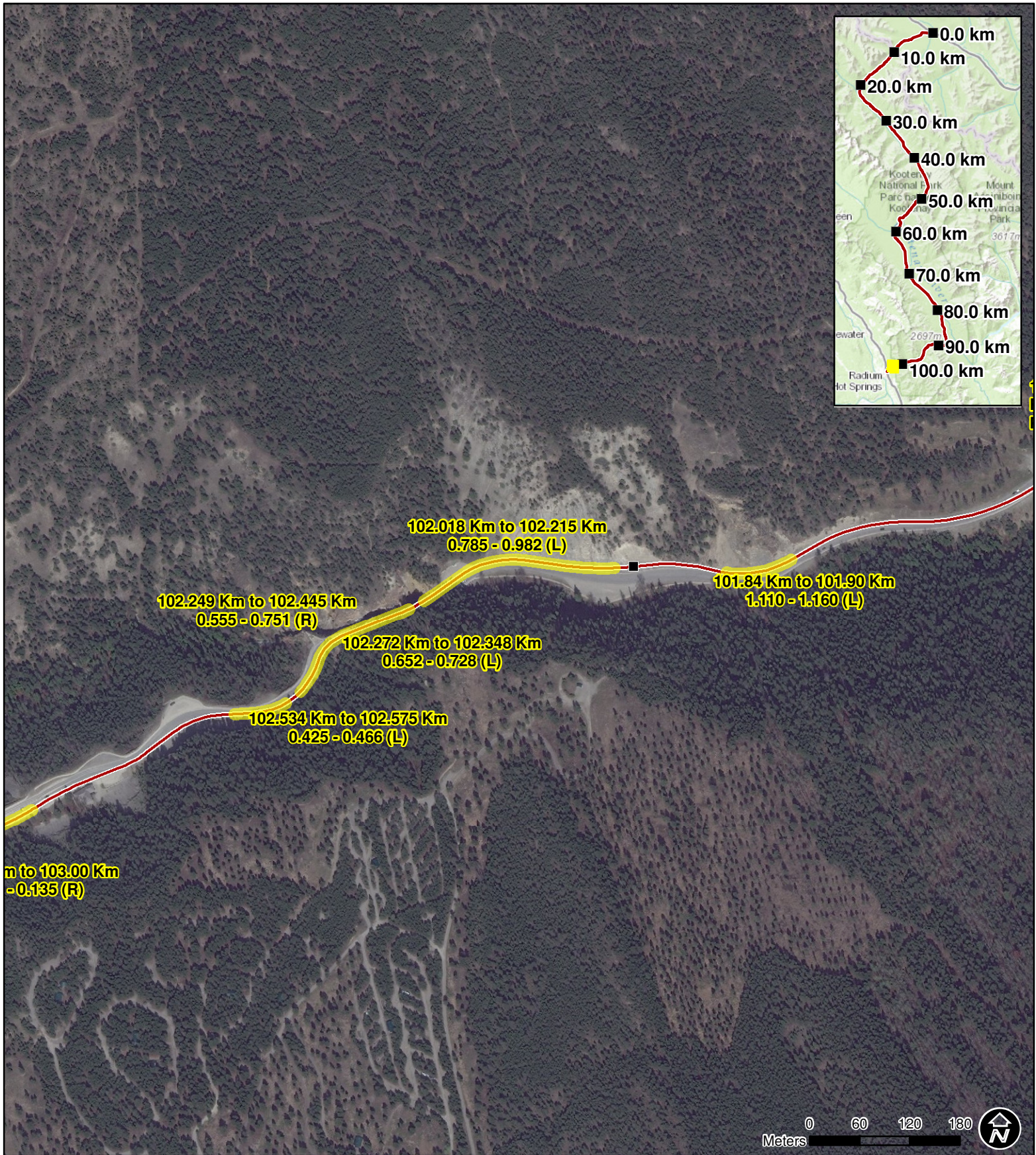
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 20



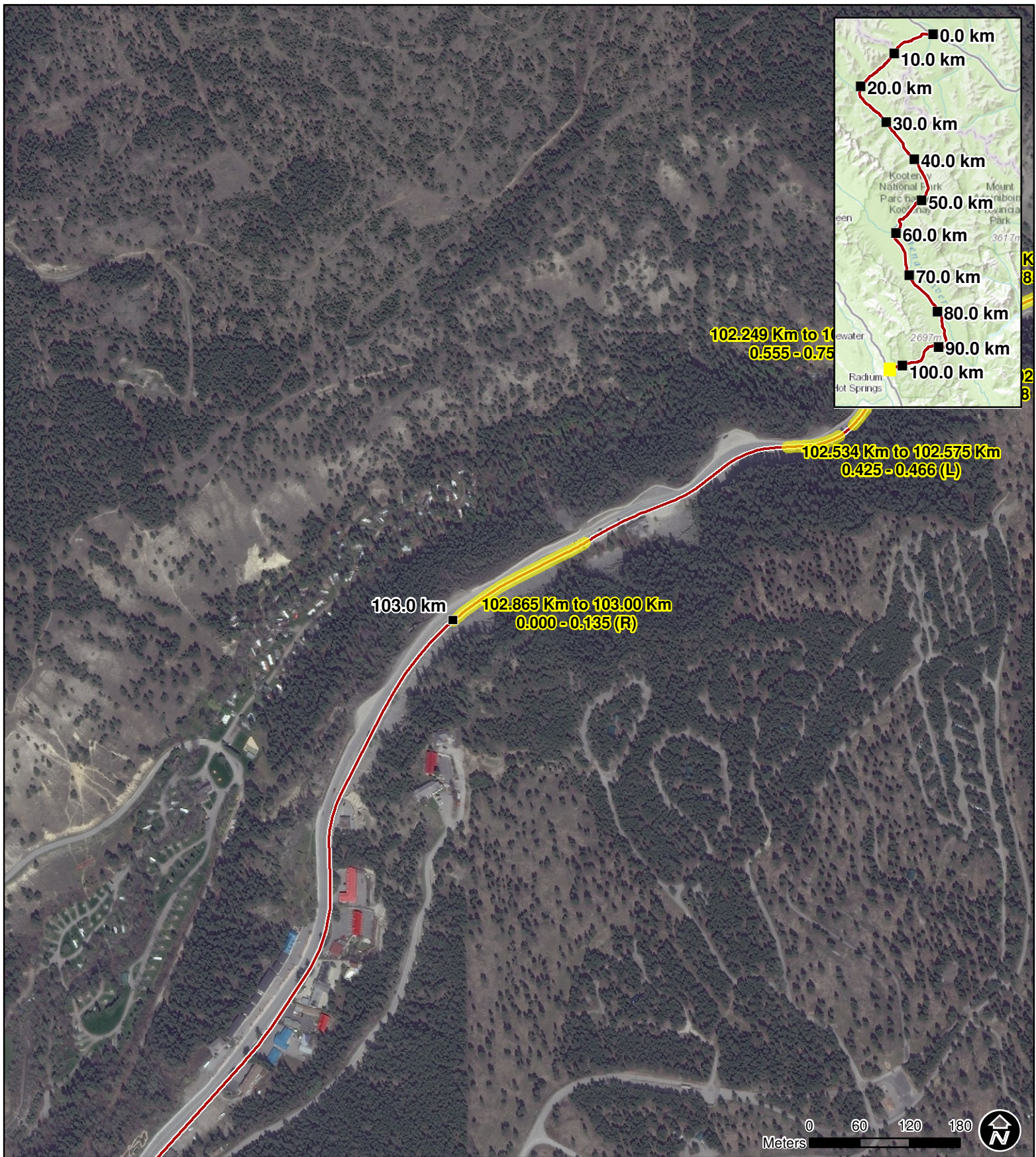
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| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
|--|---|

Hwy 93S 2015 Tetra Tech EBA
 Aquatic Sensitivity and
 Rare Plant Survey Locations
 Map: 21



- Approximate Locations of Localized Highway Improvements
 - Approximate Locations of Uninterrupted Highway Improvements
 - Kilometer Marks
 - Highway 93S Alignment
 - Rare Plant Occurrence
- Watercourse Sensitivity Level
- 1 - High: Fish-bearing, good habitat
 - 2 - High: Good habitat, fish-bearing uncertain
 - 3 - Moderate: Not fish-bearing, connected to downstream habitats
 - 4 - Negligible: No habitat present
 - Not Assessed by TTEBA

Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 22



- | | |
|---|--|
| <ul style="list-style-type: none"> ● Approximate Locations of Localized Highway Improvements ■ Approximate Locations of Uninterrupted Highway Improvements ■ Kilometer Marks — Highway 93S Alignment ● Rare Plant Occurrence | <p>Watercourse Sensitivity Level</p> <ul style="list-style-type: none"> ● 1 - High: Fish-bearing, good habitat ● 2 - High: Good habitat, fish-bearing uncertain ● 3 - Moderate: Not fish-bearing, connected to downstream habitats ● 4 - Negligible: No habitat present ○ Not Assessed by TTEBA |
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Hwy 93S 2015 Tetra Tech EBA
Aquatic Sensitivity and
Rare Plant Survey Locations
Map: 23



April 2016

Appendix 5 Recovery Planning Species Lists for Banff National Park and Kootenay National Park



Species	Scientific Name	COSEWIC STATUS	SARA STATUS	1. Is the species regularly occurring at the site?	2. Is intervention required in order for the species' current population to remain stable and at expected population and distribution levels?	3. Can KNP management actions contribute to conservation of the species at the site?	4. Can KNP management actions contribute significantly to the species' national recovery beyond our boundaries?
Grizzly Bear, Western Population	<i>Ursus arctos</i>	Special Concern	No Status	YES	YES	YES	NO
Limber Pine	<i>Pinus flexilis</i>	Endangered	No Status	YES	YES	YES	NO
Rocky Mountain Bighorn Sheep	<i>Ovis canadensis</i>	No Status	No Status	YES	YES	YES	NO
Westslope Cutthroat Trout, BC population	<i>Oncorhynchus clarkii lewisi</i>	Special Concern	Special Concern	YES	YES	YES	NO
Whitebark Pine	<i>Pinus albicaulis</i>	Endangered	Endangered	YES	YES	YES	NO
Wolverine	<i>Gulo gulo</i>	Special Concern	No Status	YES	YES	YES	NO
American badger, jeffersonii	<i>Taxidea taxus jeffersonii</i>	Endangered	Endangered	YES	YES	YES	NO
Bank Swallow	<i>Riparia riparia</i>	Threatened	No Status	YES	YES	NO	NO
Barn Swallow	<i>Hirundo rustica</i>	Threatened	No Status	YES	YES	NO	NO
Black Swift	<i>Cypseloides niger</i>	Endangered	No Status	YES	Unknown	NO	NO
Common Nighthawk	<i>Chordeiles minor</i>	Threatened	Threatened	YES	YES	NO	NO
Little Brown Myotis	<i>Myotis lucifugus</i>	Endangered	Endangered	YES	YES	NO	NO
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Threatened	Threatened	YES	YES	NO	NO
Northern Rubber Boa	<i>Charina bottae</i>	Special Concern	Special Concern	YES	Unknown	NO	NO
Western Toad	<i>Anaxyrus boreas</i>	Special Concern	Special Concern	YES	YES	NO	NO
Non-Regularly Occurring SAR							
Peregrine Falcon (anatum/Tun...)	<i>Falco peregrinus anatum/tundrius</i>	Special Concern	Special Concern	NO			
Short-eared Owl	<i>Asio flammeus</i>	Special Concern	Special Concern	Unknown			
Rusty Blackbird	<i>Euphagus carolinus</i>	Special Concern	Special Concern	NO			
Flammulated Owl	<i>Otus flammeolus</i>	Special Concern	Special Concern	NO			
Southern Maidenhair Fern	<i>Adiantum capillus-veneris</i>	Endangered	Endangered	NO			



April 2016

Appendix 6 Species at Risk Database Search Result





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Biotics Web Explorer

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Scientific Name	Common Name	SARA Schedule	COSEWIC Status	Managed Area Name	Regularity	Distribution Confidence	SARA Legal Status
Chordeiles minor	Common Nighthawk	Schedule 1	Threatened (T)	Banff National Park of Canada	Regularly occurring	Confident	Threatened
Contopus cooperi	Olive-sided Flycatcher	Schedule 1	Threatened (T)	Banff National Park of Canada	Regularly occurring	Confident	Threatened
Euphagus carolinus	Rusty Blackbird	Schedule 1	Special Concern (SC)	Banff National Park of Canada	Regularly occurring	Confident	Special Concern
Falco peregrinus pop. 1	Peregrine Falcon anatum/tundrius	Schedule 1	Special Concern (SC)	Banff National Park of Canada	Regularly occurring	Confident	Special Concern
Oncorhynchus clarkii pop. 9	Westslope Cutthroat Trout - Alberta population	Schedule 1	Threatened (T)	Banff National Park of Canada	Regularly occurring	Confident	Threatened
Physella johnsoni	Banff Springs Snail	Schedule 1	Endangered (E)	Banff National Park of Canada	Regularly occurring	Confident	Endangered
Pinus albicaulis	Whitebark Pine	Schedule 1	Endangered (E)	Banff National Park of Canada	Regularly occurring	Confident	Endangered
Rangifer tarandus pop. 1	Woodland Caribou - Southern Mountain population	Schedule 1	Threatened (T)	Banff National Park of Canada	Regularly occurring	Confident	Threatened
Number Of Records Returned 8							

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Scientific Name	Common Name	SARA Schedule	COSEWIC Status	Managed Area Name	Regularity	Distribution Confidence	SARA Legal Status
Asio flammeus	Short-eared Owl	Schedule 1	Special Concern (SC)	Kootenay National Park of Canada	Regularly occurring	Confident	Special Concern
Charina bottae	Northern Rubber Boa	Schedule 1	Special Concern (SC)	Kootenay National Park of Canada	Regularly occurring	Confident	Special Concern
Chordeiles minor	Common Nighthawk	Schedule 1	Threatened (T)	Kootenay National Park of Canada	Regularly occurring	Confident	Threatened
Contopus cooperi	Olive-sided Flycatcher	Schedule 1	Threatened (T)	Kootenay National Park of Canada	Regularly occurring	Confident	Threatened
Oncorhynchus clarkii pop. 8	Westslope Cutthroat Trout - British Columbia population	Schedule 1	Special Concern (SC)	Kootenay National Park of Canada	Regularly occurring	Confident	Special Concern
Pinus albicaulis	Whitebark Pine	Schedule 1	Endangered (E)	Kootenay National Park of Canada	Regularly occurring	Confident	Endangered
Taxidea taxus jeffersonii	American badger jeffersonii subspecies	Schedule 1		Kootenay National Park of Canada	Regularly occurring	Confident	Endangered
Number Of Records Returned 7							

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BC Species and Ecosystems Explorer Search Results

Status							
Scientific Name	English Name	Provincial	BC List	COSEWIC	SARA	Global	CF Priority
<i>Anaxyrus boreas</i>	Western Toad	S3S4 (2010)	Blue	SC (2012)	1-SC (2005)	G4 (2008)	2
<i>Ascaphus montanus</i>	Rocky Mountain Tailed Frog	S2 (2010)	Red	T (2013)	1-E (2003)	G4 (2004)	2
<i>Asio flammeus</i>	Short-eared Owl	S3B,S2N (2015)	Blue	SC (2008)	1-SC (2012)	G5 (2008)	2
<i>Chordeiles minor</i>	Common Nighthawk	S4B (2015)	Yellow	T (2007)	1-T (2010)	G5 (2009)	2
<i>Contopus cooperi</i>	Olive-sided Flycatcher	S3S4B (2015)	Blue	T (2007)	1-T (2010)	G4 (2008)	2
<i>Danaus plexippus</i>	Monarch	S3B (2013)	Blue	SC (2010)	1-SC (2003)	G5 (2011)	2
<i>Euphagus carolinus</i>	Rusty Blackbird	S3S4B (2015)	Blue	SC (2006)	1-SC (2009)	G4 (2008)	2
<i>Falco peregrinus anatum</i>	Peregrine Falcon, <i>anatum</i> subspecies	S2?B (2010)	Red	SC (2007)	1-SC (2012)	G4T4 (2006)	2
<i>Myotis lucifugus</i>	Little Brown Myotis	S4 (2015)	Yellow	E (2013)	1-E (2014)	G3 (2012)	5
<i>Oncorhynchus clarkii lewisi</i>	Cutthroat Trout, <i>lewisi</i> subspecies	S3 (2004)	Blue	SC (2006)	1-SC (2010)	G4T4 (2013)	2
<i>Pinus albicaulis</i>	whitebark pine	S2S3 (2013)	Blue	E (2010)	1-E (2012)	G3G4 (2011)	3
<i>Rangifer tarandus</i> pop. 1	Caribou (southern mountain population)	S1 (2010)	Red	E (2014)	1-T (2003)	G5T2Q (2002)	2
<i>Sphyrapicus thyroideus</i>	Williamson's Sapsucker	S3B (2015)	Blue	E (2005)	1-E (2006)	G5 (2011)	2
<i>Sphyrapicus thyroideus nataliae</i>	Williamson's Sapsucker, <i>nataliae</i> subspecies	SNR (2012)	No Status	E (2005)	1-E (2006)	G5TU (1997)	1
<i>Taxidea taxus</i>	American Badger	S2 (2015)	Red	E (2012)	1-E (2003)	G5 (2012)	1

Search Summary

Time Performed Mon Jan 11 09:26:05 PST 2016

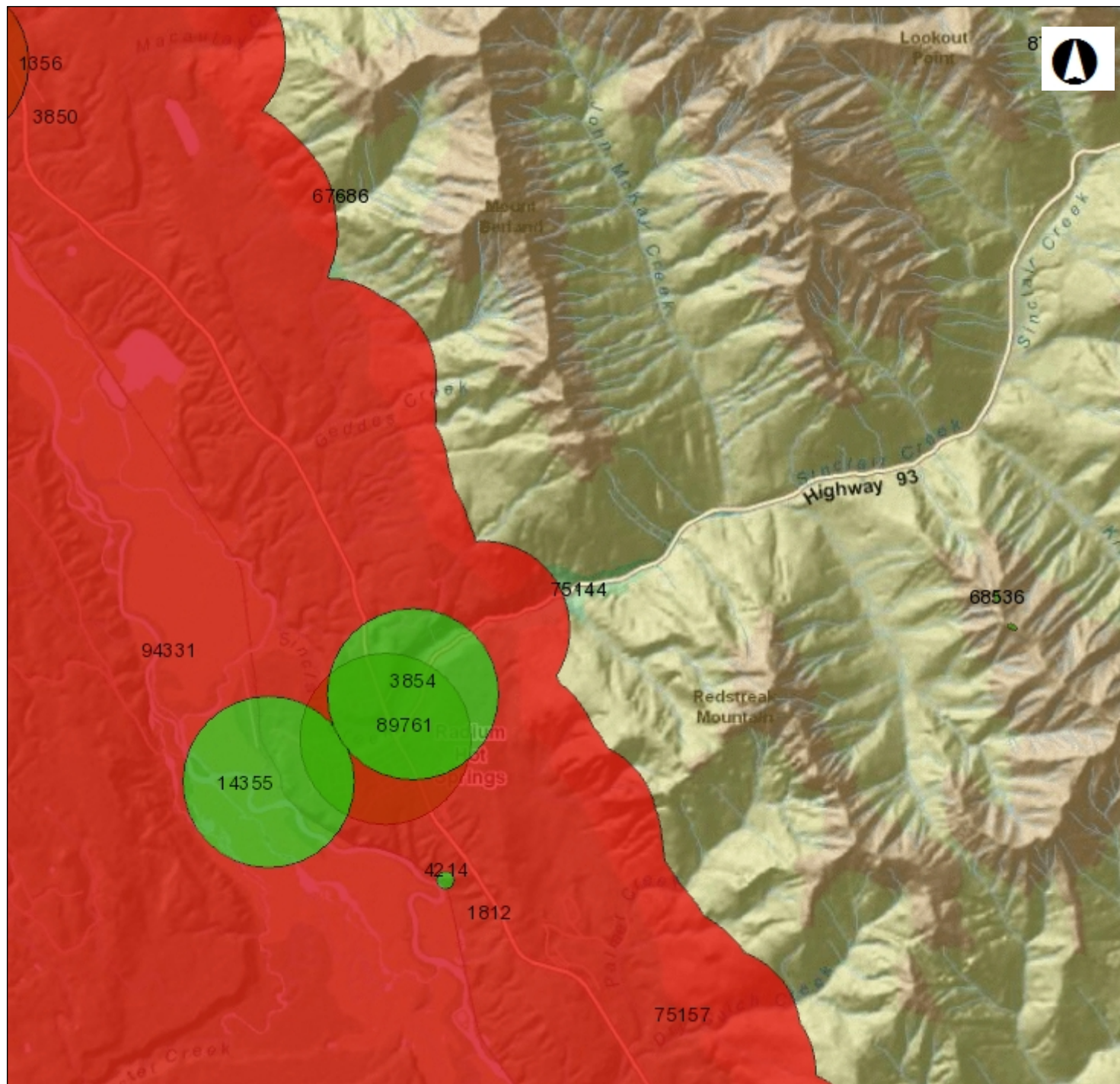
Results 15 records.

Search Criteria Search Type: Plants & Animals
 AND SARA Schedule 1 Status:True
 AND COSEWIC Status:Endangered OR Threatened OR Special Concern
 AND Forest Districts:Rocky Mountain Forest District (DRM) (Restricted to Red, Blue, and Legally designated species)
 AND MOE Regions:4- Kootenay (Restricted to Red, Blue, and Legally designated species)
 AND Regional Districts: East Kootenay (EKRD) (Restricted to Red, Blue, and Legally designated species)
 AND BGC Zone:ESSF, MS
 Sort Order:Scientific Name Ascending

Notes 1. Citation: B.C. Conservation Data Centre. 2016. BC Species and Ecosystems Explorer. B.C. Minist. of Environ. Victoria, B.C. Available: <http://a100.gov.bc.ca/pub/eswp/> (accessed Jan 11, 2016).
 2. Forest District, MoE Region, Regional District and habitat lists are restricted to species that breed in the Forest

District, MoE Region, Regional District or habitat (i.e., species will not be placed on lists where they occur only as migrants).

[Modify Search](#) | [New Search](#) | [Results](#)



CDC Occurrence Map

Legend

Species and Ecosystems at Available Occurrences - CD

FEATURE_CODE

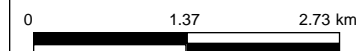
- Animal - Vertebrate
- Animal - Invertebrate
- Plant - Vascular
- Plant - Non-vascular
- Ecological Community

■ Species and Ecosystems at Secured) Publicly Available

Species and Ecosystems at Publicly Available Occurrence

FEATURE_CODE

- Animal - Vertebrate
- Animal - Invertebrate



1: 67,216

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Datum: NAD83

Projection: NAD_1983_BC_Environment_Albers

Key Map of British Columbia





BC Conservation Data Centre: Species Occurrence Report

Shape ID: 94331

Scientific Name: Taxidea taxus

English Name: American Badger

Identifiers

Occurrence ID: 12057

Shape ID: 94331

Taxonomic Class: mammals

Element Group: Vertebrate Animal

Status

Provincial Rank: S2

BC List: Red

Global Rank: G5

COSEWIC: E (NOV 2012)

SARA Schedule: 1

Locators

Survey Site: EAST KOOTENAY TRENCH

Directions: Along the East Kootenay Trench from the U.S. border north to the community of Harrogate, B.C.

Biogeoclimatic Zone:

Ecosection: UCV;ELV;EPM;FLV;MCR;EKT;SPM;SPK

Occurrence Information

First Observation Date: 1945

Last Observation Date: 2010

Occurrence Data:

The East Kootenay Trench encompasses 1395 sightings (including live, dead and roadkilled badgers) (Newhouse and Kinley 2011) and 1336 radio-telemetry locations (Weir 2014).

Area Description

General Description:

Vegetation Zone:

Min. Elevation (m):

Max. Elevation (m):

Habitat: TERRESTRIAL: Forest Needleleaf, Shrubland, Cropland/Hedgerow, Roadside

Occurrence Rank and Occurrence Rank Factors

Rank: B : Good estimated viability

Rank Date: 2010

Rank Comments:

Females capable of producing 2-4 kits per year, but survival of offspring to adulthood is low. Roads are significant mortality source of both adults and young. Local occupancy affected by habitat suitability (soil conditions, prey), mortality risk (roads, persecution) and proximity to other occupied areas.

Condition of Occurrence:

Size of Occurrence:

1395 sightings (between 1945-2010) (Newhouse and Kinley 2011) and 1336 radiolocations (between 1995 and 2002) (Weir 2014).

Landscape Context:

Version

Version Date: 6/28/2014 12:00:00 AM

Version Author: Marks, D.J.

Mapping Information

Estimated Representation Accuracy: Very Low

Estimated Representation Accuracy Comments:

Confident that full extent is represented by Occurrence: N

Confidence Extent Definition: Confident full extent of EO is NOT known

Additional Inventory Needed: Y

Inventory Comments:

Documentation

References:

- Newhouse, N. and T. Kinley. 2011. Badger sightings East Kootenay database updated to 2011-04-03. Sylvan Consulting Ltd.
- Weir, R. 2013. Methodology for creation of badger element occurrences in BC. BC Ministry of Environment, Victoria, BC.
- Weir, R. 2014. Methodology for creation of element occurrences for American Badger in the East Kootenay Trench and Elk Valley. BC Ministry of Environment, Victoria, BC.

Specimen:

Please visit the website http://www.env.gov.bc.ca/cdc/gis/eo_data_fields_06.htm for definitions of the data fields used in this occurrence report.

Suggested Citation:

B.C. Conservation Data Centre. 2014. Occurrence Report Summary, Shape ID: 94331, American Badger. B.C. Ministry of Environment. Available: <http://delivery.maps.gov.bc.ca/ess/sv/cdc>, (accessed Jan 14, 2016).