

REPORT

WaterSMART

Greenview Industrial Gateway Intake Environmental Overview 2022-3376



SEPTEMBER 2022

CONFIDENTIALITY AND © COPYRIGHT

This document is for the sole use of the addressee and Associated Engineering Alberta Ltd. The document contains proprietary and confidential information that shall not be reproduced in any manner or disclosed to or discussed with any other parties without the express written permission of Associated Engineering Alberta Ltd. Information in this document is to be considered the intellectual property of Associated Engineering Alberta Ltd. in accordance with Canadian copyright law.

This report was prepared by Associated Engineering Alberta Ltd. for the account of WaterSMART. The material in it reflects Associated Engineering Alberta Ltd.'s best judgement, in the light of the information available to it, at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Associated Engineering Alberta Ltd. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TABLE OF CONTENTS

SECTION	PAGE NO.
Table of Contents	i
List of Tables	ii
List of Figures	iii
1 Introduction	1
2 Methods	3
2.1 Desktop Information Review	3
2.2 Field Assessment	3
3 Baseline Environmental Features	6
3.1 Land Use	6
3.2 Geomorphology, Landforms, and Soils	6
3.3 Vegetation	9
3.4 Wetlands	10
3.5 Surface Water	10
3.6 Fish	12
3.7 Wildlife	17
3.8 Potential Contamination	21
3.9 Historic Resources	21
4 Regulatory Framework	21
5 Planning Recommendations	23
5.1 Planning Recommendations for the Intake	23
5.2 Site development considerations	25
Closure	
References	
Appendix A - Upland Fieldnotes	
Appendix B - Aquatic Fieldnotes	

LIST OF TABLES

	PAGE NO.
Table 3-1 Wetlands Identified by WSP in a Subset of the Project Area (WSP 2021)	10
Table 3-2 Waterbodies Within the Project Area	11
Table 3-3 Fish Species Identified in the Smoky River and McMillar Creek	12
Table 3-4 Wildlife Species and Status Previously Recorded Within or Near the Project Area	18
Table 3-5 Habitat Requirements for Wildlife Species of Conservation Concern Previously Recorded Within or Near the Study Area	21
Table 4-1 Anticipated Regulatory Permitting Requirements for Intake Construction	22
Table 5-1 Applicable Restricted Activity Periods	24

LIST OF FIGURES

	PAGE NO.
Figure 1-1 Project Location	2
Figure 2-1 Upland Field Assessment Locations	4
Figure 2-2 Aquatic Field Assessment Locations	5
Figure 3-1 Environmental Sensitivities	8
Figure 3-2 Smoky River Features	16

1 INTRODUCTION

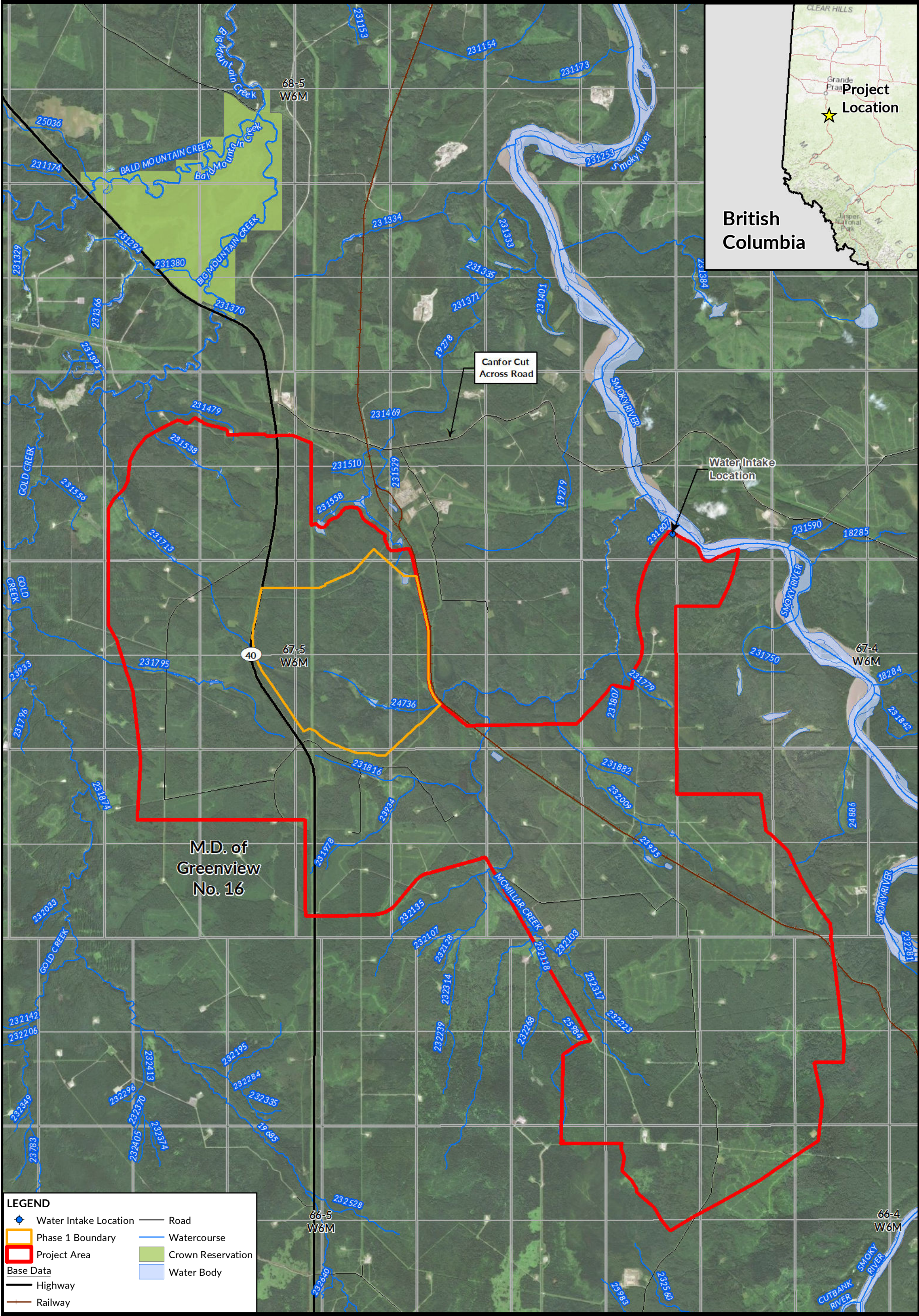
This environmental overview has been prepared for WaterSMART Solutions Ltd. (the client), as part of the Greenview Industrial Gateway (GIG) water intake and Eco-Industrial zone development (the project). The Municipal District of Greenview No. 16 (the proponent) retained WaterSMART to support the Water Application for the intake construction on the Smoky River. WaterSMART retained Associated Engineering Alberta Ltd. (Associated) to support the design and development of the water intake and provide general planning considerations for the larger industrial zone (approximately 2,000 acres). The project is to be located approximately 34 km south of Grande Prairie and extends on both sides of Highway 40. The first area planned for development is outlined in orange in the project location figure (**Figure 1-1**). The following legal land descriptions are within the proposed industrial area with the intake to be located in SE-30-67-4-W6M.

- [4, 5, 6, 7, 8, 9, 18, 19, 20, 29, & 30]-67-4-W6M;
- [1, 2, 3, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 20, 21, 22, 23, 26, 27, 28, 29, 32, 33, & 34]-67-5-W6M;
- [18, 19, 20, 21, 28, 29, 30, 31, 32, 33]-66-4-W6M; and
- [24, 25, & 36]-66-5-W6M.

The project is currently in Phase 3, which includes the following activities and outcomes:

- Submit an application for Approval under the *Water Act*.
 - Aquatic environment assessment.
 - Conceptual engineering design.
 - High level planning.
- Await decision from Alberta Environment and Parks on the *Water Act* application.
- Submit additional permits at the provincial and federal level to facilitate intake construction.
- Gain input on stormwater management, heat integration, water storage, and water delivery (domestic and waste).
- Develop/execute a water accessibility plan for construction.

No preliminary design or construction methods are available for the completion of this report. The purpose of this report is to review, at a desktop and field level, the project area for environmental sensitivities or constraints and make recommendations for regulatory and compliance requirements.



C:\Users\JAW\Desktop\PROJ\AE\2022\3376\ARCH\ENV\REV04\2022\3376_FIG1-1_LOC_200810.MXD
IMAGERY © 2022 MICROSOFT CORPORATION, EARTHSTAR GEOGRAPHICS, SIO SOURCES, NRCAN, ESR, CANADA, AND CANADIAN COMMUNITY MAPS CONTRIBUTORS. ROAD, STATISTICS CANADA, 2019; HYDROGRAPHY, ALTAUS LTD., 1994; ATS GRID, ALTAUS LTD., 2005; CROWN RESERVATION, ALBERTA ENVIRONMENT AND PARKS, 2018; RAILWAY, GOVERNMENT OF CANADA, 2018.

2 METHODS

2.1 Desktop Information Review

The information reviewed for this report included government databases and spatial datasets, available reports, and aerial imagery. Government databases included:

- Significant Landforms of Alberta (Alberta Parks 2014);
- Agricultural Regions of Alberta Soil Inventory Database (AGRASID) (Government of Alberta 2022a);
- Alberta Water Well Information Database (Government of Alberta 2022b);
- Fisheries and Wildlife Management Information System (FWMIS) database (Government of Alberta 2022c);
- Alberta Conservation Information Management System (ACIMS) database (Alberta Parks 2019);
- Listing of Historic Resources (Government of Alberta 2022d); and
- Wildlife Sensitivity Maps (Government of Alberta 2022e).

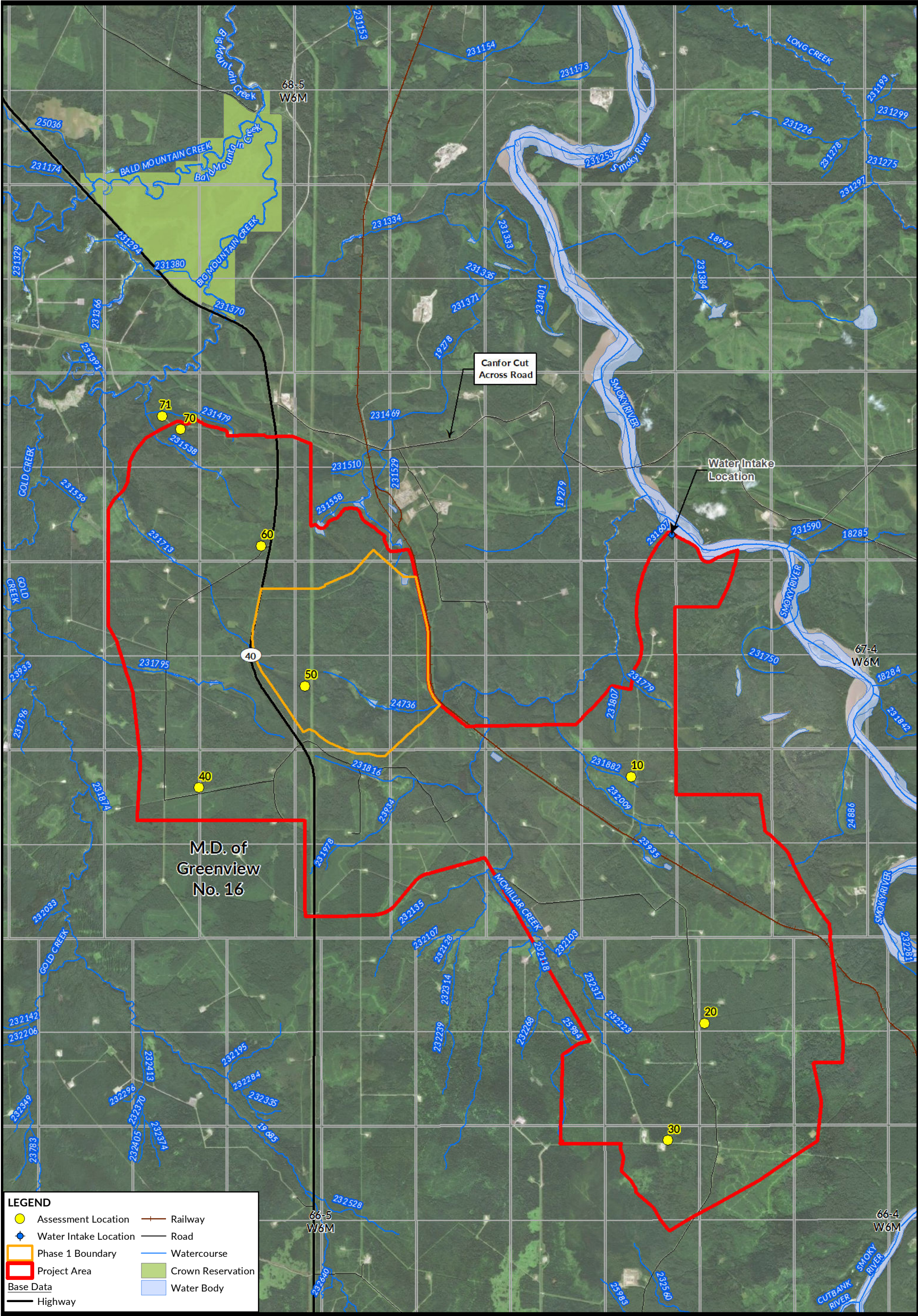
Available reports and data include a Desktop Environmental Constraints Assessment (WSP 2021) and LiDAR elevation data.

2.2 Field Assessment

A field assessment was conducted within the project area to identify environmental sensitivities that could be impacted by development. An aquatic field assessment was completed July 6, 2022, for the intake location on the Smoky River and a terrestrial field assessment was completed July 7, 2022, for the future industrial area. Erin Cawthorn, BIT and Jordan Lucas, P.Biol. of Associated completed both assessments.

The terrestrial environment assessment focused on the identification of plant community types and incidental wildlife observations within the future industrial area. Seven upland plots (assessment locations) were explored (**Figure 2-1**), and vegetation/wildlife information recorded. Additionally, incidental observations were recorded (site 71) Plots were chosen based on vegetation signatures evident on aerial imagery in order to capture the variability within the project area. Vegetation was separated by stratum (tree, shrub, and herb) and evaluated in a corresponding plot size (10 m, 5 m, and 1 m, respectively). Wildlife occurrences (auditory and visual) were recorded for each site for a standard 10-minute interval. Additionally, incidental wildlife features were recorded. The notes from the terrestrial assessment are provided in **Appendix A**.

The aquatic environment assessment focused on the intake location and examined the smoky river 500 m upstream and 1,300 m downstream of the proposed intake (**Figure 2-2**). The banks of the Smoky River were walked to determine bank type and fish habitat features. No measurements of the Smoky River were obtained due to the inaccessible banks; however, estimates are provided in the field sheets within **Appendix B**. Notes on substrates and channel morphology are provided in **Appendix B**.



waterSMART
Water Management Solutions



0 500 1,000 1,500 2,000
m

AE PROJECT NO. 2022-3376-00
SCALE 1:60000
COORD. SYSTEM NAD 1983 UTM ZONE 11N
DATE 2022-09-15
REV 00
DRAWN BY WL
CHECKED BY EC
DESCRIPTION ISSUED FOR REPORT

**FIGURE 2-1
UPLAND FIELD ASSESSMENT LOCATIONS**

WATERSMART SOLUTIONS, LTD.
GREENVIEW INDUSTRIAL
GATEWAY PROJECT

ENVIRONMENTAL OVERVIEW



3 BASELINE ENVIRONMENTAL FEATURES

Baseline environmental features, including the identification of environmental sensitivities, are shown in **Figure 3-1** and discussed in the sections below.

3.1 Land Use

The project is located in the Central Parkland Natural Sub-region of the Parkland Natural Region in Alberta (Natural Regions Committee 2006). Dominant land uses within the project area include cultivation, pulp/paper production, oil and gas activities, hunting and fishing (Natural Regions Committee 2006).

Alberta is divided into two broad land management areas: the “Green Area”, generally forested public land (Crown land), and the “White Area”, generally privately owned settled/developed land. The project area is located entirely within the Green Area.

The project area overlays a large number of existing dispositions and encompasses a number of existing industrial water wells, which are likely still in use, with the most recent being drilled for Prairie Light Power in 2021 (Government of Alberta 2022b). Access to the intake south of the Canfor cut across road passes through an active grazing lease. Cattle were observed accessing McMillar Creek during the field assessment.

The project area is located within Treaty 8 territory, which was established in 1899. Treaties outline the rights, obligations, and benefits of the signing parties to each other. Treaty 8 provides Treaty 8 First Nations with the right to carry out their “usual vocations” of hunting, fishing, and trapping within the Treaty 8 area. Additionally, the Gift Lake Métis Settlement is located northeast of the project area, and development may interfere with the Métis use of the Smoky River. First Nation and Métis people may use the project area for hunting, fishing, trapping, and gathering activities. The Municipal District of Greenview is currently engaging with the following First Nation and Métis groups:

- Sucker Creek First Nation;
- Horse Lake First Nation;
- Aseniwuche Winewak Nation;
- Sturgeon Lake First Nation; and
- Gift Lake Métis Settlement.

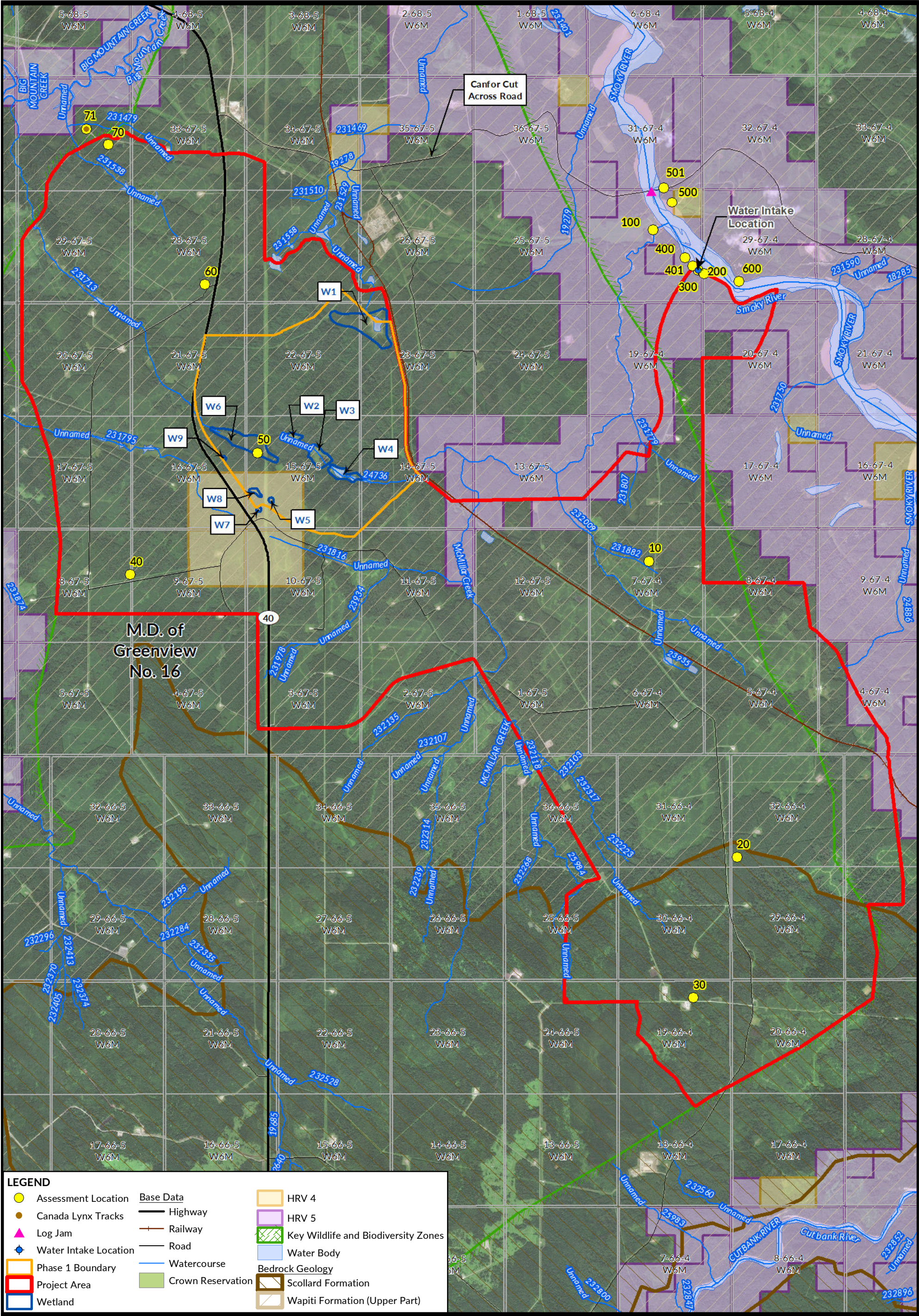
3.2 Geomorphology, Landforms, and Soils

The landscape within the Dry Mixedwood subregion is characterized by gently undulating glacial till and lacustrine plains with hummocky uplands throughout (Natural Regions Committee 2006). Surface materials are predominantly fine textured glaciolacustrine materials (i.e., sediments associated with former glacial lakes) with about 15% glaciofluvial and eolian sands, about 10% organic deposits and very little glacial till (Natural Regions Committee 2006).

The bedrock geology of the project area consists of sandstone, siltstone, and mudstone and is split between two formations (Prior et al. 2013). The northern part of the project area (including the intake) is located within the Upper Cretaceous Wapiti Formation, while the southern part of the project area is located within the Upper Cretaceous and Paleogene Scollard Formation (Prior et al. 2013).

The project is not located within an area designated as a significant landform element by the Government of Alberta (2014).

Soils within the subregion are dominated by Gray Luvisols in upland areas and gleysols or organic soils in wetland areas (Natural Regions Committee 2006). No soils mapping is available in this area (Government of Alberta 2022a). The project area is located in Soil Correlation Area 18 (Pedocan Land Evaluation Ltd. 1993), within the Dark Gray and Black Soil Zone of the South Peace Area. Soils in SCA 18 are primarily Dark Gray Luvisols with significant areas of Black Chernozems. Most soils in the project area are likely undisturbed in the forested areas; however, in areas of previous development/exploration (such as on cutlines), admixing and compaction may have occurred.



AE PROJECT NO. 2022-3376-00
SCALE 1:50000
COORD. SYSTEM NAD 1983 UTM ZONE 11N
DATE 2022-09-15
REV 00
DRAWN BY WL
CHECKED BY EC
DESCRIPTION ISSUED FOR REPORT

**FIGURE 3-1
ENVIRONMENTAL SENSITIVITIES**

WATERSMART SOLUTIONS, LTD.
GREENVIEW INDUSTRIAL
GATEWAY PROJECT

ENVIRONMENTAL OVERVIEW

3.3 Vegetation

3.3.1 General Vegetation

Vegetation within the Dry Mixedwood subregion is characterized by aspen forests with fens occurring in low-lying areas (Natural Regions Committee 2006).

The majority of the project area was found to be undisturbed; however, the area is intersected by existing developments such as cutlines and roads. Additionally, vegetation clearing was ongoing in some upland sections of the project area during the site visit. Vegetation plots that were sampled are assumed to be representative of the project area based on the vegetation signatures visible from aerial imagery.

Vegetation at the intake location was found to be similar to the mixed wood canopy described below, with of white spruce (*Picea glauca*) and paper birch (*Betula papyrifera*) trees overhanging the Smoky River. Prickly rose was found to be abundant along the bank with red osier dogwood (*Cornus stolonifera*). Common forbs at the intake location include common horsetail, bunchberry (*Cornus canadensis*), and wild sarsaparilla.

Upland plots were predominantly found to be mixed wood with the canopy consisting of a mixture of white spruce, trembling aspen (*Populus tremuloides*) and paper birch. Typically, the understory of these forested areas was found to be dense with prickly rose (*Rosa accicularis*), Saskatoon (*Amelanchier alnifolia*), northern gooseberry (*Ribes oxycanthoides*), and bracted honeysuckle (*Lonicera involucrata*). Common forbs of the forested areas include northern bedstraw (*Galium boreale*), cow parsnip (*Heracleum maximum*), common horsetail (*Equisetum arvense*), and wild sarsaparilla (*Aralia nudicaulis*).

Small areas of coniferous-dominated forest patches were also identified. The canopy consisted of white spruce with high-bush cranberry (*Viburnum opulus*), bunchberry (*Cornus canadensis*), and palmate leaf coltsfoot (*Petasites frigidus* var. *palmates*) forming the majority of the understory.

One wetland was investigated during the field assessment to record vegetation (location 50 of [Figure 2-1](#)). Within the wetland, the canopy was dominated by white spruce, black spruce (*Picea mariana*), and tamarack (*Larix laricina*). The understory was dominated by Labrador tea (*Ledum gronlandicum*) and bog cranberry (*Vaccinium oxycoccos*) with sphagnum (*Sphagnum* sp.) dominated ground cover. Upland fieldnotes taken to record vegetation and wildlife are provided in [Appendix A](#).

3.3.2 Rare Plants

The ACIMS database contains data on elements of biodiversity for conservation planning purposes, including information on vertebrates, invertebrates, plants (vascular and non-vascular), lichens, fungi, landforms, and ecological communities. A search of the database on July 12, 2022, indicated no occurrences previously reported in the project area (Alberta Parks, 2019); however, this finding may be due to the limited number of previous studies completed in the area.

No rare plants were incidentally observed during the field assessment; however, a specific rare plant survey was not completed due to the size of the project area.

Additional fine-scale surveys would be required to confirm the presence/absence of rare plants. Recommendations on next steps are provided in [Section 5](#).

3.3.3 Regulated Weeds

Regulated weeds were not observed at the intake or in the upland plots visited during the field assessment; however, weeds such as creeping thistle (*Cirsium arvense*) are likely to occur near previously disturbed locations within the project area. Species listed as noxious are regulated under the *Alberta Weed Control Regulation* (Alberta Reg. 19/2010) of the *Weed Control Act* (S.A. 2008, c. W-5.1) and must be controlled during construction ([Section 5](#)).

3.4 Wetlands

Wetlands are anticipated to be abundant within the project area. WSP Canada Inc. (WSP) completed a desktop-level environmental constraints assessment (WSP 2021) for the first development area, including the identification of nine wetlands. Desktop identification provided the wetland attributes contained within [Table 3-1](#).

Table 3-1
Wetlands Identified by WSP in a Subset of the Project Area (WSP 2021)

Wetland ID	Classification	Size (ha)
W1	Seasonal shrubby swamp / bare open water	23.8
W2	Seasonal shrubby swamp	2.5
W3	Seasonal shrubby swamp / bare open water	6.7
W4	Seasonal shrubby swamp / bare open water	5.9
W5	Seasonal shrubby swamp	0.5
W6	Wooded coniferous swamp	15.7
W7	Wooded deciduous swamp	0.5
W8	Wooded deciduous swamp	0.9
W9	Wooded deciduous swamp	0.2

One wetland was visited during the field assessment, according to the wetland ID provided by WSP in [Table 3-1](#), the wetland visited was W6. W6 was determined to have a mix of white spruce, black spruce, and tamarack with no open water. Ground cover was a mixture of sphagnum moss with abundant Labrador tea. No soil evaluation to determine depth of organic material was completed as part of the field assessment. Recommendations related to wetlands and determining wetland areas have been provided in [Section 5](#).

3.5 Surface Water

In addition to the proposed intake being located on the Smoky River, the project area intersects with 20 waterbodies ([Figure 3-1](#)). The waterbody ID, name, class (Government of Alberta 2012), and restricted activity period (RAP) (Government of Alberta 2012) for each waterbody are presented in [Table 3-2](#). Additionally, the presence of fish within each waterbody is identified in [Table 3-2](#), based on a FWMIS search completed July 12, 2022 (Government of Alberta 2022c). More information on fish and fish habitat for each waterbody is provided in [Section 3.6](#).

The Class of a waterbody is based on the relative “sensitivity” of fish habitats and their known distribution. The RAP of a waterbody refers to the time when works that disrupt the bed or banks of the waterbody must be avoided to prevent disturbing fish or fish eggs during sensitive periods of the reproductive life cycle. The unnamed waterbodies listed in [Table 3-2](#) are unmapped according to the Code of Practice for Watercourse Crossings – Grande Prairie Management Area Map (Government of Alberta 2012). However, under the Code of Practice for Watercourse Crossings “where an unmapped waterbody enters a mapped Class C waterbody, the unmapped waterbody is Class C for all portions of the unmapped waterbody.” Therefore, as the unmapped waterbodies are hydraulically connected to mapped Class C waterbodies, the unmapped waterbodies intersecting the project area adopt the Class and RAP.

Table 3-2
Waterbodies Within the Project Area

Waterbody ID	Waterbody Name	Class	Restricted Activity Period	Fish Species Present
2214	Smoky River	C	August 1 – July 15	Yes - fish sampled to date; see Table 3-3
18127	McMillar Creek	C	August 1 – July 15	Yes - fish sampled to date; see Table 3-3
23934	Unnamed	C	August 1 – July 15	No - no fish sampled to date
25984	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231816	Unnamed	C	August 1 – July 15	No - no fish sampled to date
232317	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231779	Unnamed	C	August 1 – July 15	No - no fish sampled to date
232223	Unnamed	C	August 1 – July 15	No - no fish sampled to date
232009	Unnamed	C	August 1 – July 15	No - no fish sampled to date
23935	Unnamed	C	August 1 – July 15	No - no fish sampled to date
232103	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231978	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231795	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231538	Unnamed	C	August 1 – July 15	No - no fish sampled to date
24736	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231713	Unnamed	C	August 1 – July 15	No - no fish sampled to date

Waterbody ID	Waterbody Name	Class	Restricted Activity Period	Fish Species Present
231807	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231882	Unnamed	C	August 1 – July 15	No - no fish sampled to date
24886	Unnamed	C	August 1 – July 15	No - no fish sampled to date
19278	Unnamed	C	August 1 – July 15	No - no fish sampled to date
231479	Unnamed	C	August 1 – July 15	No - no fish sampled to date

3.6 Fish

The project area is located in the yellow zone on the Whirling Disease Decontamination Risk Zone Map (Government of Alberta 2020b). Whirling disease is caused by a parasite (*Myxobolus cerebralis*) that affects salmonid fish such as trout and whitefish (Government of Alberta 2021).

The FWMIS database (Government of Alberta 2022c) includes 23 records of fish species previously documented in the Smoky River and McMillar Creek, summarized in [Table 3-3](#). No fish have been identified in the remaining unnamed waterbodies that intersect the project area.

Table 3-3
Fish Species Identified in the Smoky River and McMillar Creek

Common Name	Scientific Name	General Status of Alberta Wild Species ¹	Wildlife Act ²	COSEWIC ³	Species at Risk Act – Schedule 1 ⁴
Arctic grayling	<i>Thymallus arcticus</i>	May Be at Risk	Special Concern	N/A	N/A
Bull trout	<i>Salvelinus confluentus</i>	At Risk	Threatened	Special Concern	Special Concern
Burbot	<i>Lota lota</i>	Secure	N/A	N/A	N/A
Emerald shiner	<i>Notropis atherinoides</i>	Secure	N/A	N/A	N/A
Fathead minnow	<i>Pimephales promelas</i>	Secure	N/A	N/A	N/A
Finescale dace	<i>Phoxinus neogaeus</i>	Undetermined	N/A	N/A	N/A

Common Name	Scientific Name	General Status of Alberta Wild Species ¹	Wildlife Act ²	COSEWIC ³	Species at Risk Act – Schedule 1 ⁴
Flathead chub	<i>Platygobio gracilis</i>	Secure	N/A	N/A	N/A
Lake chub	<i>Couesius plumbeus</i>	Secure	N/A	N/A	N/A
Longnose dace	<i>Rhinichthys cataractae</i>	Secure	N/A	N/A	N/A
Longnose sucker	<i>Catostomus</i>	Secure	N/A	N/A	N/A
Goldeye	<i>Hiodon alosoides</i>	Secure	N/A	N/A	N/A
Mountain whitefish	<i>Prosopium williamsoni</i>	Secure	N/A	N/A	N/A
Northern pike	<i>Esox Lucius</i>	Secure	N/A	N/A	N/A
Northern pikeminnow	<i>Ptychocheilus oregonensis</i>	Sensitive	N/A	N/A	N/A
Pearl dace	<i>Margariscus margarita</i>	Undetermined	N/A	N/A	N/A
Rainbow trout	<i>Oncorhynchus mykiss</i>	Secure	N/A	N/A	N/A
Redside shiner	<i>Richardsonius balteatus</i>	Secure	N/A	N/A	N/A
Slimy sculpin	<i>Cottus cognatus</i>	Secure	N/A	N/A	N/A
Spoonhead sculpin	<i>Cottus ricei</i>	May Be at Risk	N/A	Not at Risk	N/A
Spottail shiner	<i>Notropis hudsonius</i>	Secure	N/A	N/A	N/A
Trout-perch	<i>Percopsis omiscomaycus</i>	Secure	N/A	N/A	N/A

Common Name	Scientific Name	General Status of Alberta Wild Species ¹	Wildlife Act ²	COSEWIC ³	Species at Risk Act – Schedule 1 ⁴
Walleye	<i>Stizostedion vitreum</i>	Secure	N/A	N/A	N/A
White sucker	<i>Catostomus commersoni</i>	Secure	N/A	N/A	N/A

¹ Government of Alberta (2020a)

² Revised Statutes of Alberta 2000, Chapter W-10

³ Government of Canada (2021a)

⁴ S.C. 2002, c. 29 (Government of Canada 2021b)

Bull trout and arctic grayling (the two species with status under the Alberta *Wildlife Act*) habitat requirements were reviewed prior to the field assessment to identify any potential areas of critical habitat.

Bull trout are found in cold water with variable water flows and minimal fine sediments (Government of Alberta and Alberta Conservation Association 2009). Water temperature and groundwater input have been found to be critical habitat characteristics that limit the major life stages. Bull trout spawn in the autumn within areas influenced by groundwater over coarse substrates with limited fine materials. Eggs overwinter and hatch in the spring; young of the year will utilize stream margins with variable structure and overwinter in the interstitial spaces of subsurface flow (Government of Alberta and Alberta Conservation Association 2009). Adults select low-velocity areas with the appropriate temperature and protection cover. Overwintering locations for bull trout are selected based on instream cover and often return to the same overwintering habitats between years (Government of Alberta and Alberta Conservation Association 2009).

Arctic grayling is a cold-water species that require clear and well-oxygenated waters (Government of Alberta and Alberta Conservation Association 2015). In the summer, young of the year are found in tributaries with little flow and gravel or cobble bottoms with little fine sediments. Adults are typically found in mainstem pools, riffles and runs with a preference for riffle-pool habitats in the summer. Overwintering habitats consist of large side channels, backwaters, lakes, and tributary streams. Spawning habitat is largely unknown; however, arctic grayling likely spawn over gravel in pools, riffles, tails of runs, and glides waters (Government of Alberta and Alberta Conservation Association 2015).

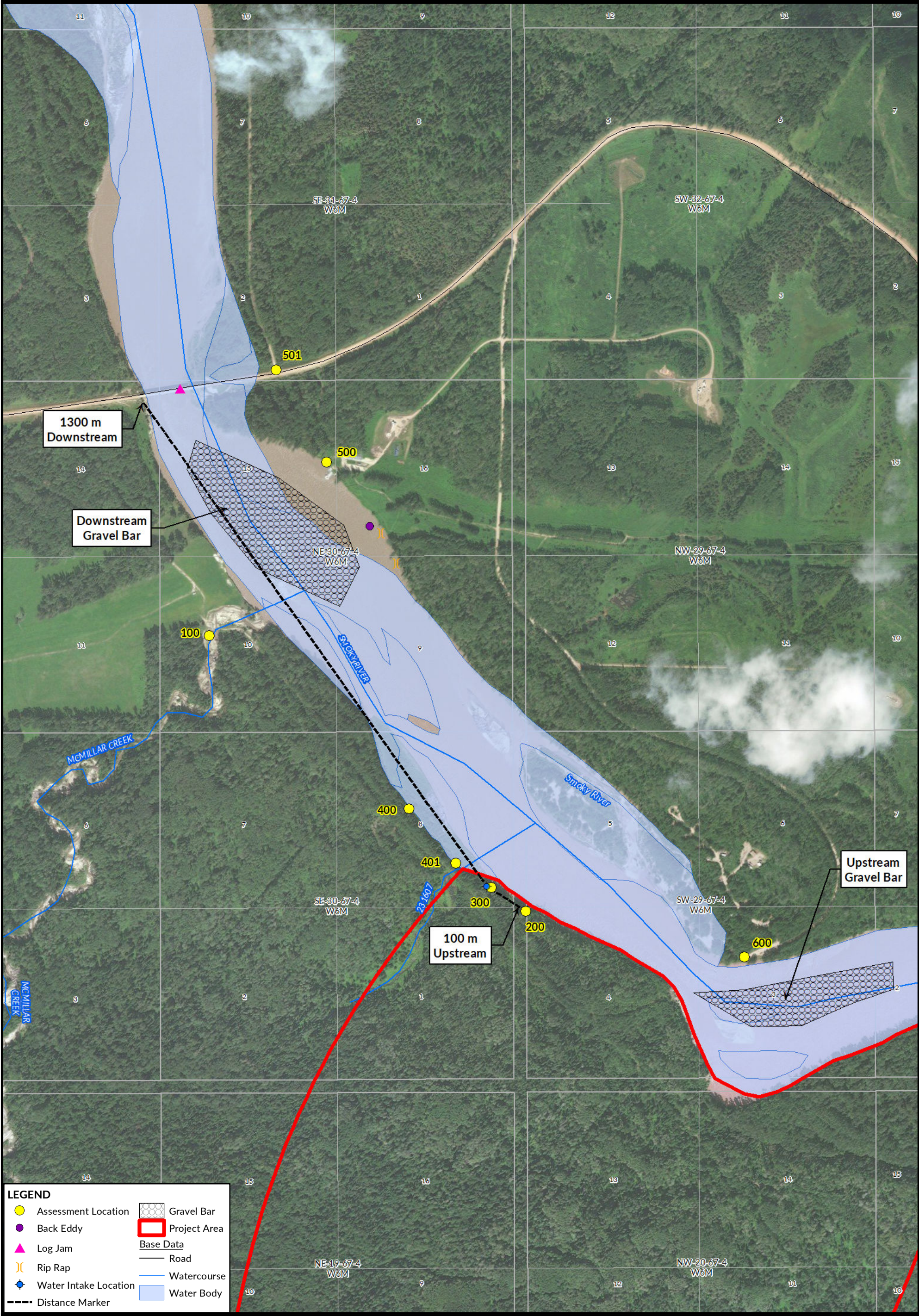
Fish habitat at the intake location was assessed and compared to habitat available in the surrounding area during the field assessment. The fish habitat assessment was completed from shore and extended 1300 m downstream and 500 m upstream. A bathymetric survey for the water intake is to be completed by others within this stretch of the Smoky River and will provide additional information on depths.

At the proposed intake location on the Smoky River, the river is uniform run habitat. Substrates are predominantly large gravel with a high percentage of fine material (i.e., sand). Two gravel bars are located in proximity of the intake location (**Figure 3-2**). One gravel bar is located approximately 700 m downstream of the intake, and the other approximately 500 m upstream. The bank at the intake location was determined to be erosional with overhanging vegetation/material that provided shade but minimal good instream cover for fish (material was found to be high over the water). The forest located on the top of the erosional bank likely provides drop-in nutrients; however, this is not

unique in this stretch of the river. The river within the instream project footprint provides suitable habitat for a variety of sportfish, sucker species, and small-bodied forage fish. The habitat at the proposed intake location is not limited in the area and does not provide critical function for any resident species that is not otherwise readily available. Therefore, the intake location does not remove critical habitat for bull trout or arctic grayling.

More unique fish habitat in the surrounding area includes the upstream and downstream gravel bar, riffles created from the gravel bars, rip rap on the opposing bank creating a back eddy, and a log jam located under the Canfor cut-across road bridge (**Figure 3-2**). The riffles created by the gravel bars provide spawning habitat for bull trout and arctic grayling, while the back eddy and log jam provide slow-moving water to allow fish a place to rest in cover (as provided by the logs and rip rap). Fish in the Smoky River are more likely to use these areas for their sensitive life stages.

Appendix B includes aquatic field notes taken to record fish habitat information.



3.7 Wildlife

3.7.1 Wildlife Zones

The project area occurs in the B5 nesting zone where the general bird nesting period is from late April to late August (Government of Canada 2018). Migratory bird nesting potential is highest in the forested areas away from disturbance. However, migratory birds may nest in vegetation within other site types or on anthropogenic structures such as bridges and buildings.

Some non-migratory birds, such as owls, may begin nesting as early as mid-February. Although there is no wildlife zone or nesting period specific to owls, the ranges of several species, including barred owl (*Strix varia*), great-horned owl (*Bubo virginianus*), and northern saw-whet owl (*Aegolius acadicus*) overlap with the project area (Cornell University 2019). Individuals of these species have potential to nest in trees and forested habitats of the project area.

A portion of the project area, including the intake, is located in a Key Wildlife Biodiversity Zone associated with the Smoky River (**Figure 3-1**), as riverine landforms contain topographic variation and vegetation productivity that increase biodiversity and provide important winter browse conditions for ungulates (Government of Alberta 2015). Generally, construction activities within Key Wildlife Biodiversity Zones should be minimized between January 15 and April 30 to avoid the displacement of ungulates (Government of Alberta 2015).

The project area is located within the range of grizzly bears (*Ursus arctos*); approvals obtained for public lands within the project area may be subject to setbacks from den sites between October 1 and April 30. The setback distance (i.e., 200, 500, or 750 m) will be determined relative to the resource management risk ranking assigned by the regulatory reviewer. The resource management risk ranking is based on the impact of construction on the site and the duration of operations of the activity.

3.7.2 Wildlife Observations

Data from FWMIS revealed that 10 wildlife species have been documented within the project area, with three additional species occurring within 1 km of the project area (Government of Alberta 2022c) (**Table 3-4**). Three of these species are species of conservation concern with some protection under the provincial *Wildlife Act* and/or federal *Species at Risk Act* (**Table 3-5**). Incidental observations of animal activity in the area include moose (*Alces alces*) tracks, coyote (*Canis latrans*) scat, deer (*Odocoileus* sp.) tracks, and Canada lynx (*Lynx canadensis*) tracks (**Figure 3-1**). Auditory and visual observations of birds were recorded at the upland sites. **Table 3-4** indicates the species recorded during the field assessment and on a desktop level. **Appendix A** includes field notes of wildlife observations.

Table 3-4
Wildlife Species and Status Previously Recorded Within or Near the Project Area

Common Name	Scientific Name	Field Recording?	General Status of Alberta Wild Species ¹	Wildlife Act ²	Species at Risk Act – Schedule 1 ³	COSEWIC ⁴
Alder flycatcher	<i>Empidonax alnorum</i>	Yes	Secure	N/A	N/A	N/A
American redstart	<i>Setophaga ruticilla</i>	Yes	Secure	N/A	N/A	N/A
American robin	<i>Turdus migratorius</i>	Yes	Secure	N/A	N/A	N/A
Baltimore oriole	<i>Icterus galbula</i>	No	Secure	N/A	N/A	N/A
Black-capped chickadee	<i>Poecile atricapillus</i>	Yes	Secure	N/A	N/A	N/A
Broad-winged hawk	<i>Buteo platypterus</i>	No	Sensitive	N/A	N/A	N/A
Canada lynx	<i>Lynx canadensis</i>	Yes	Sensitive	N/A	N/A	Not at Risk
Canada warbler	<i>Wilsonia canadensis</i>	No	May Be at Risk	N/A	Under consideration for Threatened	Special Concern
Common yellowthroat	<i>Geothlypis trichas</i>	No	Sensitive	N/A	N/A	N/A
Connecticut warbler	<i>Oporornis agilis</i>	Yes	Secure	N/A	N/A	N/A
Great gray owl	<i>Strix nebulosa</i>	No	Sensitive	N/A	N/A	N/A
Grizzly bear	<i>Ursus arctos</i>	No	At Risk	Threatened	Special Concern	Special Concern

Common Name	Scientific Name	Field Recording?	General Status of Alberta Wild Species ¹	Wildlife Act ²	Species at Risk Act – Schedule 1 ³	COSEWIC ⁴
Hermit thrush	<i>Catharus guttatus</i>	Yes	Secure	N/A	N/A	N/A
House finch	<i>Haemorhous mexicanus</i>	Yes	Secure	N/A	N/A	N/A
Killdeer	<i>Charadrius vociferus</i>	Yes	Secure	N/A	N/A	N/A
Least flycatcher	<i>Empidonax minimus</i>	No	Secure	N/A	N/A	N/A
Lincoln's sparrow	<i>Melospiza lincolnii</i>	Yes	Secure	N/A	N/A	N/A
Northern flicker	<i>Colaptes auratus</i>	Yes	Secure	N/A	N/A	N/A
Northern pygmy owl	<i>Glaucidium gnoma</i>	No	Sensitive	N/A	N/A	N/A
Northern waterthrush	<i>Seiurus noveboracensis</i>	Yes	Secure	N/A	N/A	N/A
Magnolia warbler	<i>Dendroica magnolia</i>	Yes	Secure	N/A	N/A	N/A
Ovenbird	<i>Seiurus aurocapilla</i>	Yes	Secure	N/A	N/A	N/A
Pileated woodpecker	<i>Dryocopus pileatus</i>	No	Sensitive	N/A	N/A	N/A
Red-eyed vireo	<i>Vireo olivaceus</i>	Yes	Secure	N/A	N/A	N/A
Red-breasted nuthatch	<i>Sitta canadensis</i>	Yes	Secure	N/A	N/A	N/A
Ruffed grouse	<i>Bonasa umbellus</i>	Yes	Secure	N/A	N/A	N/A

Common Name	Scientific Name	Field Recording?	General Status of Alberta Wild Species ¹	Wildlife Act ²	Species at Risk Act – Schedule 1 ³	COSEWIC ⁴
Song sparrow	<i>Melospiza melodia</i>	Yes	Secure	N/A	N/A	N/A
Swainson's thrush	<i>Catharus ustulatus</i>	Yes	Secure	N/A	N/A	N/A
Tree swallow	<i>Tachycineta bicolor</i>	Yes	Secure	N/A	N/A	N/A
Trumpeter swan	<i>Cygnus buccinator</i>	No	Sensitive	Special Concern	N/A	Not at Risk
Western wood-pewee	<i>Contopus sordidulus</i>	No	May Be at Risk	N/A	N/A	N/A
Wilsons snipe	<i>Gallinago delicata</i>	Yes	Secure	N/A	N/A	N/A
White-bellied thrush	<i>Ixoreus naevius</i>	No	Secure	N/A	N/A	N/A
White-throated sparrow	<i>Zonotrichia albicollis</i>	Yes	Secure	N/A	N/A	N/A
White-winged crossbill	<i>Loxia leucoptera</i>	Yes	Secure	N/A	N/A	N/A
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	Yes	Secure	N/A	N/A	N/A
Yellow-rumped warbler	<i>Dendroica coronata</i>	Yes	Secure	N/A	N/A	N/A

¹ Government of Alberta (2020a), ² Revised Statutes of Alberta 2000, Chapter W-10, ³ Government of Canada (2021a), ⁴ S.C. 2002, c. 29 (Government of Canada 2021b)

Table 3-5
Habitat Requirements for Wildlife Species of Conservation Concern
Previously Recorded Within or Near the Study Area

Common Name	Scientific Name	Habitat Requirements	Habitat Presence in Study Area
Canada warbler	<i>Wilsonia canadensis</i>	Found in mixed conifer and deciduous forests with a shrubby understory (Cornell University 2019).	High potential to occur in forested areas.
Grizzly bear	<i>Ursus arctos</i>	Found in forests, woodlands, meadows and prairies at all elevations, preference for riparian areas (National Wildlife Federation 2022).	High potential to occur in forested areas adjacent waterbodies.
Trumpeter swan	<i>Cygnus buccinator</i>	Use shallow, small ponds, lakes, marshes, bogs, and quiet stretches of river for breeding. Require 100 yards of open water for take-off (Cornell University 2019).	Moderate potential to occur on the shallow open water wetlands identified in Section 3.4 . Not likely to use the Smoky River.

3.8 Potential Contamination

No records of contamination have been recorded in the Environmental Site Assessment Repository (Government of Alberta 2022f). Contamination is possible along previously developed areas such as roadways and train tracks; however, it is unlikely that there will be large areas of contaminated soils encountered as a result of previous development.

3.9 Historic Resources

Lands within the project area generally do not have a historic resource value (HRV) listing; however, areas along the Smoky River have been assigned a HRV of 5 a,p, and 5p, and one quarter section split by highway 40 has a HRV of 4c ([Figure 3-1](#)). A HRV of 4 indicates the lands “contain a historic resource that may require avoidance” and 5 indicates there is a “high potential to contain a historic resource.” The a, p, and c designations indicate the type of historic resource that may be encountered, with a, p, and c meaning archaeological, palaeontological, and cultural, respectively.

4 REGULATORY FRAMEWORK

Anticipated federal, provincial, and municipal regulatory permitting requirements are outlined in [Table 4-1](#). These requirements are based on the legislation current to August 21, 2022. The regulatory requirements should be verified during the preliminary and detailed design stages to ensure compliance with current regulations.

Regulatory requirements noted below are for intake construction only and do not consider upland development, which will require additional permitting. Additionally, the intake and all associated infrastructure that forms the new waterworks system will require registration under the *Environmental Protection and Enhancement Act* prior to operation.

Table 4-1
Anticipated Regulatory Permitting Requirements for Intake Construction

Regulatory Body	Act	Permit	General Practices for Compliance	Project Component
Federal				
Fisheries and Oceans Canada	<i>Fisheries Act</i>	Request for Review with potential for Authorization	Submit the project for review of components in and near water as they may require approval through Fisheries and Oceans Canada (DFO). DFO may require the project to obtain an Authorization for construction in a waterbody for potential impacts to fish and fish habitat.	Construction of the intake in the Smoky River.
Transport Canada	<i>Canadian Navigable Waters Act</i>	Notification of Work on a Non-Scheduled Waterbody or Approval	Submit project components located on or over navigable waterbodies for public comment. Submit project components for Approval if works do not fall under the minor works order.	Construction of the intake in the Smoky River. The intake will be considered minor works if it does not extend vertically above the bed of the navigable water more than 5% of the water depth.
Provincial				
Government of Alberta Ministry of Culture and Status of Women	<i>Historical Resources Act</i>	Approval	Submit the project for Approval when there are new construction/ground disturbance activities within designated Historical Resource Value (HRV) lands.	Ground disturbance for construction of the intake and associated infrastructure.
Government of Alberta Ministry of Environment and Parks	<i>Public Lands Act</i>	Disposition Temporary Field Authorization	Obtain approvals for any new occupation of Crown land, including the bed and shore of all waterbodies. Dispositions (licence of occupation) are required for permanent use of Crown land (to be obtained by the M.D.). A Temporary Field Authorization is expected to	Temporary and permanent workspace for construction of the intake on the bed/bank of the Smoky River.

Regulatory Body	Act	Permit	General Practices for Compliance	Project Component
			be required for geotechnical exploration and laydowns/short-term use for construction.	
Government of Alberta Ministry of Environment and Parks	Water Act	Approval	Obtain approval for all works on a Class C waterbody. Recommendations from a QAES will be required.	Construction of the intake in the Smoky River. A preliminary certificate has been issued.
		Water Diversion License	Obtain a water diversion license for diversion from the Smoky River for industrial use.	Diversion of water from the Smoky River for industrial use.

5 PLANNING RECOMMENDATIONS

Based on the desktop level review and field assessment completed for the project, constraints from an environmental perspective include the potential for impacts to the Smoky River, including fish and fish habitat instream through the construction of the new intake and to undisturbed upland areas. Impacts on these resources can be mitigated by implementing avoidance strategies during design and implementing best management practices during construction. Recommendations provided below are separated into components to address instream and upland activities.

Construction recommendations are not provided as it is too early in the project process. If the intake location changes, this could change the recommendations provided in this report.

5.1 Planning Recommendations for the Intake

- The current location is adequate from an environmental perspective with the following considerations:
 - The intake location provides uniform run habitat not critical to species present.
 - There are eroding banks present at the site.
 - Ensure permitting is obtained for completion of geotechnical investigations (e.g., *Public Lands Act*, *Water Act*)
 - Access routes can avoid potentially valuable wildlife habitat.
 - Determine access routes for construction. If access routes are determined to traverse existing leaseholders or critical wildlife habitat, engage with leaseholders as soon as possible for land access permissions to avoid delays and complete pre-construction wildlife sweeps.
- Long lead regulatory permitting is required for this project. Revisit regulatory permit requirements as design progresses with the following actions:
 - Engage with regulators early including, Fisheries and Oceans Canada, Transport Canada, Alberta Environment and Parks, and the Aboriginal Consultation Office.
 - Utilize the intake design to determine if the intake will fall under the minor works order of the *Canadian Navigable Waters Act*.

- Consider opportunities for *Fisheries Act* offsetting during design. Fish habitat offsetting is expected to be a requirement under the *Fisheries Act*; the project is likely to trigger an Authorization with potential offsetting requirements at a ratio of 3:1).
- Continue early First Nations engagement and define the consultation requirements early with each regulator as it relates to the regulatory permitting process under each Act.
- Obtain all regulatory permits for the project prior to the start of construction.
- There are numerous timing windows that apply to this project (Table 5-1). It will be complex to construct access to the site outside of the migratory bird window in time to complete instream work outside of the RAP. In addition, there is a very small window permitted for installation of the instream isolation area (July 16 to 30, a 2-week period).
 - Schedule discussions with regulators early to receive project approval in time to meet the 2-week instream work period.
 - Complete additional wildlife surveys as soon as the construction area is known and prior to clearing.
 - Pileated woodpeckers have been identified in the area, which means that buffers around active woodpecker nests could constrain developable areas in the short term where the nests are identified. Note that a woodpecker nest must be abandoned for 36-months before it can be permitted to be damaged, destroyed, removed, or disturbed (*Migratory Birds Convention Act*).
 - If active or inactive nests are identified in the work area additional steps will be required with direction from a qualified professional. Early identification and action can help mitigate any delays caused by nests identified.

Table 5-1
Applicable Restricted Activity Periods

Environmental Constraint	Restricted Activity Period
Waterbodies	August 1 to July 15
Migratory Birds	Late April to late August
General Owl Nesting	Mid February to mid July
Grizzly Bear Dens	October 1 to April 30
Key Wildlife Biodiversity Zone	January 15 to April 30
Note: The dates for nesting periods are approximations. Some species may nest earlier or later than those specified here, and nesting periods can vary by geographic region and habitat type.	

- Intake screens should adhere to the DFO Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater (Government of Canada 2020). Determine intake fish screen requirements related to the size and rate of water withdrawal using the weakest swimmers (burbot) within the Smoky River.

- Once construction details are known, engage a qualified aquatic environment specialist (QAES) to develop recommendations for work in water. Recommendations should include those related to working in isolation of flows, fish salvage activities, and turbidity monitoring.
- Additional assessment may be required under the *Historical Resources Act* (e.g., Historical Resources Impact Assessment, which may be triggered during application review).

5.2 Site development considerations

- Wetlands are anticipated to be abundant in the surrounding areas. Avoid impacting wetlands where possible through the design of the project and construction planning. Where wetland avoidance is not possible, ensure proper permitting, assessment, and compensation requirements are completed prior to site development.
- There are a large number of watercourses.
 - Consider presence and setbacks in development planning.
 - Be aware of timing windows for activities with the potential to impact.
 - Consider watercourses in stormwater management planning.
- The site consists of largely undisturbed vegetated areas which provide wildlife habitat.
 - Consider appropriate timing windows for vegetation clearing.
 - Complete surveys for rare plants prior to vegetation clearing.
 - Maintain a vegetated buffer and setback (e.g., 100 m) along the smoky river to maintain wildlife movement corridors.

CLOSURE

This report was prepared for WaterSMART to describe the existing environmental sensitivities and regulatory constraints associated with the planning and construction of the water intake and industrial area planned within the Municipal District of Greenview No. 16.

The services provided by Associated Engineering Alberta Ltd. in the preparation of this report were conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. No other warranty expressed or implied is made.

Respectfully submitted,
Associated Engineering Alberta Ltd.

Prepared by:



Erin Cawthorn, BIT
Environmental Scientist

Reviewed by:



April Ziegler, P.Biol.
Environmental Scientist

REFERENCES

Alberta Parks. 2014. Significant Landforms of Alberta Project – an Introduction. Alberta Environment and Sustainable Resource Development. Edmonton, Alberta. Available at: <https://www.albertaparks.ca/albertaparksca/management-land-use/significant-landforms-of-alberta/>. Accessed July 13, 2022.

Alberta Parks. 2019. Alberta Conservation Information Management System. Available at: <https://www.albertaparks.ca/albertaparksca/management-land-use/alberta-conservation-information-management-system-acims/>. Accessed July 13, 2022.

Cornell University. 2019. All About Birds.

Environmental Protection and Enhancement Act. RSA 2000, c. E-12

Fisheries Act. R.S.C., 1985, c. F-14

Government of Alberta. 2009. Restricted Activity Periods (RAPs) for Fish Species in the 10 Fish Management Zones of Alberta. Available at: <https://open.alberta.ca/publications/restricted-activity-periods-for-fish-species>. Accessed July 13, 2022.

Government of Alberta and Alberta Conservation Association. 2009. Status of the Bull Trout (*Salvelinus confluentus*) in Alberta: Update 2009. Alberta wildlife status report no. 39 (update 2009).

Government of Alberta. 2012. Code of Practice for Pipelines and Telecommunication Lines Crossing a Water Body, Code of Practice for Watercourse Crossings, Code of Practice for Outfall Structures on Water Bodies. Available at: <https://open.alberta.ca/publications/crossing>. Accessed July 13, 2022.

Government of Alberta. 2015. Recommended Land Use Guidelines: Key Wildlife and Biodiversity Zones. Wildlife Land Use Guidelines. Environment and Sustainable Resource Development.

Government of Alberta and Alberta Conservation Association. 2015. Status of the Arctic Grayling (*Thymallus arcticus*) in Alberta: Update 2015. Alberta wildlife status report no. 57 (update 2015).

Government of Alberta. 2020a. Alberta General Species Status Listing – 2020. Available at: <https://extranet.gov.ab.ca/env/wild-species-status/default.aspx>. Accessed July 13, 2022.

Government of Alberta. 2020b. Whirling disease decontamination risk zone [MAP]. Available at: <https://open.alberta.ca/publications/whirling-disease-decontamination-risk-zone-map>. Accessed August 21, 2022.

Government of Alberta. 2021. Stop the Spread of Whirling Disease. Available at: <https://www.alberta.ca/stop-whirling-disease.aspx#jumplinks-1>. Accessed August 21, 2022.

- Government of Alberta. 2022a. Agricultural Regions of Alberta Soil Inventory Database (AGRASID). Available at: <https://soil.agric.gov.ab.ca/agrasidviewer/>. Accessed July 13, 2022.
- Government of Alberta. 2022b. Water Well Information Database. Available at: <http://groundwater.alberta.ca/WaterWells/d/>. Accessed July 13, 2022.
- Government of Alberta. 2022c. Fisheries and Wildlife Management Information System (FWMIS). Available at: https://geospatial.alberta.ca/FWIMT_Pub/?TermsOfUseRequired=true&Viewer=FWIMT_Pub. Accessed July 13, 2022.
- Government of Alberta. 2022d. Listing of Historical Resources. Available at: <https://open.alberta.ca/publications/4211759>. Accessed July 13, 2022.
- Government of Alberta. 2022e. Wildlife Sensitivity Maps. Available at: <https://www.alberta.ca/wildlife-sensitivity-maps.aspx>. Accessed July 13, 2022.
- Government of Alberta. 2022f. Environmental Site Assessment Repository. Available at: <https://www.esar.alberta.ca/ESARmap.aspx?&>. Accessed August 18, 2022.
- Government of Canada. 2018. General Nesting Periods of Migratory Birds in Canada. Environment Canada. Available at: <https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html>. Accessed July 13, 2022.
- Government of Canada. 2020. Interim code of practice: End-of-pipe fish protection screens for small water intakes in freshwater. Available at: <https://www.dfo-mpo.gc.ca/pnw-ppe/codes/screen-ecran-eng.html>. Accessed August 22, 2022.
- Government of Canada. 2021a. Species at Risk Public Registry – Species Search. Available at: <https://species-registry.canada.ca/index-en.html#/species?sortBy=commonNameSort&sortDirection=asc&pageSize=10>. Accessed July 13, 2022.
- Government of Canada. 2021b. Schedule 1 List of Wildlife Species at Risk. Available at: https://www.sararegistry.gc.ca/species/schedules_e.cfm?id=1. Accessed July 13, 2022.
- Government of Canada. 2022. Registry for Abandoned Nests. Available at: <https://www.permis-permits.ec.gc.ca/en/AbandonedNests>. Accessed August 22, 2022.
- Historical Resources Act. RSA 2000, c H-9*
- Migratory Birds Convention Act, 1994 (S.C. 1994, c. 22)*
- Migratory Birds Regulations, 2022: SOR/2022-105*
- National Wildlife Federation. 2022. Grizzly Bear.

- Natural Regions Committee. 2006. Natural Regions and Subregions of Alberta. Compiled by D.J. Downing and W.W. Pettapiece. Government of Alberta. Pub. No. T/852. Available at: https://www.albertaparks.ca/media/2942026/nrsrcomplete_may_06.pdf. Accessed July 13, 2022.
- Pedocan Land Evaluation Ltd. 1993. Soil Series Information for Reclamation Planning in Alberta. Reclamation research technical advisory committee.
- Prior, G. J., Hathaway, B., Glombick, P.M., Pana, D.I., Banks, C.J., Hay, D.C., Schneider, C.L., Grobe, M., Elgr, R., and Weiss, J.A. 2013. Bedrock Geology of Alberta. Alberta Geological Survey, Map 600.
- Public Lands Act*. P-40 RSA 2000
- Soil Conservation Act*. RSA 2000, c. S-15
- Species at Risk Act*. SC 2002, c. 29
- Water Act*. RSA 2000, c. W-3
- Weed Control Act*. RSA 2008, c. W-5.1.
- Weed Control Regulation*. Alberta Reg. 19/2010.
- Wildlife Act*. RSA 2000, c. W-10
- Wildlife Act: Wildlife Regulation*. Alberta Regulation 143/1997
- WSP Canada Inc. 2021. Desktop Environmental Constraints Assessment. Greenview Industrial Gateway. 23 pg. Prepared for the Municipal District of Greenview No. 16.

APPENDIX A - UPLAND FIELDNOTES

ID 10 - Upland 4

July 7 9:05AM

16°C partly cloudy.

Tree (10m radius)

→ new point on Collector

IMG 3107-3110

White spruce (*Picea glauca*)

Paper birch (*Betula papyrifera*)

Trembling aspen (*Populus tremuloides*)

Shrub (5m radius)

Twining honeysuckle (*Lonicera dioica*)

Bracted honeysuckle (*Lonicera involucrata*)

Red raspberry (*Rubus idaeus*)

Wild rose (*Rosa acicularis*)

Saskatoon (*Amelanchier alnifolia*)

Bearberry (*Symphoricarpus uva-ursi*)

Herb (1x1m)

Wild strawberry (*Fragaria virginiana*)

Common yarrow (*Achillea millefolium*)

Palm-leaf coltsfoot (*Parasites frigidus* var. *palmates*)

American vetch (*Vicia americana*)

Galium boreale (northern bedstraw)

Wild lily of the valley (*Maianthemum canadensis*)

Tall lungwort (*Mertensia paniculata*)

Twin flower (*Linnaea borealis*)

Bunchberry (*Cornus canadensis*)

Red paintbrush (*Castilleja coccinea*)

Site 10 - upland 4 July 7, 2022

Auditory

Swainson's thrush
Wilson's snipe
American Robin
black-capped chickadee
white-throated sparrow
ruffed grouse
Hermit thrush
White-breasted nuthatch
yellow-bellied sapsucker
Northern flicker
red-breasted nuthatch

Visual

~~no~~
~~base~~

incidental

moose tracks
coyote scat

woodpecker?

ID 20 - Upland 5

July 7 2022

9:45 AM

Partly cloudy 16°C

Tree (10m radius)

photos? ☒

White spruce (*Picea glauca*)

trembling aspen (*Populus tremuloides*)

paper birch (*Betula papyrifera*)

IMG 3112-3120

• new point on
Collector

Shrub (5m radius)

- northern gooseberry (*Ribes oxycanthoides*)

- wild rose (*Rosa acicularis*)

bracted honeysuckle (*Lonicera involucrata*)

low bush cranberry (*Viburnum edule*)

beaked hazelnut (*Corylus cornuta*)

Herb (1x1m)

Aralia nudicaulis (wild sarsaparilla)

creamy peavine (*Lathyrus ochroleucus*)

bunchberry (*Cornus canadensis*)

wild strawberry (*Fragaria virginiana*)

cow parsnip (*Heracleum maximum*)

bishops cap (*Mitella nuda*)

common horsetail (*Equisetum arvense*)

galium boreale (northern bedstraw)

Viola canadensis (Canada violet)

red paintbrush (*Castilleja coccinea*)

butter and eggs

Site 20 - Upland S - July 7, 2022 @ 9:45 am.

Auditory

Swainson's thrush
Yellow-rumped warbler
red-eyed vireo
white-throated sparrow

Visual

Swainson's thrush

Incidental

moose tracks

1D 30 - Upland 6 → new location due to clearing. Marked
on collector

July 6, 2022 16°C partly cloudy.
10:30AM

photos ☒

Tree

White Spruce (*Picea glauca*)
Paper birch (*Betula papyrifera*)

IMG 3121 - 3130

Shrub

high bush cranberry (*Viburnum opulus*)
wild rose (*Rosa acicularis*)
northern gooseberry (*Ribes oxycanthoides*)
bracted honeysuckle (*Lonicera involucrata*)

Herb

Aralia nudicaulis (wild sassafras)
Stinging nettle (*Urtica dioica*)
Common horsetail (*Equisetum arvense*)
tall lungwort (*Mertensia paniculata*)
bishops cap (*Mitella nuda*)
~~galium boreale → northern and sweet~~
fireweed (*Chamaenerion angustifolium*)
viola canadense (canada violet)
cow parsnip (*Heracleum maximum*)
purple avens (*Geum rivale*)
northern bedstraw (*Galium boreale*)
Sweet bedstraw (*Galium triflorum*)

Site 30 - upland 6 - July 7, 2022 @ 10:30am

Auditory

white-throated sparrow
magnolia warbler
yellow-rumped warbler

Visual

Incidental

Notes:

Auditory interference
compressor station nearby.

ID 40 - Upland 3

July 7 2022 17°C cloudy 11:51 AM
+ light rain

Tree

Trembling aspen (*populus tremuloides*) 3 pic this
white spruce (*picea glauca*)

photos ☒

IMG 3132-3141

Shrub

Wild rose (*rosa acicularis*)
bracted honeysuckle (*lonicera involucrata*)
northern gooseberry (*ribes oxycanthoides*)
low bush cranberry (*viburnum edule*)
beaked hazelnut (*corylus cornuta*)
canadian buffaloberry (*shepherdia canadense*)
pussy willow (*salix discolor*)

-new point on
collector

Herb

wild lily of the valley	(<i>maianthemum canadense</i>)
Common horsetail	(<i>equisetum arvense</i>)
Cow parsnip	(<i>heracleum maximum</i>)
galium boreale	(northern bedstraw)
False Solomons Seal	(<i>maianthemum racemosum</i>)
Fireweed	(<i>chamaenerion angustifolium</i>)
wild strawberry	(<i>fragaria virginiana</i>)
heart leaved arnica	(<i>arnica cordifolia</i>)

Site 40 - Upland 3 - July 7, 2022 @ 12 pm.

Auditory

American redstart

red-eyed vireo

American robin

white-throated sparrow

Ovenbird

Visual

Incidental

Notes:

Started raining

at minute 6:30/

8:00 min.

ID 50 - wetland 1

July 7 2022 12:33PM

18°C and light
rain

Tree

white spruce (*Picea glauca*)
black spruce (*Picea mariana*)
tamarack (*Larix laricina*)

photos ☒

IMG 3142 - 3150

Note: Forest around
wetland is all
cleared

- point on
collector

Shrubs

labrador tea (*Ledum groenlandicum*)
bog cranberry (*Vaccinium oxycoccos*)
cloud berry (*Rubus chamaemorus*)

Herb

ground cover moss

Reindeer moss (*Cladonia rangiferina*)
Sphagnum (*Sphagnum* moss)

Site 50 - ~~Upland 2~~ -
Wetland 1
(peat/bog)

July 7, 2022 @ 12:30pm.

Auditory

Wilson's Snipe
White-throated sparrow
Lincoln's Sparrow
black-capped
Mountain Chickadee
White-winged crossbill
Song Sparrow
Tree Swallow
American Robin
Northern waterthrush
Connecticut warbler
Cassin's Finch
Alder flycatcher

Visual

Incidental

moss tracks.

bufflehead -
on nearby wetland.

ID 60 - Upland 1

July 7, 2022 1:01pm

18°C and light
rain

Trees

trembling aspen (*populus tremuloides*)
white spruce (*picea glauca*)

photos ☒

IMG 3151 - 3161

Shrubs

-new point on
collector

Saskatoon (*amelanchier alnifolia*)
northern gooseberry (*ribes oxycanthoides*)
red and white baneberry (*actaea rubra*)
canadian buffalobery (*shepherdia canadensis*)
wild rose (*rosa acicularis*)
bracted honeysuckle (*lonicera involucrata*)
low bush cranberry (*viburnum edule*)
choke cherry (*prunus virginiana*)
bearberry (*symphoricarpos uva-ursi*)

Herbs

Common pink wintergreen (*pyrola asarifolia*)
American vetch (*vicia americana*)
galium boreale (northern bedstraw)
wild strawberry (*fragaria virginiana*)
canada violet (*viola canadensis*)
creamy peavire (*lathyrus ochroleucus*)
palmate-leaf coltsfoot (*parasites frigidus* var. *palmates*)
bunchberry (*cornus canadensis*)
Common yarrow (*achillea millefolium*)

Site 60 - Upland 1 - July 7, 2022 @ 1:00pm

Auditory

Visual

Incidental
deer tracks

Killdeer
black-capped chickadee
American Robin
white-throated sparrow

Site 70 - upland 2

July 7, 2022 @ 2:00pm

17°C slight rain

Trees

White spruce (*Picea glauca*)

photos ☒

IMG 3162-3170

Shrubs

high bush cranberry (*Viburnum opulus*)

Herbs

palmate leaf coltfoot (*Petasites frigidus* var. *palmates*)

bunchberry (*Cornus canadensis*)

galium boreale (northern bedstraw)

bishops cap (*Mitella nuda*)

tall lungwort (*Mertensia paniculata*)

twin flower (*Linnaea borealis*)

Fragaria virginiana (wild strawberry)

sweet bedstraw (*Galium triflorum*)

Canada violet (*Viola canadensis*)

doeberry ~~awberry~~ (*Fucus flagellaris*)

common yarrow (*Achillea millefolium*)

doeberry

Site 70 - Upland 2 - July 7, 2022 @ 2:00pm

Auditory

Usual

Incidental
squirrel

Red-breasted nuthatch
Wilson's snipe

Cougar tracks
observed at well
pad near site.
(71)
↑
ID

APPENDIX B - AQUATIC FIELDNOTES



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology – see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 001
Location : (example: From Effluent Outfall to Range road) Canfor Cut Across Rd	Time and Date July 5, 2022 3:48pm

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) upstream- grassy Forest	Any large ponds/wetlands? – approximate size of any ponding (area, largest cross section) No
Upland Area (Forest, Ag, pasture, residential, ...) upstream- grassy. Forest	Sinuosity (straight, slight meander, strong meander) Slight meander
Any other obstructions (beaver dams, culverts; describe size) Culvert (not hanging) - 1000mm	Any surface water inflows in this reach? (add GPS point) no
Flow measurements (yes/no), use separate sheet and note reach #) (no)	General gradient (stagnant versus slowly moving vs. running) running, flaws present
Average Channel wetted width (m) 1-1.2 m wide	Bank-full width (m)
Maximum water depth (m) 30cm	Substrate (mud, sand, gravel, cobble, bolder ...) 10% cobble, 90% silt at culvert
☒ Riffle ☒ Run ☒ Pool sequence (yes/no) yes	Number of photos taken IMG 2804-2812

Other Notes:

Not offsetting candidate
Small pool at inlet



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology – see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 002
Location : (example: From Effluent Outfall to Range road) Canfor cut across road	Time and Date July 5, 2022 4:05pm

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Wetland upstream	Any large ponds/wetlands? – approximate size of any ponding (area, largest cross section) yes - 10m upstream large (100m ²) ponding
Upland Area (Forest, Ag, pasture, residential, ...) Forest	Sinuosity (straight, slight meander, strong meander) slight meander
Any other obstructions (beaver dams, culverts; describe size) no, culvert (700mm) 2 inch overhang	Any surface water inflows in this reach? (add GPS point) no
Flow measurements (yes/no), use separate sheet and note reach #) no	General gradient (stagnant versus slowly moving vs. running) slowly moving
Average Channel wetted width (m) 0.5m	Bank-full width (m) /
Maximum water depth (m) up - 0.2m down - 0.5m	Substrate (mud, sand, gravel, cobble, bolder ...) Organics
Riffle / Run / Pool sequence (yes/no) no	Number of photos taken IMG 2813 - 2829
Other Notes: Potential candidate	

down

Downstream pool with 2 inch overhang culvert
Slow moving. mud / organic bottom down trace cobble
Riffle downstream of pool



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology – see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 003
Location : (example: From Effluent Outfall to Range road) CanFor cut across	Time and Date July 5, 2022 4:24pm

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) grassland	Any large ponds/wetlands? – approximate size of any ponding (area, largest cross section) No Pool at outlet (10m x 10m)
Upland Area (Forest, Ag, pasture, residential, ...) grass to forest	Sinuosity (straight, slight meander, strong meander)
Any other obstructions (beaver dams, culverts; describe size) Lots of LWD 0.5m overhang culvert	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/no), use separate sheet and note reach #)	General gradient (stagnant versus slowly moving vs. running) Slow moving
Average Channel wetted width (m) 0.3m	Bank-full width (m) /
Maximum water depth (m) 0.1-0.2m	Substrate (mud, sand, gravel, cobble, bolder ...) 50% cobble, 50% fines - up. down - rip rap (cobble) intermixed
Riffle / Run / Pool sequence (yes/no)	Number of photos taken 734-002
Other Notes: Garter snakes (2)	Potential offsetting

Overhanging culvert blocking passage

in fines
and gravel



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology – see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 004
Location : (example: From Effluent Outfall to Range road) CanRur Cut	Time and Date July 5, 2022 4:55pm

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Forest	Any large ponds/wetlands? – approximate size of any ponding (area, largest cross section) pond at outlet (10m x 10m)
Upland Area (Forest, Ag, pasture, residential, ...) Forest	Sinuosity (straight / <u>slight meander</u> , strong meander)
Any other obstructions (beaver dams, culverts; describe size) LWD blocking culvert entrance	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/ <u>no</u>) use separate sheet and note reach #)	General gradient (stagnant versus <u>slowly moving</u> vs. running)
Average Channel wetted width (m) 0.5m	Bank-full width (m) /
Maximum water depth (m) up - 0.2m down - 0.4m	Substrate (<u>mud</u> , sand, gravel, cobble, bolder ...) intmixed small gravel → riprap
Riffle / Run / Pool sequence (yes/ <u>no</u>)	Number of photos taken IMG 2831 - 2842
Other Notes: LWD could be removed to open passage	



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology - see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 100
Location : (example: From Effluent Outfall to Range road) McMillar Creek	Time and Date July 6, 2022 9:45am

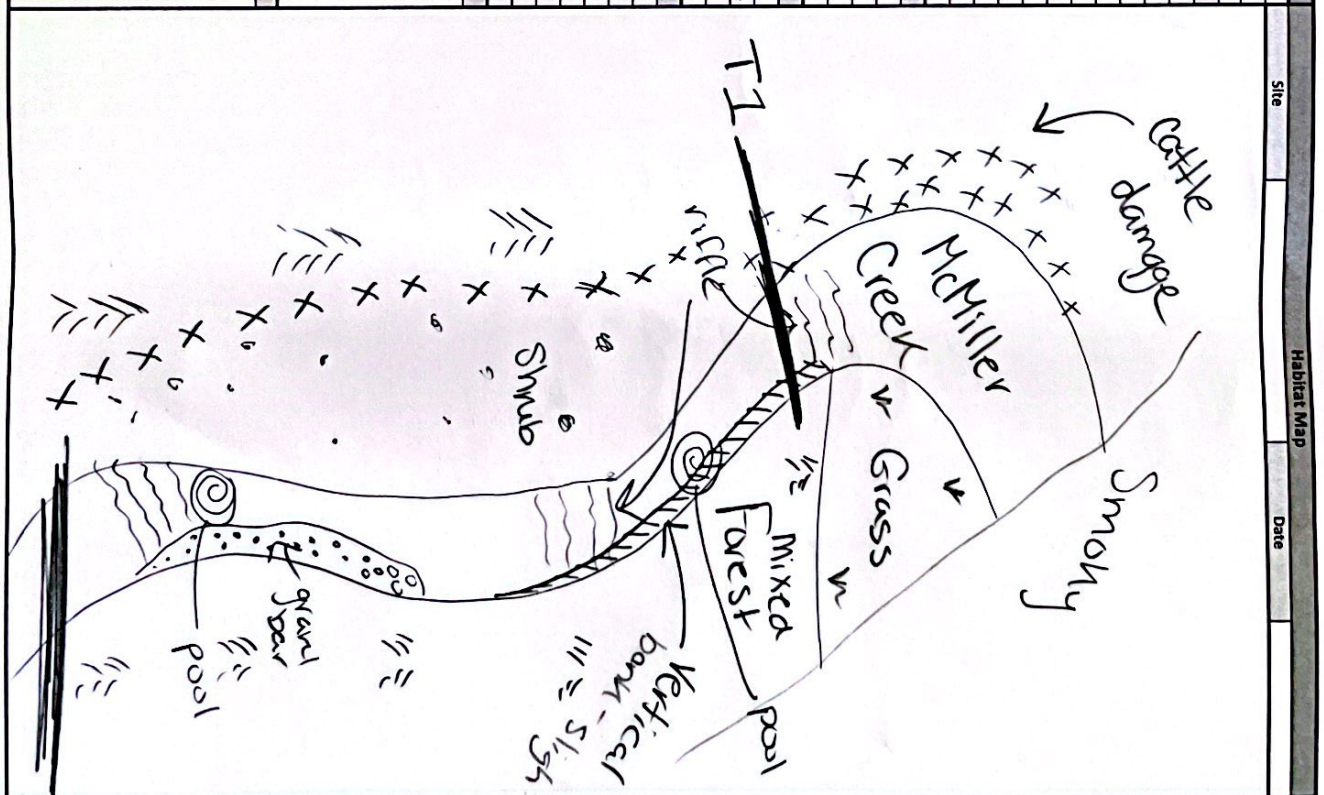
Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Forest + Shrub	Any large ponds/wetlands? - approximate size of any ponding (area, largest cross section) No
Upland Area (Forest, Ag, pasture, residential, ...) Forest, grazing lease	Sinuosity (straight, slight meander, strong meander) slight meander
Any other obstructions (beaver dams, culverts; describe size) No obstructions	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/no) use separate sheet and note reach #) (no)	General gradient (stagnant versus slowly moving vs. running) slowly moving
Average Channel wetted width (m) 2m	Bank-full width (m)
Maximum water depth (m) 0.3m	Substrate (mud, sand, gravel, cobble, bolder ...) 40% Cobble, 20% gravel, 40% Fines
Riffle / Run / Pool sequence (yes/no) (no)	Number of photos taken IMG 2863-2893

Other Notes:

Cattle crossing on grazing lease - Crown land
Potential to restore creek where cattle cross near mouth Good habitat upstream.

Aquatics Site Card						Habitat Map	
Site	Date	Crew	Weather	DO (mg/l)	DO (mg/l)	Site	Date
McMiller Creek	5/24/06	RS	Sunny				
Temperature	19.2						
pH							
Parameter	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5		
Channel Width (TDB) (m)	10	15					
Channel Width (HWM) (m)							
Wetted Width (m)	7	10					
Depth @ 25% Width (m)	0.5	0.5					
Depth @ 50% Width (m)	0.5	0.3					
Depth @ 75% Width (m)	0.1	0.3					
Pool (%)	5	10					
Riffle (%)	10	30					
Run (%)	85						
Other (%)							
HWM (m)							
Height (m)	1	1.5	Upstream				
Composition	F/G/C/Bo/Bt/F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt		
Riparian	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M		
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U		
Height (m)	0.1	1	Right Bank				
Composition	F/G/C/Bo/Bt/F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt	F/G/C/Bo/Bt		
Riparian	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M		
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U		
Substrate (%)							
Fines (<2mm)	40	40					
Small Gravel (2 - 16mm)	5	5					
Large Gravel (17 - 64 mm)	5	5					
Small Cobble (65 - 125 mm)	15	15					
Large Cobble (126 - 256 mm)	45	45					
Boulder (>256 mm)	1	1					
Bedrock							
Legend							
TDB: Top of Bank							
HWM: Highwater Mark							
Pool: Discrete portion of channel with reduced velocity, formed by channel scour							
Riffle: High velocity portion with broken surface, relatively shallow							
Run: Moderate to high velocity with unbroken surface, deeper than riffle							
Bank composition: F - Fines, G - Gravel, C - Cobble, Bo - Boulder, Bt - Bedrock							
Riparian: Gr - Grasses, S - Shrubs, D - Deciduous, C - Coniferous, M - Mixed Forest							
Bank Shape: S - Slumping, V - Vertical, U - Undercut							
Notes & Habitat Evaluation							



T2



Site 300 (upstream)

↳ identical

Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology - see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 200 (Intake)
Location : (example: From Effluent Outfall to Range road) Smoky River Bank	Time and Date July 6, 2022 10:30 AM

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Forest	Any large ponds/wetlands? - approximate size of any ponding (area, largest cross section) Some small wetlands adjacent cut line - not at intake
Upland Area (Forest, Ag, pasture, residential, ...) Forest	Sinuosity (straight, slight meander, strong meander) slight meander
Any other obstructions (beaver dams, culverts; describe size) No	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/no), use separate sheet and note reach #) no	General gradient (stagnant versus slowly moving vs. running) Running
Average Channel wetted width (m) ~ 300m	Bank-full width (m)
Maximum water depth (m) Unknown	Substrate (mud, sand, gravel, cobble, bolder ...) Fines, cobbles, some gravel
Riffle / Run / Pool sequence (yes/no) no	Number of photos taken IMG 2913 - 2922 (intake) 2927 - 2936 (100m upstream)
Other Notes: Very steep, vertical bank with minimal bank at water level. Unable to get to water due to grade. Large volume of overhanging vegetation and large woody debris.	

Site 300 = identical

Aquatics Site Card

Site	200	Crew	EC
Date	July 6	Weather	Sunny
Temperature		pH	
Parameter	Transect 1	Transect 2	Transect 3
Channel Width (TDB) (m)	200		
Channel Width (HWM) (m)			
Wetted Width (m)			
Depth @ 25% width (m)			
Depth @ 50% width (m)			
Depth @ 75% width (m)			
Pool (%)			
Riffle (%)			
Run (%)	100		
Other (%)			
HWM (m)			
Height (m)	1	Left Bank Upstream	
Composition	(F)G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be		
Riparian	Gr/S/D/C/M Gr/S/D/C/M Gr/S/D/C/M Gr/S/D/C/M		
Shape	S/V/U S/V/U S/V/U S/V/U		
Height (m)	2	Right Bank	
Composition	(F)G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be		
Riparian	Gr/S/D/C/M Gr/S/D/C/M Gr/S/D/C/M Gr/S/D/C/M		
Shape	S/V/U S/V/U S/V/U S/V/U		
Substrate (%)			
Fines (<2mm)	100		
Small Gravel (2 - 16mm)	15		
Large Gravel (17 - 64 mm)			
Small Cobble (65 - 125 mm)			
Large Cobble (126 - 256 mm)	13		
Boulder (>256 mm)			
Bedrock			

Legend

TDB: Top of Bank
HWM: Highwater Mark
Pool: Discrete portion of channel with reduced velocity, formed by channel scour
Riffle: High velocity portion with broken surface; relatively shallow
Run: Moderate to high velocity with unbroken surface; deeper than riffle
Bank composition: F - Fines, G - Gravel, C - Cobble, Bo - Boulder, Be - Bedrock
Riparian: Gr - Grasses, S - Shrubs, D - Deciduous, C - Coniferous, M - Mixed forest
Bank Shape: S - Slumping, V - Vertical, U - Undercut

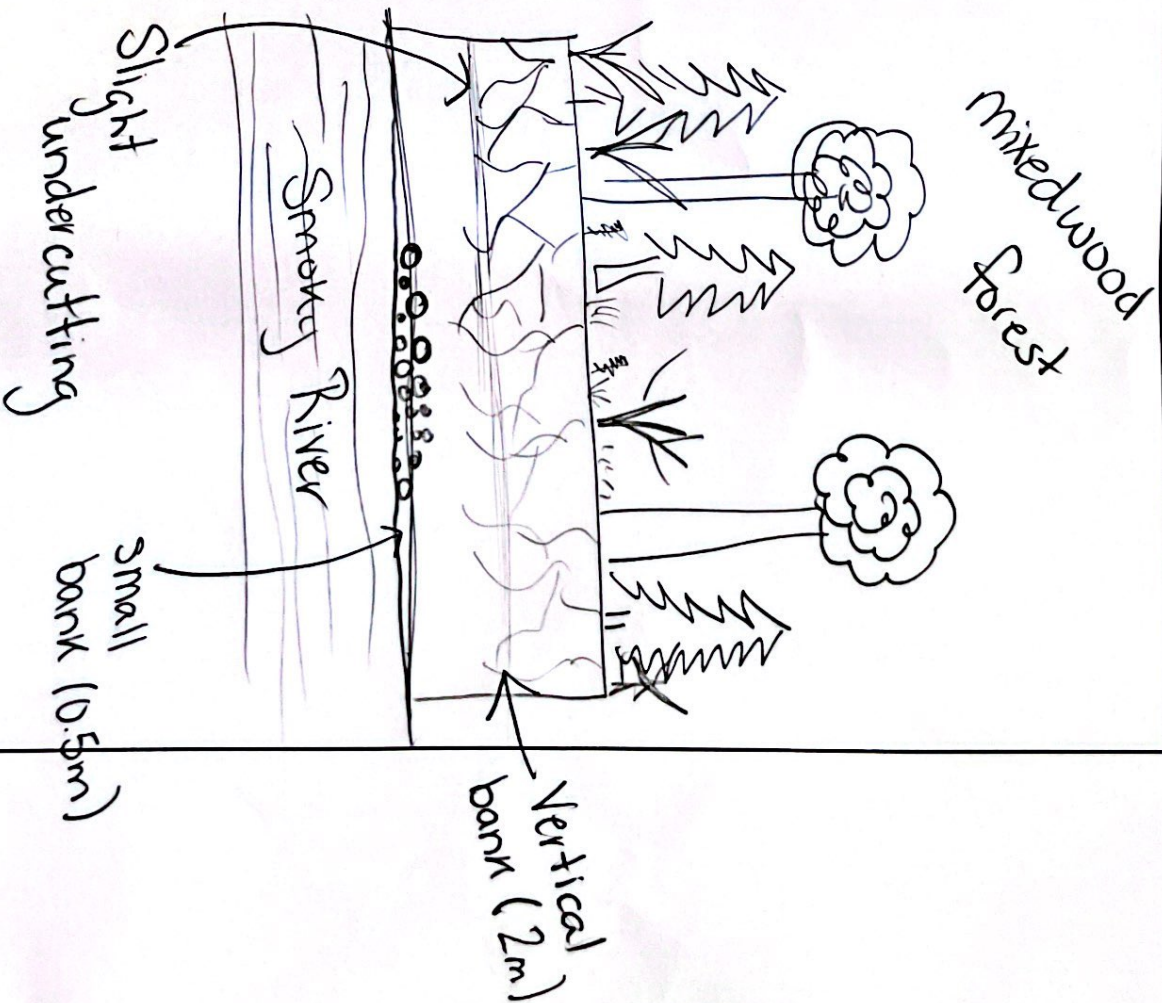
Notes & Habitat Evaluation

Water discolored, substrates are not visible. Substrate estimate made by visible bank + gravel bars in area.

Site

Habitat Map

Date





Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology – see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 400
Location : (example: From Effluent Outfall to Range road) Side channel of Smoky	Time and Date July 6 11:15am

Observations:

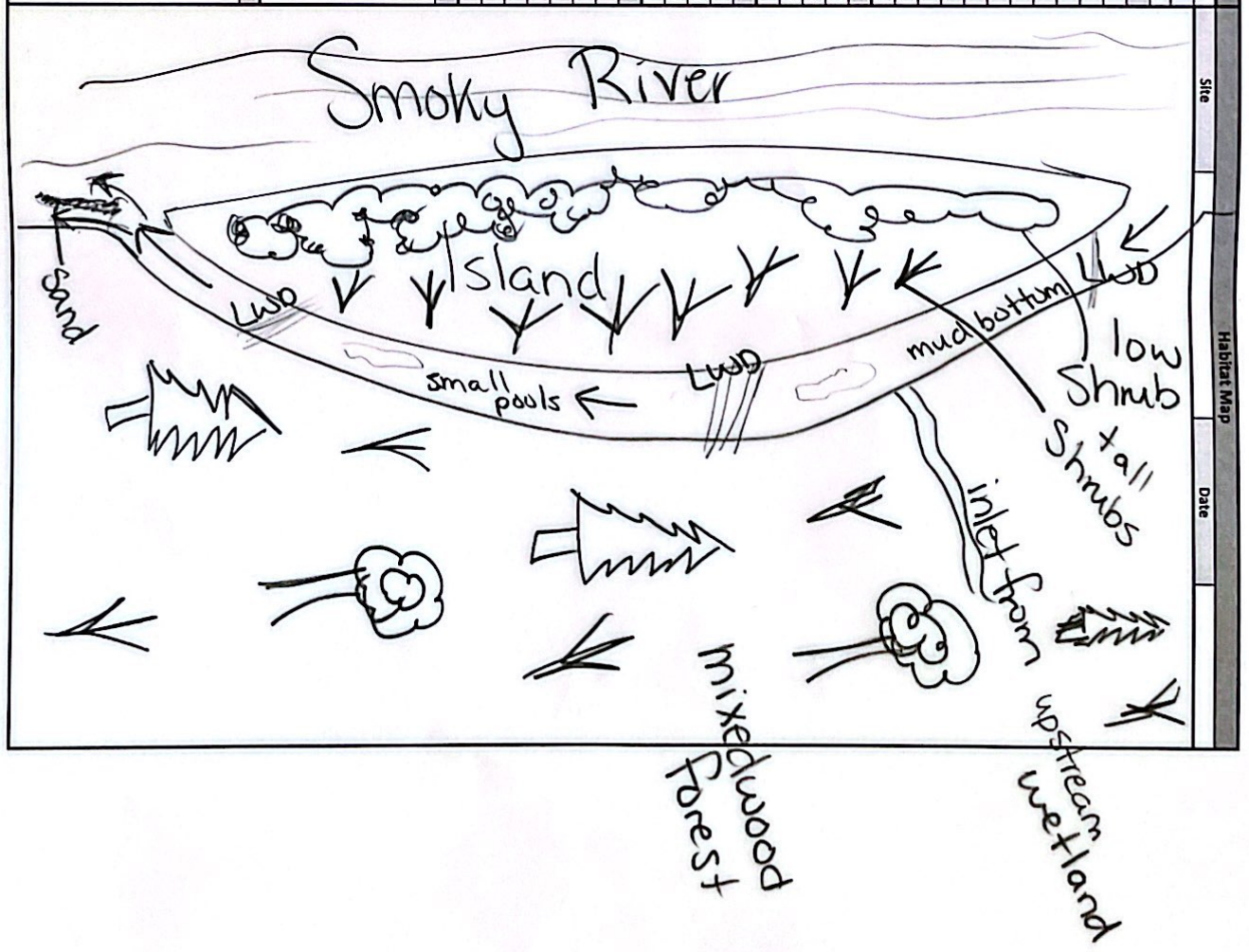
Riparian area (wetland, pond, ☒ forest, pasture, shrubs, etc.)	Any large ponds/wetlands? – approximate size of any ponding (area, largest cross section) No
Upland Area (☒ Forest, Ag, pasture, residential, ...)	Sinuosity (☒ straight, slight meander, strong meander)
Any other obstructions (beaver dams, culverts; describe size) No but beaver dam/den in area	Any surface water inflows in this reach? (add GPS point) yes. From adjacent wetland (data point 401)
Flow measurements (yes ☒ no) use separate sheet and note reach #)	General gradient (stagnant ☒ versus slowly moving vs. running)
Average Channel wetted width (m) 0.5m	Bank-full width (m)
Maximum water depth (m) 0.2	Substrate (mud, sand, gravel, cobble, bolder ...) 100% mud.
Riffle / Run / Pool sequence (yes ☒ no)	Number of photos taken IMG 2941 - 2984

Other Notes:

Very muddy, evidence of flooding into channel potential to excavate inlet and allow water to flow into reach. ~1m elevation difference

Aquatics Site Card					
Site	Date	Crew	Weather	DO (mg/L)	
400	July	EC SL			
Parameter	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5
Temperature					
Channel Width (TOB) (m)	2				
Channel Width (HWM) (m)					
Wetted Width (m)	0.5				
Depth @ 25% width (m)	0				
Depth @ 50% width (m)	0.2				
Depth @ 75% width (m)	0				
Pool (%)					
Riffle (%)					
Run (%)					
Other (%)					
HWM (m)					
Left Bank upstream					
Height (m)	1				
Composition	(F) G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be
Riparian	(G/S) D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U
Right Bank					
Height (m)	1.5				
Composition	(F) G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be
Riparian	(G/S) D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U
Substrate (%)					
Fines (<2mm)					
Small Gravel (2 - 16mm)	100				
Large Gravel (17 - 64 mm)					
Small Cobble (65 - 125 mm)					
Large Cobble (126 - 256 mm)					
Boulder (>256 mm)					
Bedrock					
Legend					
TOB: Top of Bank HWM: Highwater Mark Pool: Discrete portion of channel with reduced velocity, formed by channel scour Riffle: High velocity portion with broken surface; relatively shallow Run: Moderate to high velocity with unbroken surface; deeper than riffle Bank composition: F - Fines, G - Gravel, C - Cobble, Bo - Boulder, Be - Bedrock Riparian: Gr - Grasses, S - Shrubs, D - Deciduous, C - Coniferous, M - Mixed Forest Bank Slope: S - Slumping, V - Vertical, U - Undercut					
Notes & Habitat Evaluation					

potential to create a
side channel ~1m
elevation difference





Spotted sandpiper
American robin

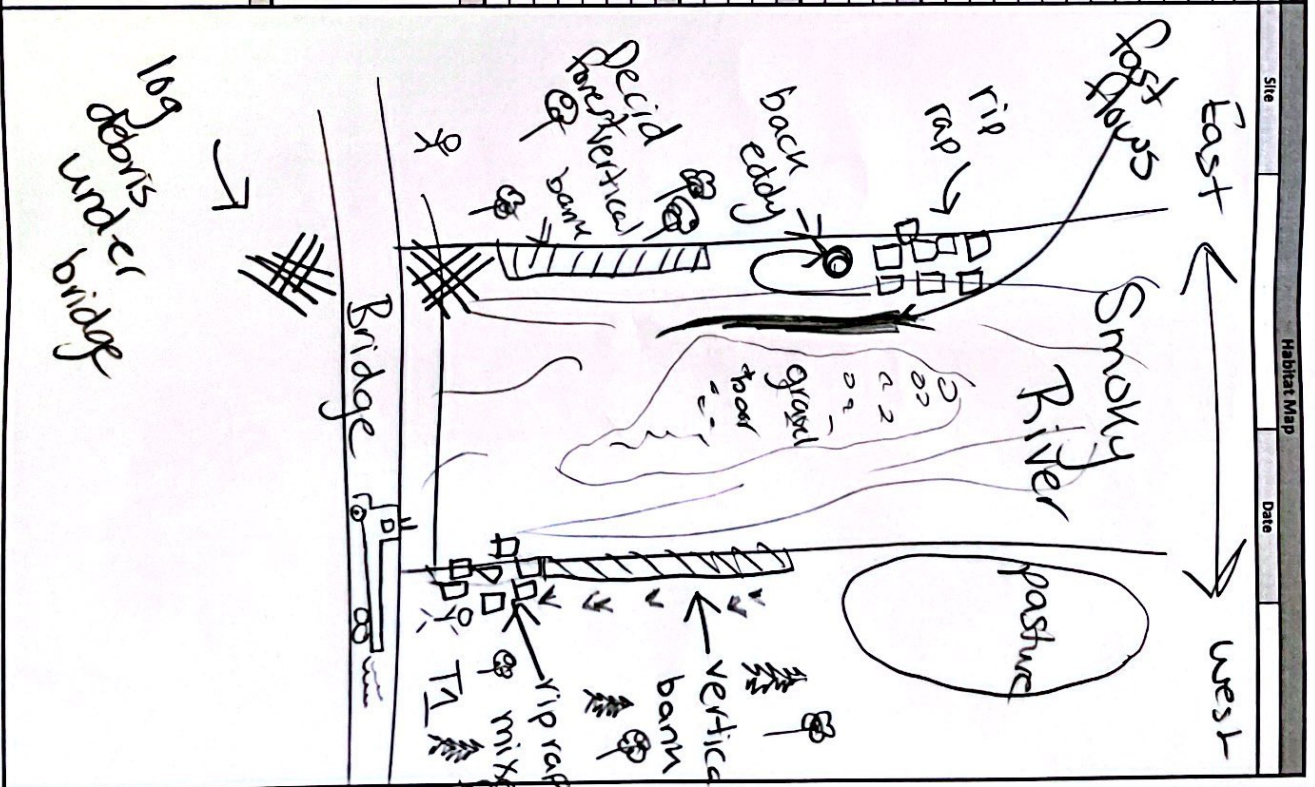
Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology - see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 500 + 501
Location : (example: From Effluent Outfall to Range road) Bank across from intake	Time and Date July 6 2:45pm
Observations:	
Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Shrub to Forest	Any large ponds/wetlands? - approximate size of any ponding (area, largest cross section) No
Upland Area (Forest, Ag, pasture, residential, ...) Forest	Sinuosity (straight, slight meander, strong meander) straight
Any other obstructions (beaver dams, culverts; describe size) No	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/no) use separate sheet and note reach #) no	General gradient (stagnant versus slowly moving vs. running) running
Average Channel wetted width (m) ~300m	Bank-full width (m)
Maximum water depth (m) ?	Substrate (mud, sand, gravel, cobble, bolder ...) Cobble, fines and gravels
Riffle / Run / Pool sequence (yes/no) Back eddy formed on left bank (looking up)	Number of photos taken IMG 2997-3037
Other Notes:	

Aquatics Site Card									
Site	500 + 501		Crew	EC JL					
Date	July 6		Weather						
Temperature			pH						
Parameter	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5				
Channel Width (TOB) (m)	200								
Channel Width (HWM) (m)									
Wetted Width (m)	1								
Depth @ 25% Width (m)	1								
Depth @ 50% Width (m)									
Depth @ 75% Width (m)									
Pool (%)	10								
Riffle (%)	80								
Run (%)									
Other (%)									
HWM (m)									
Left Bank									
Height (m)	2								
Composition	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be				
Riparian	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M				
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U				
Right Bank									
Height (m)	3								
Composition	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be	F/G/C/Bo/Be				
Riparian	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M	Gr/S/D/C/M				
Shape	S/V/U	S/V/U	S/V/U	S/V/U	S/V/U				
Substrate (%)									
Fines (<2mm)									
Small Gravel (2 - 16mm)									
Large Gravel (17 - 64 mm)									
Small Cobble (65 - 125 mm)									
Large Cobble (126 - 256 mm)									
Boulder (>256 mm)									
Bedrock									



Thalweg on East

Notes & Habitat Evaluation

TOB: Top of Bank
HWM: Highwater Mark
Pool: Discrete portion of channel with reduced velocity, formed by channel scour
Riffle: High velocity portion with broken surface, relatively shallow
Run: Moderate to high velocity with unbroken surface, deeper than riffle
Bank composition: F - Fines, G - Gravel, C - Cobble, Bo - Boulder, Be - Bedrock
Riparian: Gr - Grasses, S - Shrubs, D - Deciduous, C - Coniferous, M - Mixed Forest
Bank Shape: S - Slumping, V - Vertical, U - Undercut



Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology - see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: <u>600</u>
Location : (example: From Effluent Outfall to Range road) <u>McLeod Flats Recreation</u>	Time and Date <u>July 6 3:22 pm</u>

Observations:

Riparian area (wetland, pond, <u>forest</u> pasture, shrubs, etc.)	Any large ponds/wetlands? - approximate size of any ponding (area, largest cross section) <u>No</u>
Upland Area <u>Forest</u> Ag, pasture, residential, ...)	Sinuosity <u>straight</u> , slight meander, strong meander)
Any other obstructions (beaver dams, culverts; describe size) <u>No</u>	Any surface water inflows in this reach? (add GPS point) <u>No</u>
Flow measurements (yes/no) <u>no</u> , use separate sheet and note reach #)	General gradient (stagnant versus slowly moving vs. <u>running</u>)
Average Channel wetted width (m) <u>~300m</u>	Bank-full width (m) <u>/</u>
Maximum water depth (m) <u>?</u>	Substrate (<u>mud, sand, gravel, cobble, bolder</u> ...)
<u>Riffle / Run</u> Pool sequence (yes/no)	Number of photos taken <u>IMG3039-3056</u>

Other Notes:

Gravel bar mostly underwater, aerial photo during low flow times. Not potential offsetting area

Aquatics Site Card

Site	1000 July				Crew	EC SL				
Temperature					pH					
Parameter	Transect 1	Transect 2	Transect 3	Transect 4	Transect 5					
Channel Width (TOB) (m)	300									
Channel Width (HWM) (m)										
Wetted Width (m)										
Depth @ 25% Width (m)										
Depth @ 50% Width (m)										
Depth @ 75% Width (m)										
Pool (%)										
Riffle (%)										
Run (%)										
Other (%)										
HWM (m)										
Height (m)	3					Left Bank upstream				
Composition	B/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be									
Riparian	Gr/S/D/C/M S/V/U									
Shape	S/V/U									
Height (m)	2					Right Bank				
Composition	F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be F/G/C/Bo/Be									
Riparian	Gr/S/D/C/M S/V/U									
Shape	S/V/U									
Substrate (%)										
Fines (<2mm)										
Small Gravel (2 - 16mm)										
Large Gravel (17 - 64mm)										
Small Cobble (65 - 125mm)										
Large Cobble (126 - 256mm)										
Boulder (>256mm)										
Bedrock										

Legend

TOB: Top of Bank
HWM: Highwater Mark
Pool: discrete portion of channel with reduced velocity; formed by channel scour
riffle: high velocity portion with broken surface; relatively shallow
Run: Moderate to high velocity with unbroken surface; deeper than riffle
Bank composition: F - Fines, G - gravel, C - Cobble, Bo - Boulder, Be - Bedrock
Riparian: Gr - Grasses, S - Shrubs, D - Deciduous, C - Coniferous, M - Mixed forest
Bank Shape: S - Slumping, V - Vertical, U - Undercut

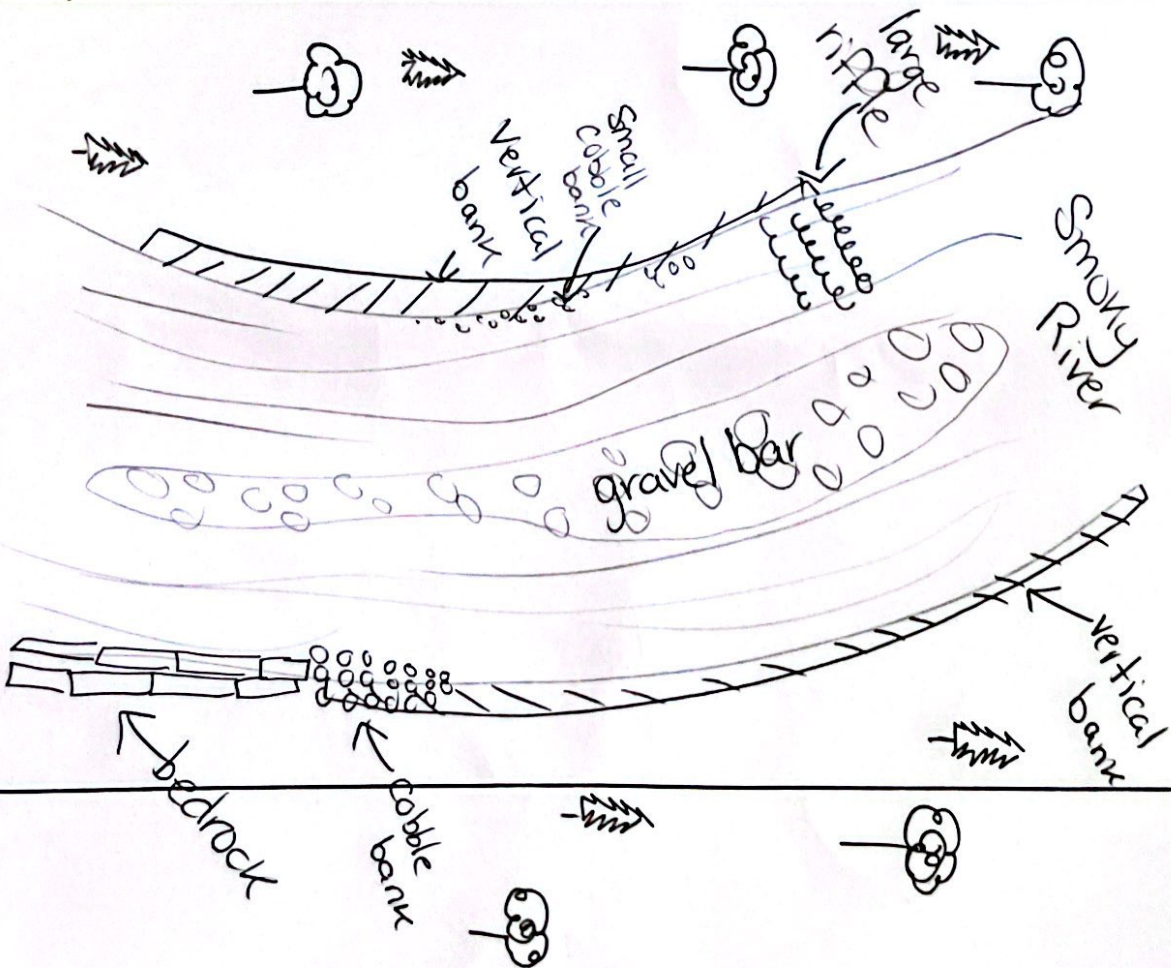
Notes & Habitat Evaluation

"looks like Jurassic Park" - SL

Site

Habitat Map

Date





Tasks:

- 1) Walk creeks and identify reaches (stretches of similar channel morphology - see notes below) - complete field sheet for at least one point along each reach.
- 2) Take GPS points at border between reaches and at each location where sheet was completed

General:

Reach Number	Location Number entered into Trimble: 700
Location : (example: From Effluent Outfall to Range road.) Cantor Cut	Time and Date July 6 3:58pm

Observations:

Riparian area (wetland, pond, forest, pasture, shrubs, etc.) Forest	Any large ponds/wetlands? - approximate size of any ponding (area, largest cross section) No
Upland Area (Forest, Ag, pasture, residential, ...)	Sinuosity (straight, slight meander, strong meander) slight meander
Any other obstructions (beaver dams, culverts; describe size) No	Any surface water inflows in this reach? (add GPS point) No
Flow measurements (yes/no), use separate sheet and note reach #) no	General gradient (stagnant versus slowly moving vs. running) slowly moving
Average Channel wetted width (m) 0.5m	Bank-full width (m) /
Maximum water depth (m) 0.2m	Substrate (mud, sand, gravel, cobble, bolder...) Riprap Boulder, dom. fines
Riffle / Run / Pool sequence (yes/no) no	Number of photos taken IMG 3069-3077
Other Notes: No opportunity for offsetting	