CopperFox Metals Inc.

Schaft Creek Project

British Columbia, Canada

Schaft Creek
Wetland Baseline Report 2007

Prepared by:

Rescan Environmental Services Ltd.
Vancouver, British Columbia

May 2008

EXECUTIVE SUMMARY

Executive Summary

Wetlands are important ecosystems because they are valuable sources, sinks, and transformers of a multitude of chemical and biological material. They are sometimes described as “nature’s water purifier” because of the functions they perform in the hydrological and biochemical cycles. They are also known as “biological supermarkets” for the extensive food chain and rich biodiversity they support. Wetlands are recognized world wide as critical habitat, through United Nations programs such as Ramsar; in Canada a substantial amount of wetlands have been lost due to development. Hence, developments now evaluate the number and type of wetlands which may be affected. This baseline report describes the wetlands in the Schaft Creek area such that the effects of the Project can be later be evaluated.

Within Canada, wetlands are described following the Canadian Wetland Classification System and conserved through the federal policy of wetland conservation. The objective of the policy is to “promote the conservation of Canada’s wetlands to sustain their ecological and socio-economic functions, now and in the future”. There are four primary functions and four associated values. It was the objective of this study to identify the number and types of wetlands and the functions of these wetlands within the study area.

In June, 2006, two wetland sites (Schaft and Mess creeks) were selected for hydrological monitoring and continuous water level logging. Shallow wells were installed at these two sites. Hydrological monitoring was conducted from June to October, 2006, and again from July to October, 2007. Aquatic biological samples of primary and secondary production communities were sampled in the summer of 2007 from 12 wetlands: water and sediments were also collected from these sites to identify the chemical properties of the wetlands. The hydrological, aquatic biological and chemical sample results were assessed with ecosystem survey results to identify wetland function. The ecosystem survey followed provincial methodologies which incorporates provincially relevant ecosystem description methodologies and the federal descriptions of wetland class from the Canadian Wetland Classification System. The ecosystem survey data was also used to map the location and size of wetlands in the study area.

A total of 131 wetland ecosystems were mapped using ecosystem survey and TRIM GIS data. All five federally recognized wetland classes (bog, fen, marsh, swamp, and shallow open water) encompassing 23 provincial wetland ecosystem associations covering a total of 844.2 ha were mapped in the study area. Five provincially blue-listed ecosystems of concern (Wf05, Wf08, Wf13, Wb07, and Wb10) and one COSEWIC listed species of concern (western toad, *Bufo boreas*) were found in the study area. This ecosystem data was combined with the hydrological and aquatic biological survey data to support the descriptions of wetland function. The four wetland functions were identified in wetlands in the study area. Wetland function descriptions were then assessed against known current land use practices to identify and describe wetland value. The two values most important to wetlands in the study area are economic/social/cultural and maintenance of ecosystem health.

ACKNOWLEDGEMENTS

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Field work was conducted by the following Rescan scientists: Wade Brunham, Dave Campbell (M.Sc., GIT.), Chris Doughty (B.Sc.), Steve Guenther (M.Sc., A.Ag.), Greg Norton (M.Sc.), Allyson Longmuir, and Dave Fauquier. Field assistance was provided by: Amanda Quash, and Dion Quash. Report production was coordinated by Joanna Lerner of Rescan.

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1. Introduction

1.1 Schaft Creek Project Summary

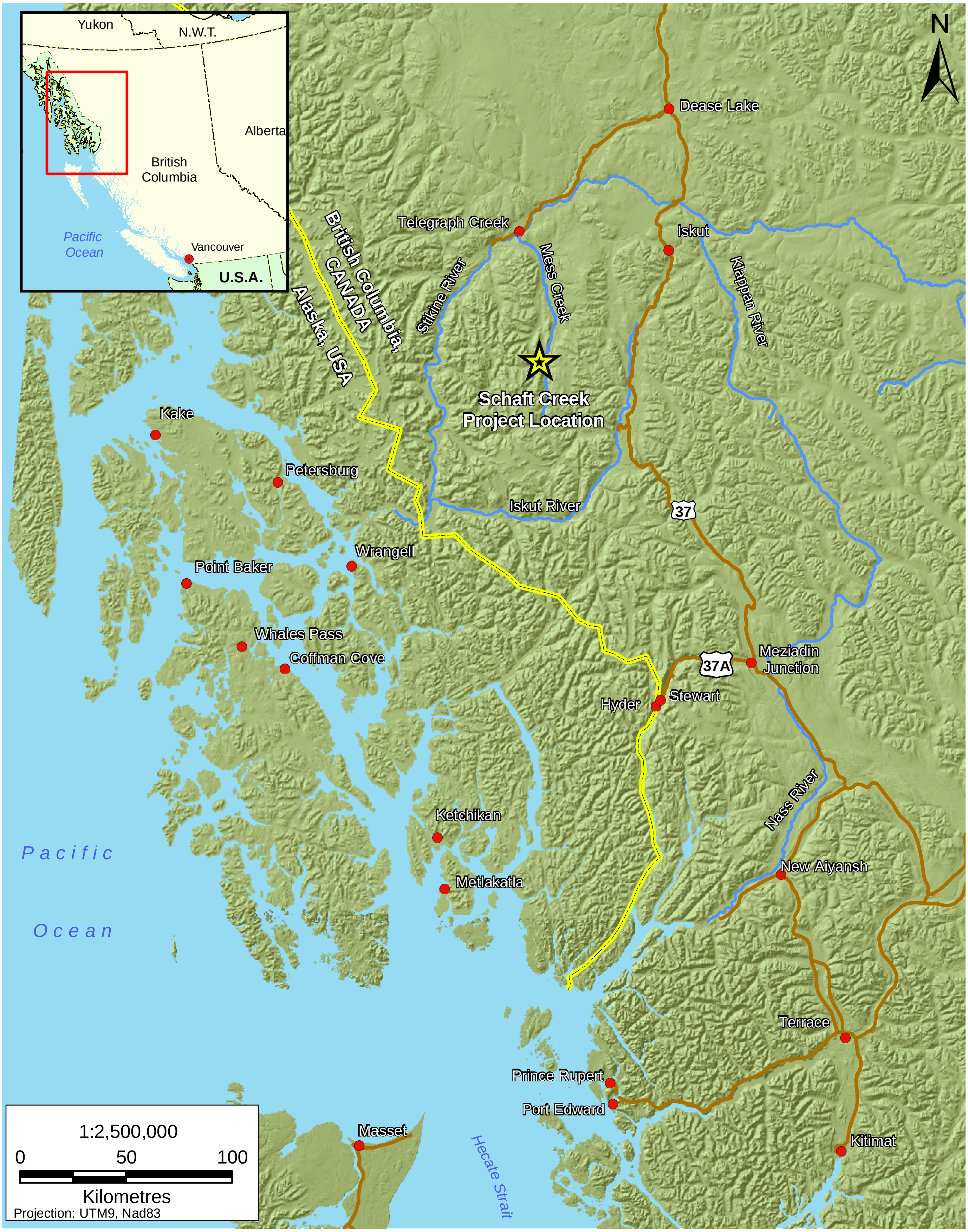
Copper Fox Metals Inc. (Copper Fox) is a Canadian mineral exploration and development company focused on developing the Schaft Creek deposit located in north-western British Columbia, approximately 60 km south of the village of Telegraph Creek (Figure 1.1-1). The Schaft Creek deposit is a polymetallic (copper-gold-silver-molybdenum) deposit located in the Liard District of north-western British Columbia (Latitude 57^{o} 22' 4.2''; Longitude 130^{o}, 58' 48.9"). The property is comprised of 40 mineral claims covering an area totalling approximately 20,932 ha within the Cassiar Iskut-Stikine Land and Resource Management Plan (Figure 1.1-2).

The Schaft Creek Project (The Project) is located within the traditional territory of the Tahltan Nation. Copper Fox has been in discussions with the Tahltan Central Council (TCC) and the Tahltan Heritage Resources Environmental Assessment Team (THREAT) since initiating exploration activities in 2005. Copper Fox has engaged in numerous agreements with the TCC including a Communications Agreement, Traditional Knowledge Agreement, Letter of Understanding with the Tahltan Nation Development Corporation (TNDC) and a THREAT Agreement. Copper Fox will continue to work together with the Tahltan Nation as work on the Schaft Creek Project continues.

The Schaft Creek deposit was discovered in 1957 and has since been investigated by prospecting, geological mapping, geophysical surveys as well as diamond and percussion drilling. Over 65,000 meters of drilling has been completed on the property as of end of 2007. Additional drilling is planned for 2008 to support future economic assessments of the property and an environmental assessment application.

The Schaft Creek Project entered the British Columbia environmental assessment process in August 2006. Although a formal federal decision has not yet been made, the Project will likely require federal approval as per the Canadian Environmental Assessment Act. Copper Fox has targeted the end of 2008 for submission of their Schaft Creek Environmental Assessment Application.

Copper Fox has recently released a scoping level engineering and economic report for Schaft Creek. The mine and associated infrastructure are presented in Figure 1.1-3. The current mine plan has ore milled from an open pit at a rate of 65,000 tonnes/day. The Schaft deposit will be mined with large truck/shovel operations and typical drill and blast techniques. An explosives manufacturing facility will be constructed on-site to support blasting activities. The mine plan includes 719 million tonnes of minable ore over a 31 year mine life. The Project is estimated to generate up to 1,200 jobs during the construction phase of the Project and approximately 500 permanent jobs during the life of the mine.



Location Map for Schaft Creek Project

FIGURE 1.1-1

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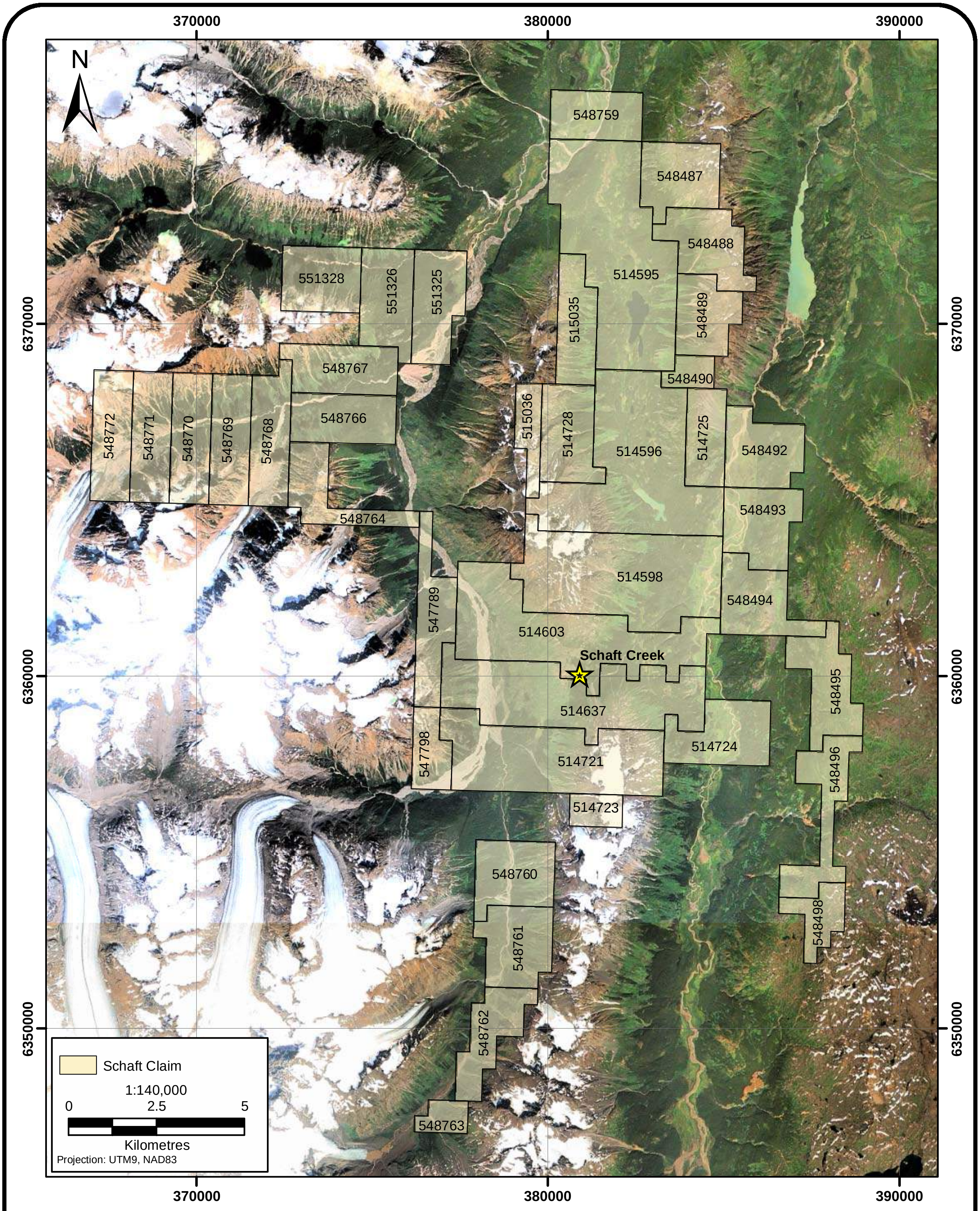

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Schaft Creek Project Mineral Claims

FIGURE 1.1-2

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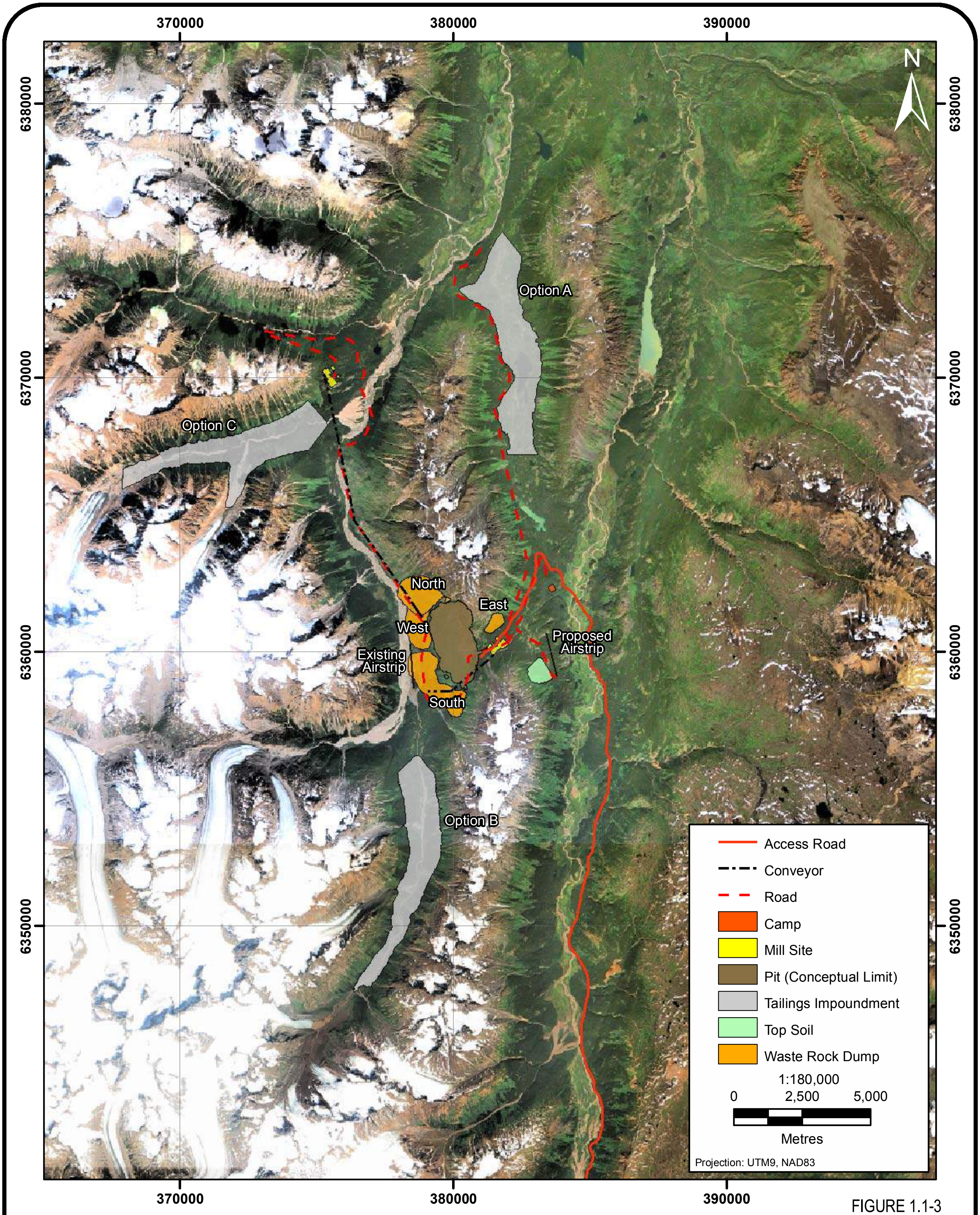

FIGURE 1.1-3

Schaft Creek Project Mine and Associated Infrastructure

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Ore will be crushed, milled and filtered on-site to produce copper and molybdenum concentrates. The mill will include a typical comminution circuit (Semi-Autogenous Mill, Ball Mill and Pebble Crusher) followed by a flotation circuit and a copper circuit with thickener, filtration and concentrate loadout and shipping. The mill includes a designated molybdenum circuit with thickener, filtration circuit, drying and bagging. The filter plant will be located at the plant site. A tailings thickener and water reclaim system will be used to recycle process water. The circuit will have a design capacity of 70,652 tonnes per day and a nominal capacity of 65,000 tonnes per day (23,400,000 tonnes per year). The copper and molybdenum concentrates will be shipped via truck from the mill to the port of Stewart, BC.

Copper Fox will construct an access road from Highway 37 to the Schaft Creek property. Access to the property from Highway 37 will require approximately 105 km of new road. The first 65 km of the access road to the Schaft Creek property corresponds to the Galore Creek access road. NovaGold and Teck Cominco have currently put a hold on future construction efforts along their access road and the overall Galore Creek Project. Copper Fox will seek approval from the provincial government and NovaGold/Teck Cominco to construct the first 65 km of the Galore Creek access road should the status of the Project not change.

The route of the final 40 km of access road has not been finalized. Copper Fox has completed initial investigations of a route along Mess Creek. An alternative route is also being considered that utilizes the plateau to the east of Mess Creek. Copper Fox is currently investigating the feasibility, as it relates to geohazards, of the two alignments. Both alignments include a 30 m bridge on Mess Creek. Mess Creek is considered navigable as per Transportation Canada criteria. Figure 1.1-4 presents the access road alignment that follows the Galore Creek road (65 km from Highway 37) and the Mess Creek alignment (40 km) to the Schaft Creek property.

Over the life of the mine, the Schaft Creek Project will generate over 700 million tonnes of tailings. There are three tailings facilities being considered (Figure 1.1-3). The three options will undergo an alternatives assessment that will include engineering, construction and operating costs, geotechnical, geohazards, environmental and social considerations.

The Project will generate over a billion tonnes of waste rock. Waste rock dumps are proposed around the perimeter of the pit (Figure 1.1-3). This includes the flat area between the proposed pit and Schaft Creek.

A detailed water management plan has yet to be developed for the Project. A water management plan will be included in the next level of economic assessment (pre-feasibility) and the next Project description update. A waste water discharge is expected from the tailings facility, waste rock dumps and domestic waste water treatment plant. The management plan will detail the plans to minimize natural drainage into the tailings facility, the pit and the waste rock dumps. Pit water will be pumped to the tailings facility.

A new airfield will be constructed to the east of the pit (Figure 1.1-3). The Project will be a fly-in, fly-out operation. The new landing strip will be capable of handling a Boeing 737. Other facilities include a terminal building, fuelling, maintenance and control facilities.

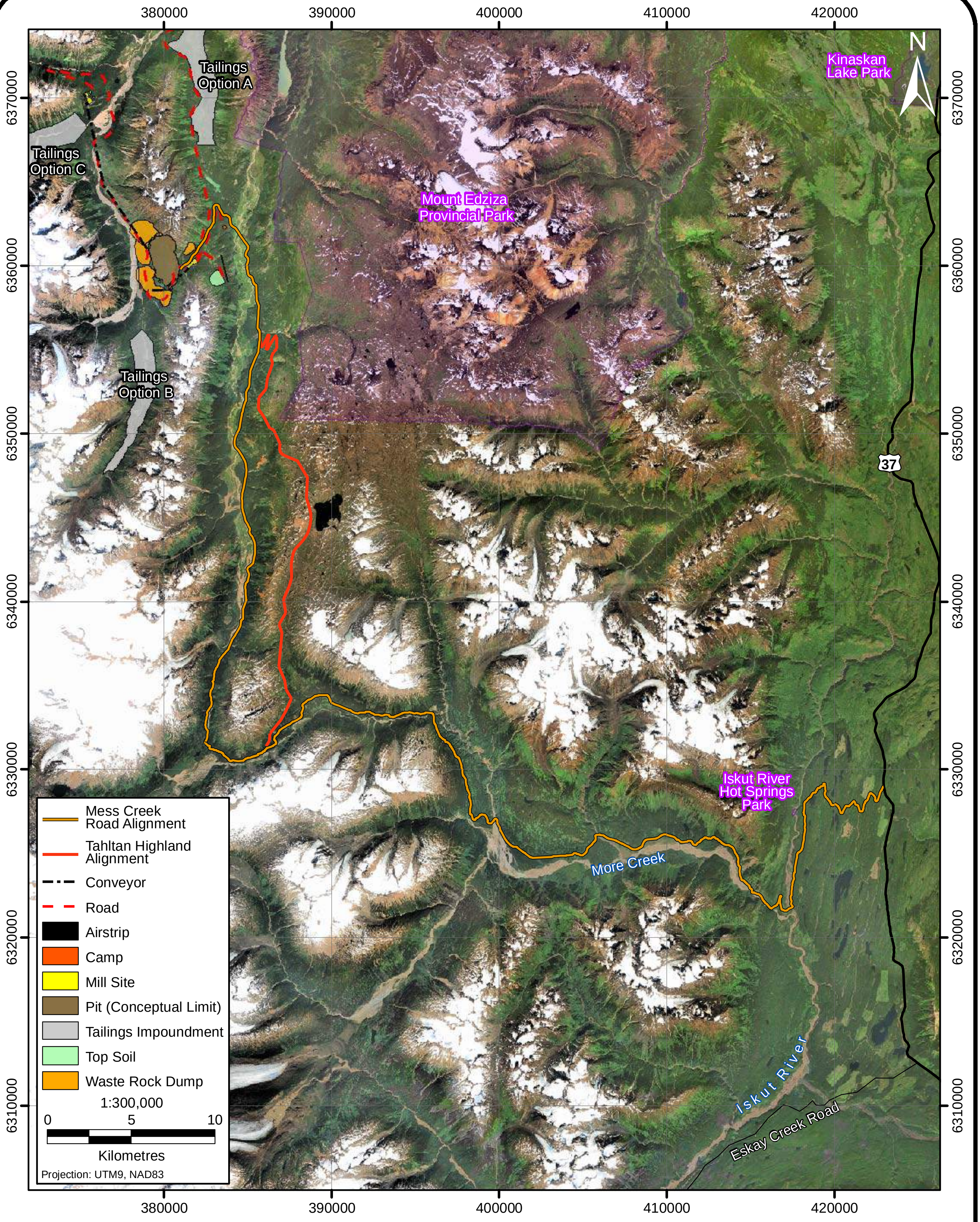

FIGURE 1.1-4

Proposed Access Road Alignment for the Schaft Creek Project

A permanent camp will be constructed to support a staff of approximately 500 employees. Other facilities include truck shop, warehouse, administration, maintenance laboratory, explosives storage, water treatment facilities and potable water storage.

Copper Fox has targeted the end of 2008 for submission of their Environmental Assessment Application and full Feasibility Report. Screening of the EA Application plus the 180 day review period will result in Project approval as early as July 2009. Copper Fox will likely seek concurrent permitting for strategic permits to facilitate the timely construction of key Project components. Construction is estimated to take two and half years. Thus, production could begin by early 2012.

1.2 Wetland Ecosystem Study

As part of the baseline studies conducted for the Project, a survey of wetland ecosystems was initiated in June 2006. Wetland hydrological data was collected during both baseline study years (2006 and 2007) and a comprehensive wetland survey was completed in 2007. The wetland survey incorporated provincially recognized ecosystem description methodology, water quality sampling, and aquatic biology surveys and sampling. A study area was established to map and classify any wetlands potentially affected by Project development and includes the following areas:

- 100 m either side of the proposed centre line of the Mess Creek access option;
- within 150 m of any proposed mine facility and infrastructure; and
- the three tailings options.

1.2.1 Objectives

The objectives of the wetland baseline studies program were to determine the hydrological physical, chemical and biological characteristics of wetlands and to identify the quantity, size and location of wetlands within the study area. Once the wetland classification was complete, an assessment of wetland function and associated values was conducted. This assessment considered wetland characteristics, along with relevant information from the scientific community to identify ecosystem functions that have the greatest value or potential value to society such as flood protection and habitat for culturally/economically important wildlife species.

2. METHODS

2. Methods

2.1 Study Area

The study area for the Schaft Creek Wetland baseline study includes all areas at or near proposed development features. Wetlands were surveyed, identified, or mapped if they were within 100 m of the centre line of the proposed Mess Creek access option, within 150 m of any proposed infrastructure development (airstrip, mine site roads, waste rock piles, plant sites, *etc.*), and in each tailings option (Tailings Options A, B, and C).

2.2 Hydrology Survey

Wetland hydrology studies were conducted during the summer field season (June to October, 2006 and 2007) at four representative wetlands in the Schaft Creek Project area (Figure 2.2-1). This monitoring was conducted to provide hydrological data characteristic of the area that could be used to infer the hydrology of wetlands throughout the baseline studies area. The wetland hydrology study has two components: static surveys of the wetland water table and continuous monitoring of shallow sub-surface water.

Locations of the six wetland hydrological monitoring sites are presented in Figure 2.2-1 and details of the monitoring sites are summarized in Table 2.2-1.

Table 2.2-1
Details of Wetland Hydrological Monitoring Sites

Wetland Name / Well	Location (Northing, Easting)	Wetland Class	Type of Monitoring
Schaft Creek Wetland SC-A	381407 6377210	Marsh/Fen - Complex	Continuous
Schaft Creek Wetland SC-B	381193 6377335	Marsh/Fen - Complex	Continuous
Mess Creek Wetland MS-A	384458 6360461	Marsh	Continuous
Mess Creek Wetland (MS-B)	384343 6360416	Marsh	Continuous
Skeeter Creek Wetland (SK)	382204 6367804	Fen	Static
Hickman Creek Wetland (HC)	378845 6356530	Bog	Static

***All coordinates in UTM9**

2.2.1 Shallow Groundwater Well Installation

Shallow (< 1.0 m below ground surface) groundwater wells were installed at the Schaft Creek (SC) and Mess Creek (MS) study wetlands at the beginning and end of each transect. Wells consisted of 1 inch PVC pipe with a drive point installed using a hand auger and a sledge hammer.

Water level elevation was measured (relative to the ground surface) between the groundwater wells in the SC and MS wetlands. The Hickman Creek (HC) and Skeeter Creek (SK) wetlands did not receive any wells and the wetland transect consisted of a single surveyed cross-section on June 24th, 2007 and June 19th, 2006 for the two wetlands, respectively.

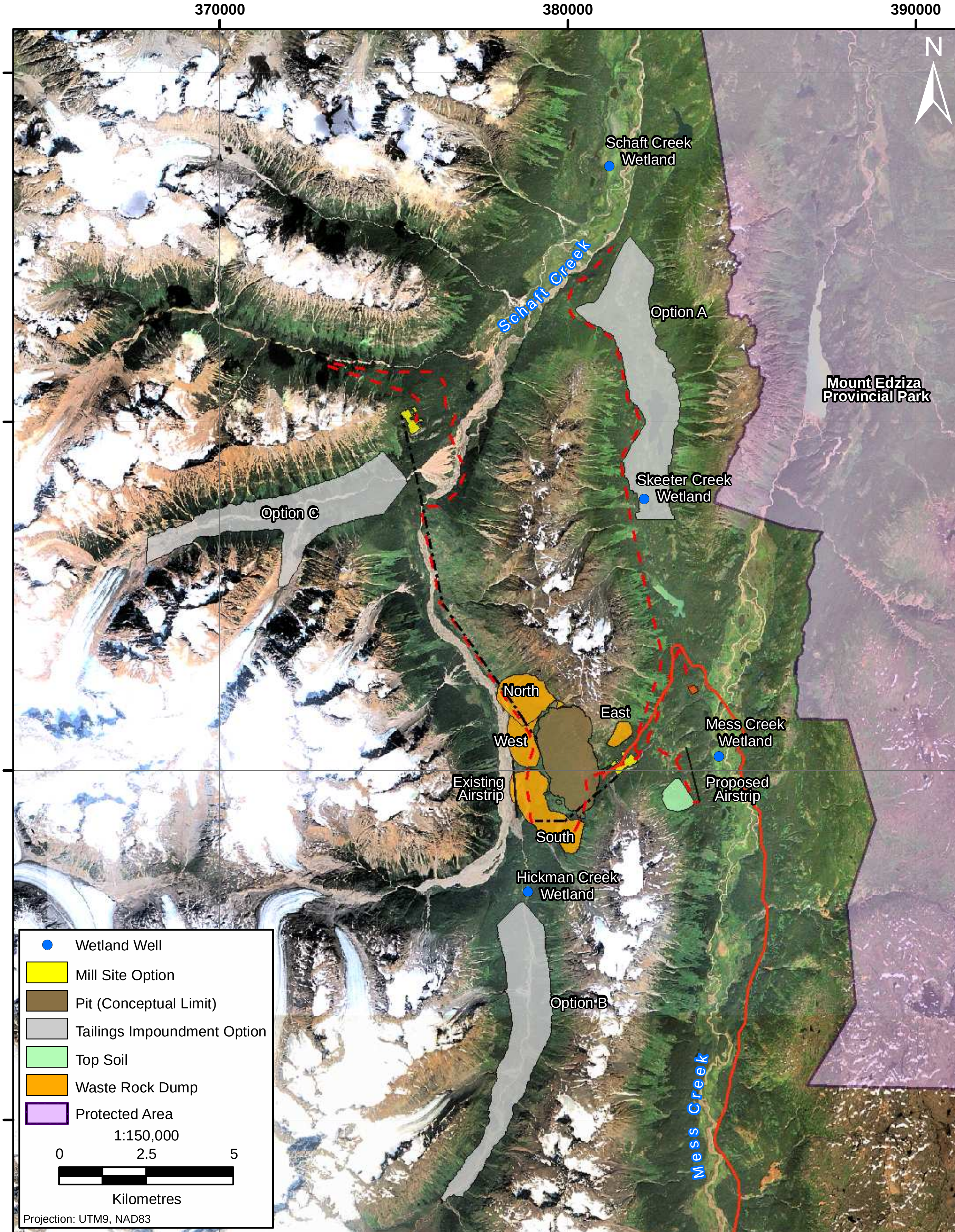

FIGURE 2.2-1

Schaft Creek Project Wetland Hydrological Monitoring Sites

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The wells were installed on June 19th, 2006 and continuous water level data was collected from that time until September 9th, 2006. In 2007, continuous water level data was collected from June 24th until November 11th.

A builder's level (transit) was used to determine distance and relative elevation of the ground surface and standpipe height of all of the groundwater wells. The surface water features along the lateral cross-section were also surveyed at the time of groundwater well installation.

Due to the relatively unstable conditions of the wetland surfaces, surveyed elevations are assumed to have an error of ± 0.01m.

2.2.2 Continuous Monitoring

The four wells in the Mess and Schaft Creek wetlands were continuously monitored throughout the open water season of 2006 and 2007. Continuous monitoring consisted of recording water level data within study wetlands using Solinst® leveloggers (automated pressure transducers). Water levels were recorded at 30 minute intervals. A barologger was also installed at the SC wetland to correct the levelogger data for changes in atmospheric pressure at the SC and MS wetlands. Daily average water table measurements are presented in Appendices 1A and 1B for 2006 and 2007, respectively.

2.3 Aquatic Biology

A component of the aquatics baseline studies for the Schaft Creek Project is a characterization of aquatic resources in wetlands in the study area and along the road route. Characterization of aquatic resources included assessing water and sediment quality, primary producer (phytoplankton) communities and benthic invertebrate communities. Assessment objectives include determining baseline conditions of these aquatic components within the Project area.

A total of twelve wetland sites were assessed during the 2007 baseline studies (Figure 2.3-1). WL8 appears in Figure 2.3-1 but was actually assessed and discussed in the stream section of the aquatics baseline report since it more resembles stream rather than wetland habitat. All sites were sampled during August, 2007. Detailed methods regarding field sampling, sample and data analyses can be found in the Section 2 of the Schaft Creek 2007 Aquatic Resources Baseline Report (Rescan, 2008a). All of these wetlands were also assessed to determine fish presence.

2.4 Ecosystem Survey

Wetland ecosystem surveys initiated in July 2007 were done to classify wetland ecosystems to the Canadian Wetland Classification System (class level) and provincial site association.

2.4.1 Preliminary Mapping

Prior to field work, wetlands to be surveyed were identified using available Terrain Resource Inventory Management (TRIM) geographic information system (GIS) data. ArcView 9.2 was used to overlay proposed Project features (tailings containment options, mill sites, roads, etc.) and TRIM wetland shape files. If TRIM wetlands were identified with in a "reasonable distance" to proposed Project features, they were selected for survey. The selection was based on the topography, abundance of wetlands near the site, and proximity to surface water features. Four, large scale maps were created and used in the field to track survey progress and identify areas or focus.

2.4.2 Field Studies

Field studies were conducted to classify the wetlands identified within the study area. On the ground classification is required to provide detailed descriptions of the wetlands types and characteristics. TRIM data includes some wetland classification, but at a broad level of organization.

The TRIM data is useful for identifying the locations of wetlands and their size. However, it is insufficient to provide detailed ecosystem information. The wetlands in TRIM are defined into two classes 1) marsh and 2) swamp. These two wetland classes are recognized as two of the five federal wetland classes (Warner and Rubec, 1997). Bogs, fens, and shallow open water wetlands (the remaining three federal wetland classes) are not differentiated by TRIM and are either included in the two TRIM classes or not mapped as wetlands altogether. The definitions for marsh and swamp supplied by TRIM (Ministry of Environment, Land and Parks, 1991) are:

1. Marsh - A water-saturated, poorly drained, treeless area intermittently or permanently water covered, having cattail, rushes or grass-like vegetation.
2. Swamp - A water-saturated area, intermittently or permanently covered with water, having shrubs.

It is likely that some shallow open water, fens and tree-less bogs are included in the TRIM marsh class. The TRIM swamp class does not include treed swamps; treed swamp associations can represent a major percentage of wetlands in northwest British Columbia and high elevation biogeoclimatic zones (MacKenzie and Moran, 2004). Bogs and shallow open water are not included in either TRIM class; however, shallow open water wetlands may appear as small lakes. The field studies are intended to qualify the wetlands within the study area as they relate to the federal descriptions of class (Warner and Rubec, 1997) and the provincial description of ecosystem association (MacKenzie and Moran, 2004).

Wetlands were surveyed according to methods outlined in *Field Description of Wetland and Related Ecosystems in the Field*, (MacKenzie, 1999) and *Wetlands of British Columbia: A Guide to Identification*, (MacKenzie and Moran, 2004). Wetland sample locations are displayed in Figure 2.4-1.

Plots were established in the centre of large (> 20 m x 20 m) uniform wetlands, on the boundaries between different wetland associations in the same complex or at the ecosystem edge in amorphous and small (< 20 m x 20 m) wetlands. At the centre of the plot, a soil pit was dug and a GPS coordinate was taken. Photographs were taken in each cardinal direction of the soil pit, soil surface, a representative soil sample and other significant features such as landforms, unique vegetation and wildlife.

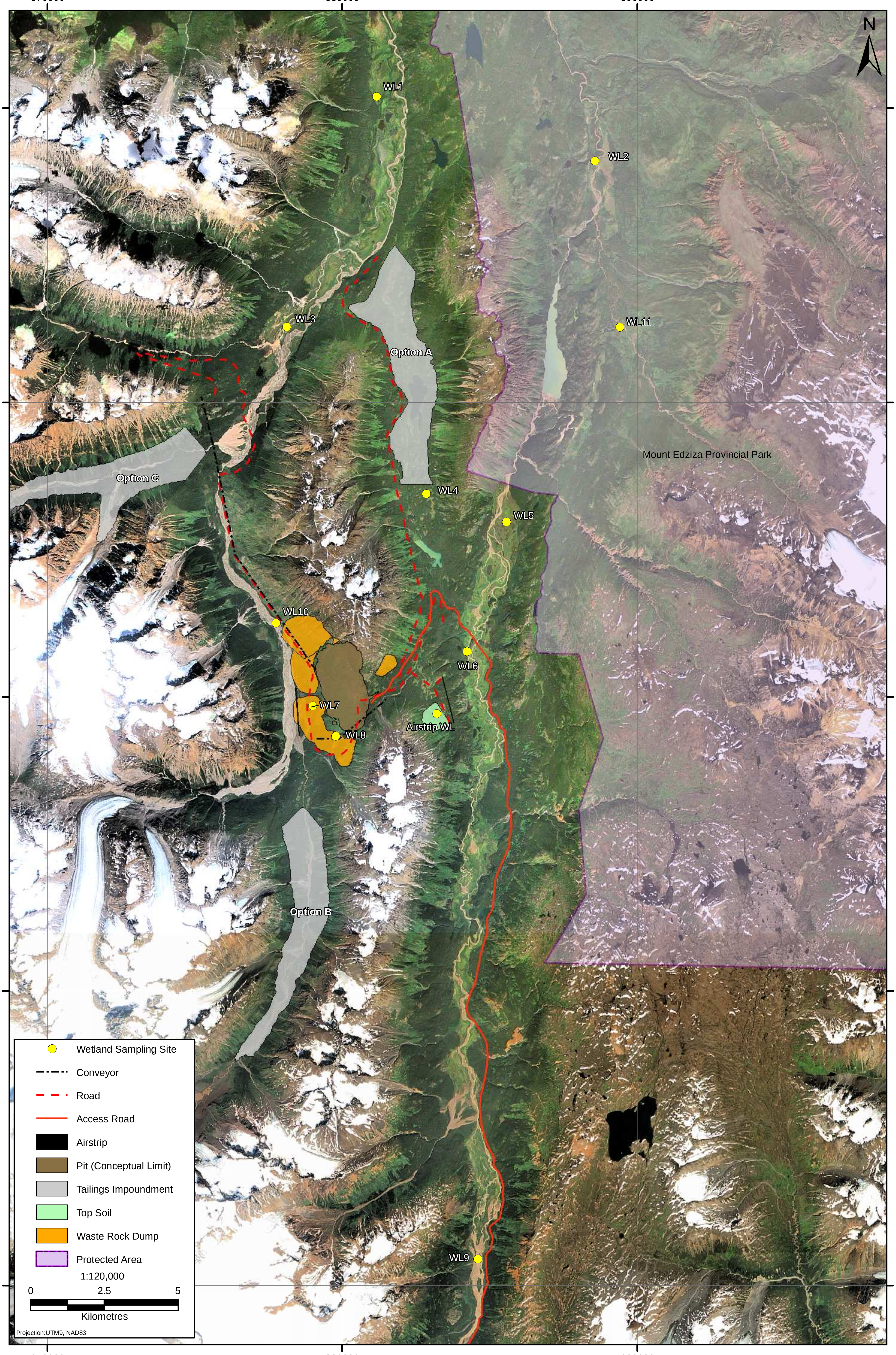

FIGURE 2.3-1

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Schaft Creek Aquatics Wetland Sampling Sites, 2007

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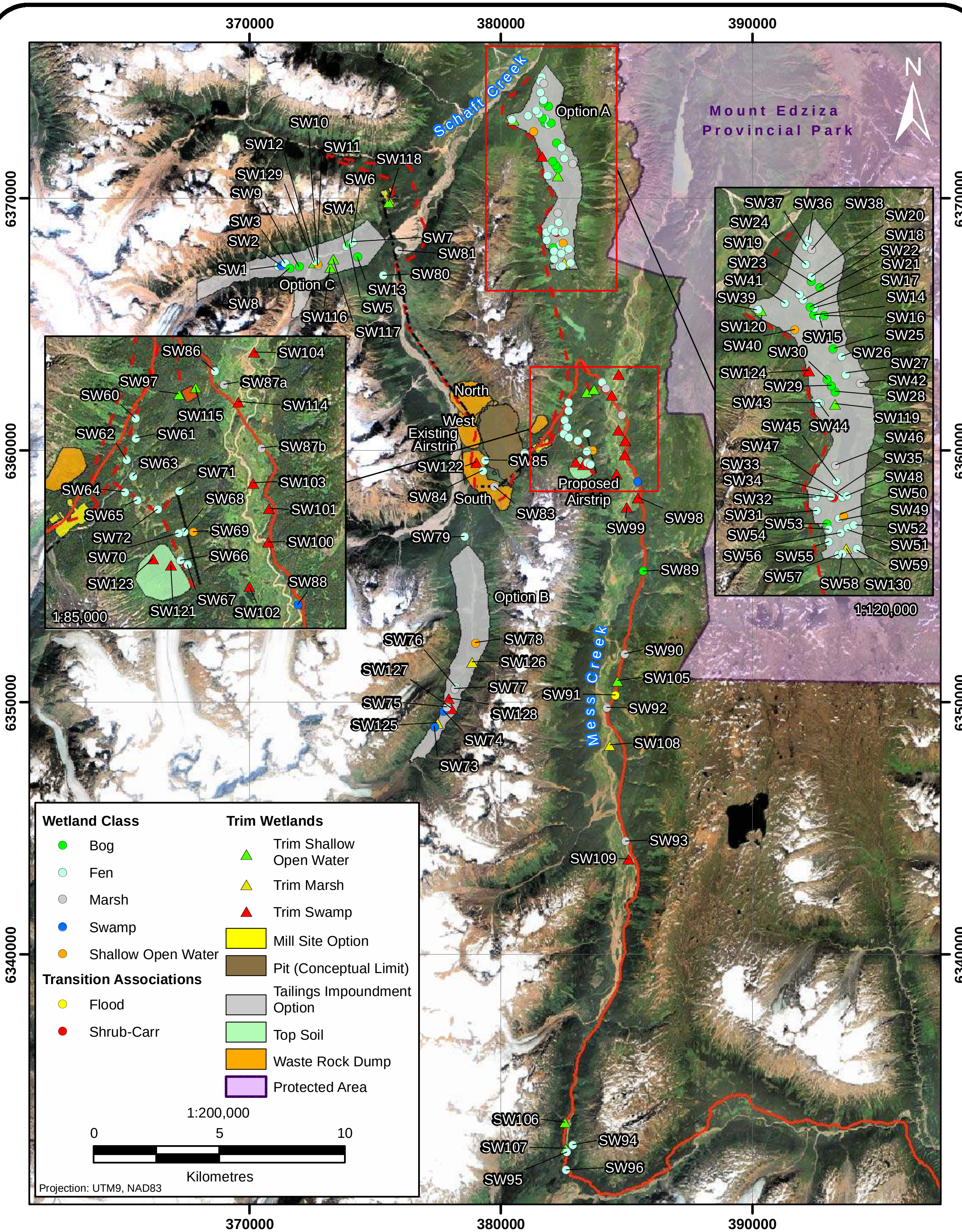


FIGURE 2.4-1

Schaft Creek Wetland Ecosystem Survey Locations

Ground Inspection Forms (GIF) were used to record field notes. Information recorded on the field form included:

- Plot Number;
- Project ID;
- Surveyor;
- Date;
- Photograph Numbers;
- GPS coordinates in Universal Transverse Mercator (UTM);
- Aspect (slope direction);
- Meso Slope Position (site position in the overall landscape);
- Soil Moisture Regime (hydrodynamic index);
- Soil Nutrient Regime (nutrient content; poor to rich) ;
- Drainage Mineral Soils (drainage of all soils);
- Moisture Subclasses – Organic Soils (location and types of water features);
- Mineral Soil Texture;
- Organic Soil Texture (notes on decomposition);
- Surface Organic Horizon Thickness;
- Humus Form (decomposition of surface layer);
- Root Restricting Layer;
- Coarse Fragment Content;
- List of Vegetation (dominant/indicator plant species and percent cover); and
- Site Diagram on waterproof paper.

The hydrodynamic index, a measure of vertical and/or lateral water flow through the wetland was recorded in the GIF form's Soil Moisture Regime field. The Drainage Mineral Soils field was used to document the drainage of all soils, mineral or organic. Moisture Subclasses – Organic Soils was used to comment on water presence above or below the ground and its availability through surface or groundwater pathways. Organic Soil Texture was used to record the texture and decomposition of the organic horizons (humic – very decomposed, mesic – moderate decomposition, fibric – little decomposition). The site diagram space on the GIF was used for a diagram of the soil pit, a soil colour smear (to record measurements of soil water and surface water pH) and to describe peat development, rooting depth and the level of decomposition using the von post scale of decomposition.

The soil survey methodologies for wetland ecosystem classification principally follow *The Canadian System of Soil Classification* (CSSC, 1987), *Towards a Taxonomic Classification of*

Humus Forms (Green *et. al.*, 1993), *Describing Ecosystems in the Field* (Luttmerding *et. al.* 1990), and *Field Description of Wetland and Related Ecosystems in the Field* (MacKenzie, 1999). These methods require soil identification to a depth of 160 cm or lithic contact. Often super-saturated soils and shallow alpine soils made deep sampling impossible. Soil pits were dug to a minimum depth of 40 cm, or when significant contact with the water table or lithic/parent material was made.

A vegetation species list and relative percent vegetation cover were recorded at each plot. Special focus was placed on wetland association indicators such as *Carex spp.* and *Salix spp*. Vegetation identification in the field followed: *Plants of Costal British Columbia* (Pojar and Makinnon, 1994), *Plants of Southern Interior British Columbia* (Parish *et. al.* 1996), and *Plants of the Western Boreal Forest and Aspen Parkland* (Johnson *et. al.,* 1995). Species not identified in the field were collected and identified in Vancouver B.C. using *The Illustrated Flora of British Columbia: Volumes 1-6* (Douglas *et. al.* 2001).

Site diagrams were drawn to show specific vegetation community locations and terrain features. The plot centre was shown in relation to the wetland and other features such as the location of unique topography, water sources, existing infrastructure, and wildlife observations. Once the site diagram was finished, the soil pit was filled in and the field team moved to the next study plot.

2.5 Wetland Classification

Wetland classification was completed, where possible, in the field and followed Warner and Rubec (1997) for "class" level classification and MacKenzie and Moran (2004) for "site association" level classification. Wetland class describes associations with similar basic underlying environmental characteristics that support similar species guilds at climax (MacKenzie and Moran, 2004). There are five federal wetland classes (bog, fen, marsh, swamp, and shallow open water). Site association defines all sites capable of supporting a similar plant association at climax (MacKenzie and Moran, 2004). There are a number of site associations in each wetland class.

Occasionally, classification was not possible in the field, due to time constraints or unidentified vegetation; and in these cases a post-field classification was done. The botanical name of all vegetation species identified in the field and office were entered into a database to aid in post-field classification of wetlands to provincial site association (MacKenzie and Moran, 2004) (Appendix 2). Wetlands were classified to the lowest level, typically site association, and that information, along with the field data, were entered into a database (Appendix 3).

Wetlands are described as complexes where they are composed of more than one wetland class or association. Following terrestrial ecosystem mapping standards (RIC, 1998) ecosystem complexes were separated into three deciles. The deciles used in the wetland study are different from ecosystem mapping deciles in that they are only relative measure of size as opposed to a percentage of ecosystem area. The size of the ecosystem described as decile-1 is larger than the decile-2 ecosystem, which in turn is larger than the decil-3 ecosystem. This division of complex wetland ecosystems allows each association in a wetland complex to be identified and classified (Appendix 3).

2.5.1 Wetland Area

Wetland area is estimated using field observations and TRIM data. The results from these area calculations are reported throughout the baseline report as wetland association areas (Section 3.3). The wetland area calculation converts the data presented in Appendix 3 into an ESRI Shape file. This file is added to a GIS file of the proposed development options and TRIM wetlands. The field data file is spatially joined to any TRIM wetland that is completely or partially within any proposed development feature. Photographs and field data for non surveyed sites are used to supplement classification information for any TRIM wetlands that were not physically surveyed. The areas of each wetland association, as calculated from the TRIM wetlands, are then incorporated into the database (Appendix 3) and included in the ecosystem association descriptions (Section 3.3).

2.5.2 Wetland Valuation

The Wetland Environmental Assessment Guideline (Environment Canada, 2003) states that environmental impacts to wetlands should be assessed against the function and value of wetlands. Environment Canada (2003) identified a list of eight functions and values.

Wetland functions are defined as a process or series of processes that take place within a wetland (Novitzki, *et. al*., 1997). All wetland associations identified in the study area were evaluated for function based on the information collected during baseline studies. All of the functions were observed in the study area; however, the degree of the function varies between wetlands. Wetland functions, as established by the federal *Wetland Environmental Assessment Guideline* (Environment Canada, 2003), include the following:

1. Hydrological functions – contribution of the wetland to the quantity of surface water and groundwater;
2. Biochemical functions – role wetlands in relation to biochemical regulation of water chemistry;
3. Habitat functions **–** availability and use of both terrestrial and aquatic habitats; and
4. Ecological function **–** role and uniqueness of wetlands with respect to surrounding ecosystems.

Wetland values are not processes that take place within wetlands but involve the benefits that wetlands provide to the surrounding environment or to people. Wetlands can have ecological, social and economic values. Each of the values identified in this assessment are described in terms of their associated wetland function. Not all functions are assessed as values; for example, wetlands may provide habitat for mosquitoes; however, this is not a function that society typically values. Wetland values, as established by the federal *Wetland Environmental Assessment Guideline* (Environment Canada, 2003), include the following:

1. Social/Cultural/Commercial values;
2. Aesthetic/Recreational values;

3. Education and Public awareness; and
4. General considerations.

The value of land, including wetlands, is typically made easier to comprehend when expressed in monetary terms. This approach has been taken by the B.C. Ministry of Environment (MOE) which has expressed the value of the province's wetlands in terms of their estimated dollar value (B.C. MOE, 2005). To generate the monetary value of B.C.'s wetlands the MOE used the rate of $19,580 per wetland hectare/year (U.S. 1994) developed by Costanza *et al.* (1997). Although this rate is easily applied by the lay person, the suitability of this type of value assessment to specific wetland areas is questionable. For instance, some wetlands in the study area, given their remote location, do not have all of the values (*e.g.*, peat harvesting, education and instructional) included in the Costanza *et al.* (1997) calculation. Consequently, the discussion of the valuation of wetlands within the study area will not generate specific monetary values. Instead the value of wetlands will be discussed from the viewpoint of broad ecosystem functions with comments on the importance of these functions to society.

3. RESULTS

3. Results

3.1 Wetland Hydrology

3.1.1 Schaft Creek Wetland (SC)

Schaft Creek Wetland (SC) is located along Schaft Creek to the north of the Project area (Figure 2.2-1). The lateral cross-section of the wetland was established approximately perpendicular to Schaft Creek (Plate 3.1-1).

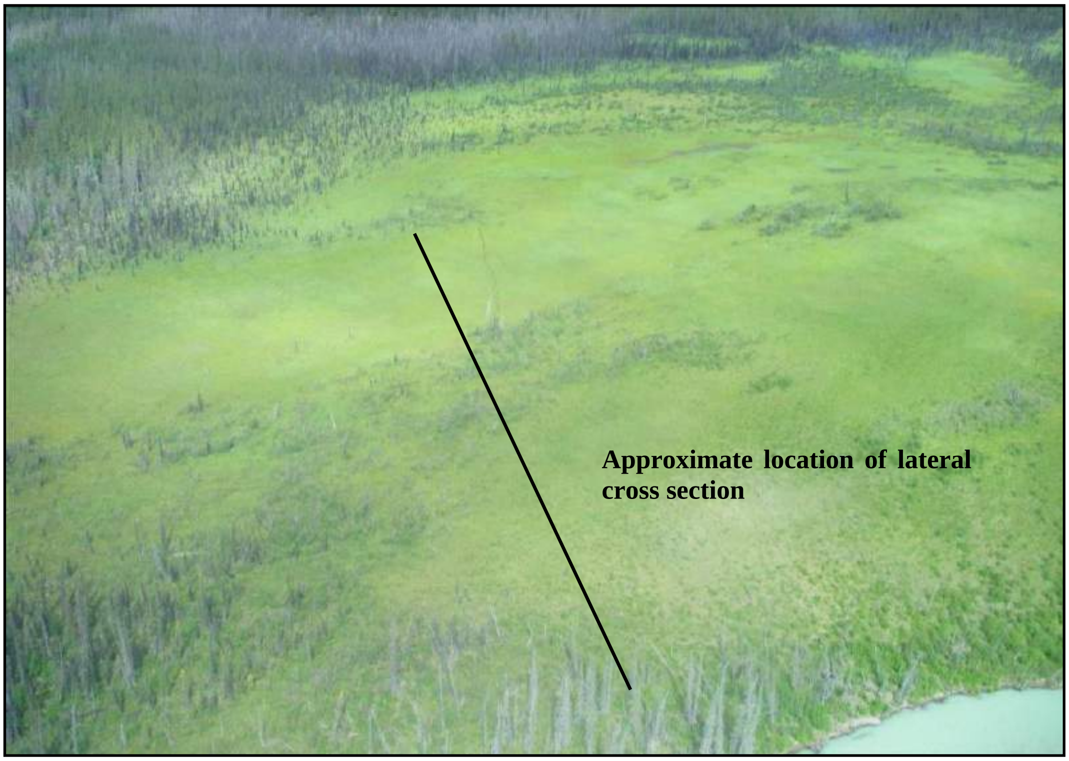
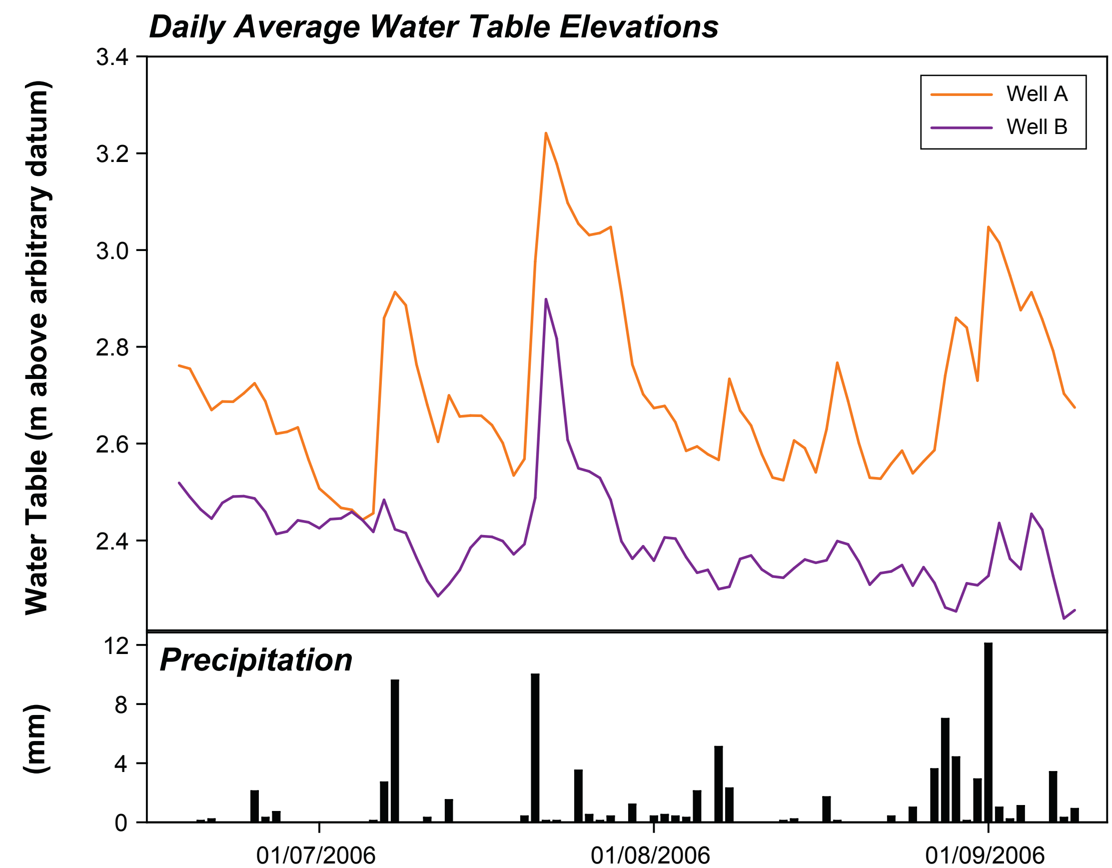
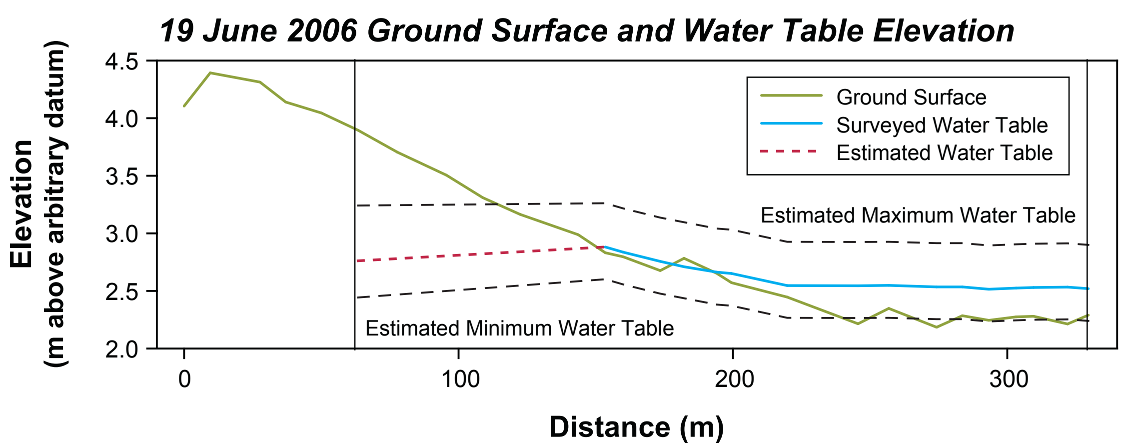


Plate 3.1-1. Schaft Creek Wetland (view to the west).

The lateral cross section of the SC wetland in both years (2006-2007) indicates the water level between the two wells at that point in time (Plate 3.1-1). The continuous water level record from the wells identifies the seasonal variability of the water table in the wetland (Figure 3.1-1 and 3.1-2). This real time water table variation was used to estimate the seasonal maximum and minimum water table elevations for the wetland transect.

Generally, the data showed that the water table was above the surface in the low lying portion and below the surface in areas that were elevated for both years. Seasonally the water table varied from 65 cm to almost 80 cm, with the greater variation occurring in well A which lies at a higher elevation than well B. In general, the water table was estimated to be above the surface of the ground for the majority of both the 2006 and 2007 season. The exception was in the higher elevation site (near well A) where the water table was never above the surface in either year.





Notes: Vertical lines indicate locations of Wells.
Maximum and minimum water table estimates are derived from continuous monitoring well elevations and surveyed water table elevations.

FIGURE 3.1-1

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Water Table and Longitudinal Elevation Profile for Schaft Creek Wetland 2006

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In 2006, the water levels were highest during August while in 2007 a slightly higher water table was observed during early July but with no noticeable seasonal pattern. These patterns suggest that during the two years of study the hydrology of the SC wetland was controlled by precipitation events. In 2006, precipitation clearly dominated the water table levels with two large rises in water table elevation in late July and early September. In 2007, the pattern is not as clear but the repeated rise of water table elevation is consistent with the relatively wet open water season that occurred during 2007 (Figure 3.1-2).

3.1.2 Mess Creek Wetland (MS)

The Mess Creek (MS) wetland is located east of the proposed mine infrastructure alongside Mess Creek (Figure 2.2-1). The lateral cross-section of the wetland is oriented approximately perpendicular to Mess Creek at that location (Plate 3.1-2).

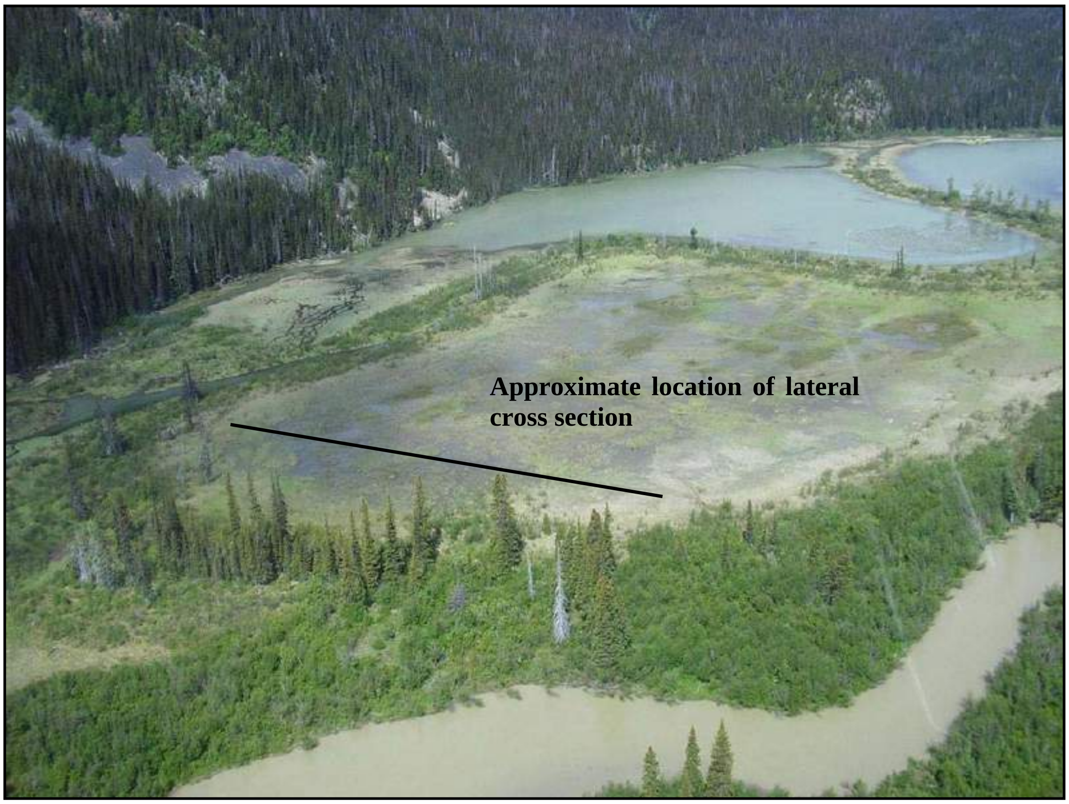
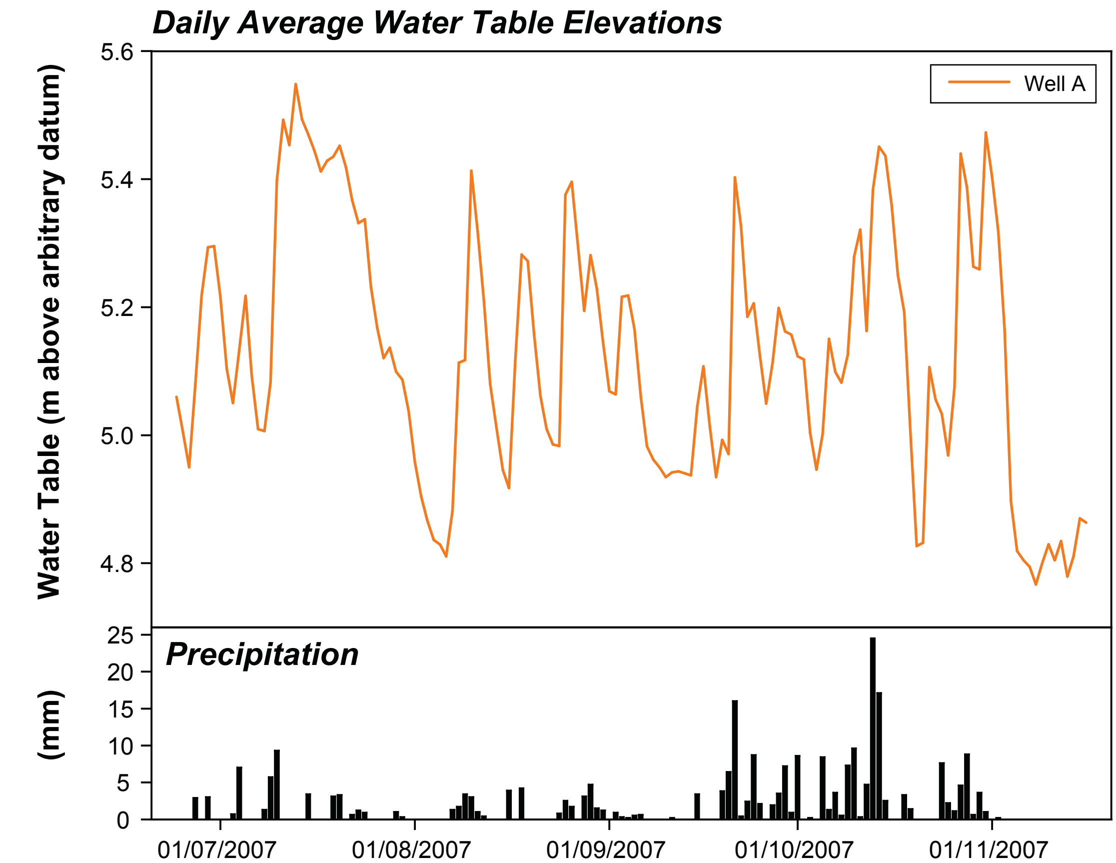
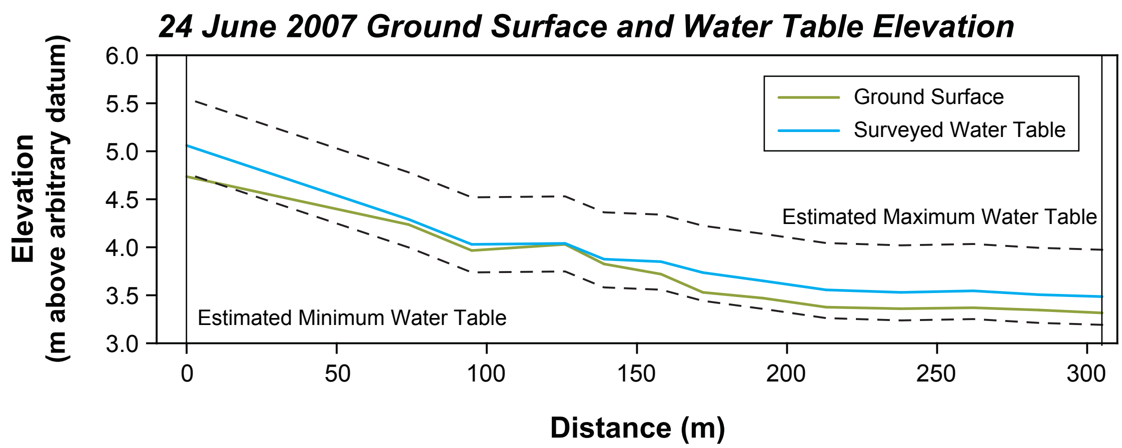


Plate 3.1-2. Mess Creek Wetland (view to the southwest).

The two lateral cross-sections that were conducted suggest that the water table was above the surface for the length of the cross-section (Figures 3.1-3 and 3.1-4). Contrary to the Schaft Creek wetland the MS wetland showed little response to precipitation events in either year. The overall trend of the hydrology suggests that this wetland is dominated by the spring snow melt. In 2006, the water table decreased throughout the open water season. In 2007, the water table rose substantially in early July, declined for the remainder of the season and increased minimally in the fall.





Notes: Vertical lines indicate locations of Wells.
Maximum and minimum water table estimates are derived from continuous monitoring well elevations and surveyed water table elevations.

FIGURE 3.1-2

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Water Table and Longitudinal Elevation Profile for Schaft Creek Wetland 2007

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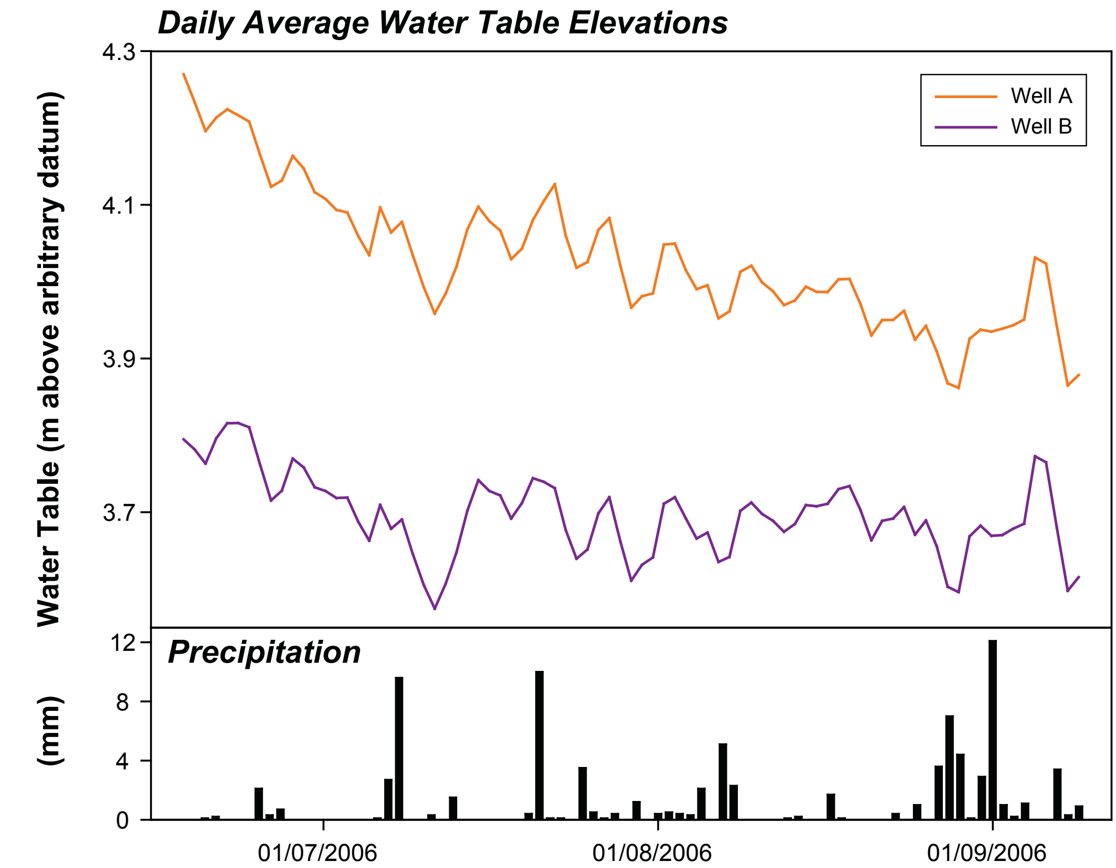
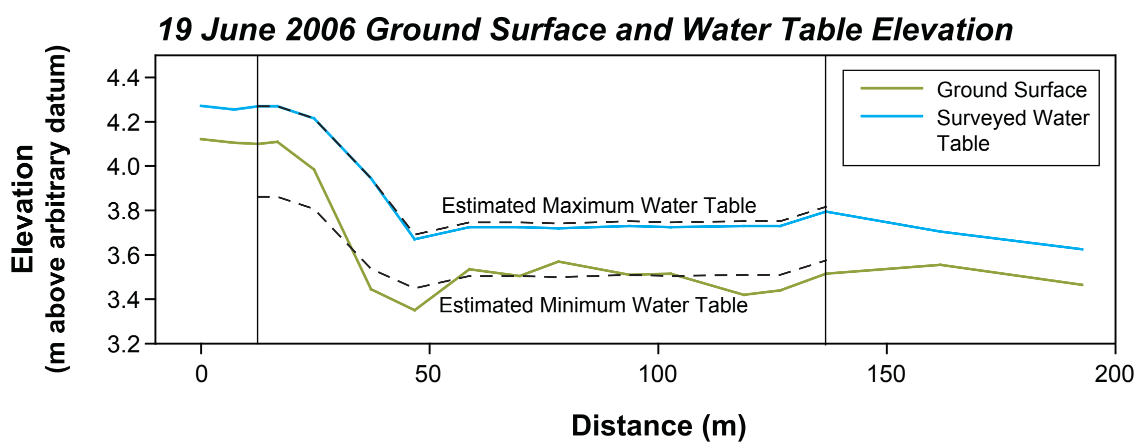
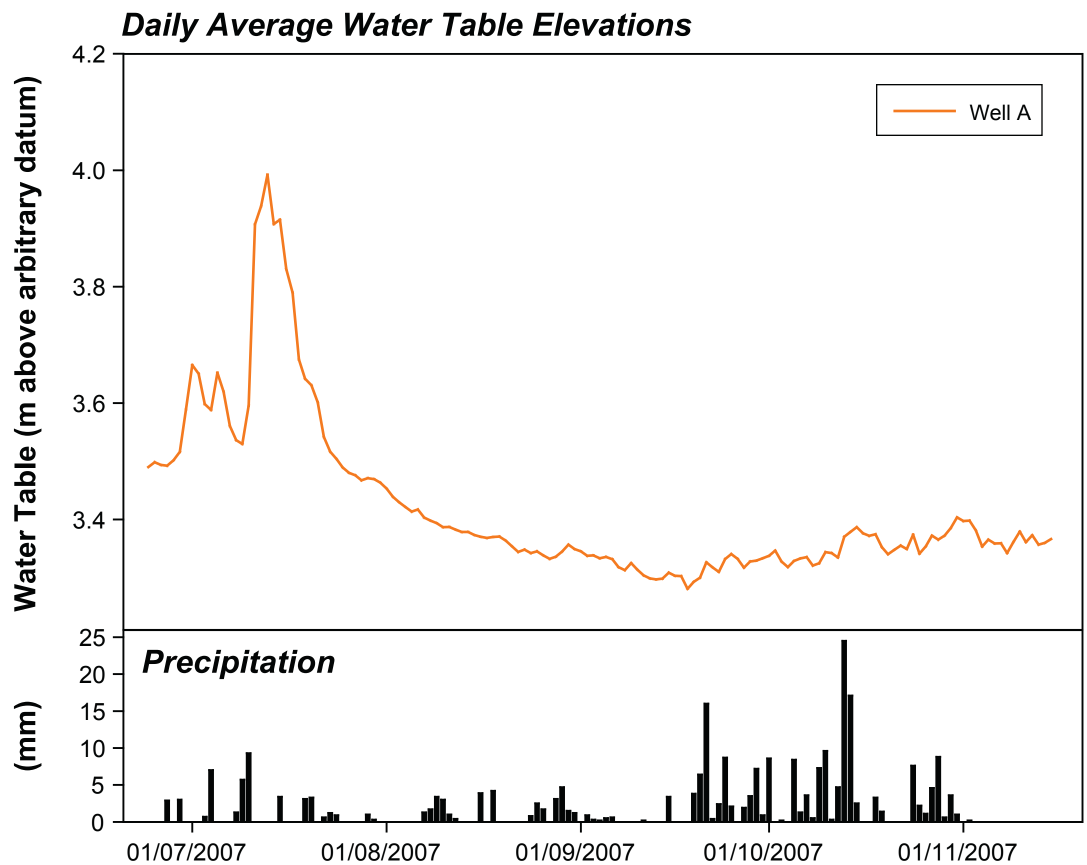


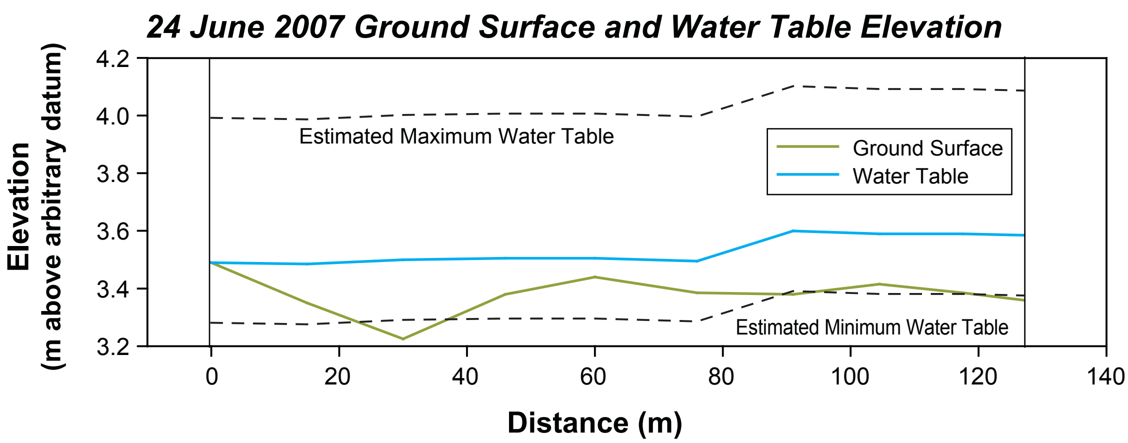


Notes: Vertical lines indicate locations of Wells.
Maximum and minimum water table estimates are derived from continuous monitoring well elevations and surveyed water table elevations.

FIGURE 3.1-3

Water Table and Longitudinal Elevation Profile for Mess Creek Wetland 2006





Notes: Vertical lines indicate locations of Wells.
Maximum and minimum water table estimates are derived from continuous monitoring well elevations and surveyed water table elevations.

FIGURE 3.1-4

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Water Table and Longitudinal Elevation Profile for Mess Creek Wetland 2007

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3.1.3 Hickman Creek (HC) and Skeeter Creek (SK) Wetlands

The Hickman Creek wetland (HC) is located south of the mine infrastructure and downstream of Tailings Option B (Figure 2.2-1). The lateral transect crosses Hickman Creek (Plate 3.1-3). Skeeter Creek wetland lies northeast of the proposed main pit in Tailings Option A.

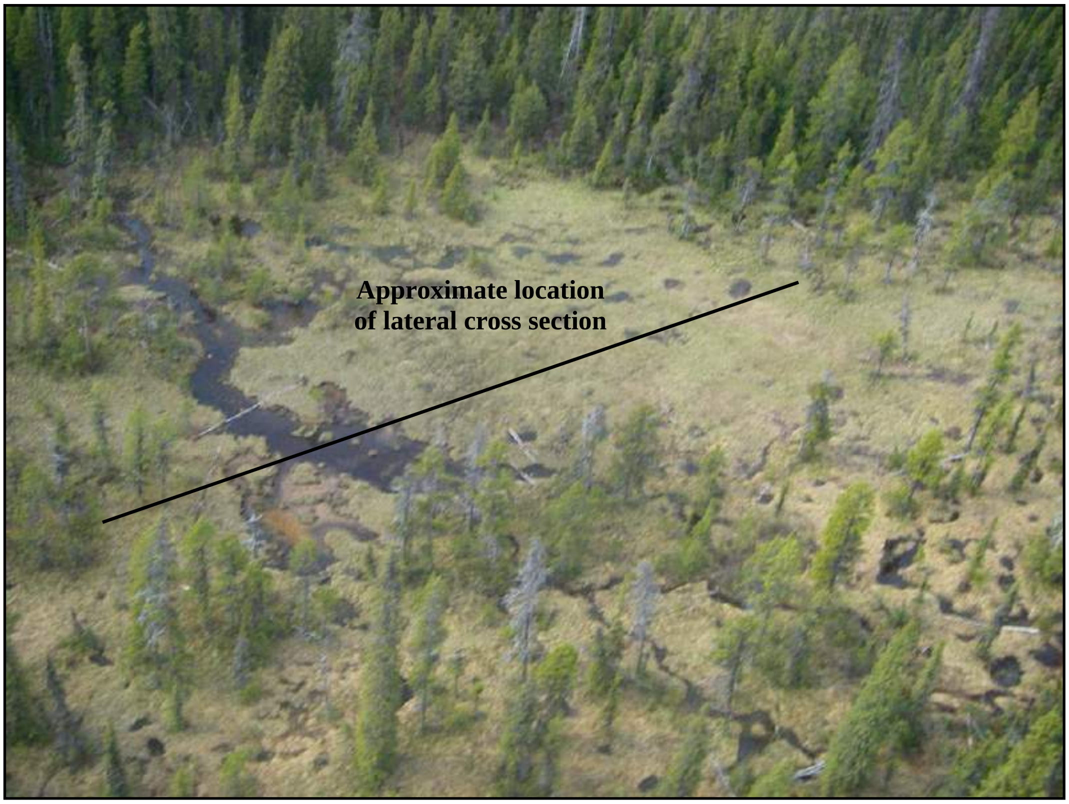


Plate 3.1-3. Hickman Creek Wetland (view to the northwest).

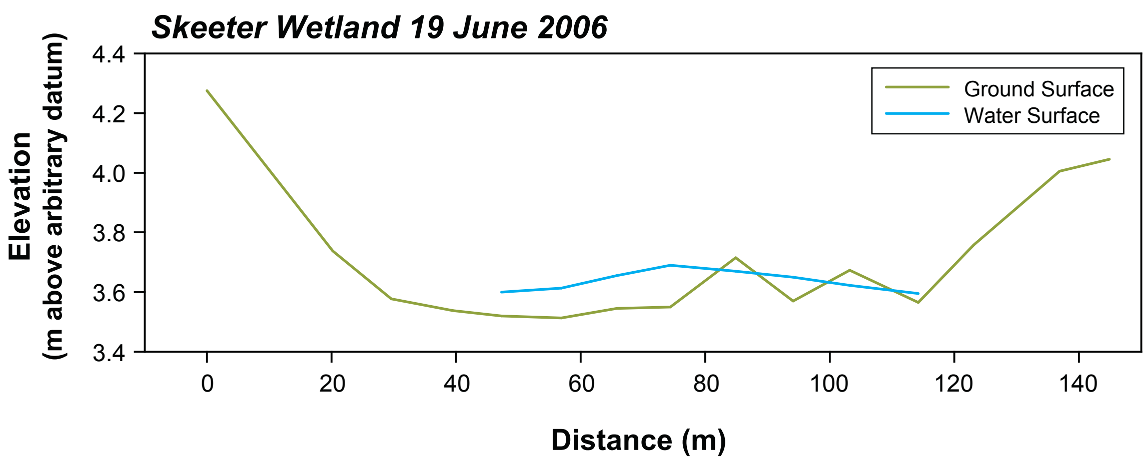
No continuous monitoring wells were installed in either of these two wetlands; hence, only information from the one time lateral cross-section can be interpreted. For both wetland transects the water table was near or above the ground surface at the time of the survey (Figure 3.1-5).

3.2 Aquatic Biology and Fisheries Resources

Data presented here is a summary of wetland specific data from the aquatic resources sampling program. Complete results as well as raw data in appendices are available in Rescan (2008a).

3.2.1 Water Quality

No major trends were observed between watersheds, though the Mess Creek watershed had slightly higher concentrations of ammonia, hardness, TDS and total and dissolved arsenic, boron, and manganese. More than half of the water quality variables analyzed had 50% or more samples below the detection limits. The Schaft Creek and Skeeter watersheds generally had low water hardness, while the Mess Creek watershed had moderate to high hardness.



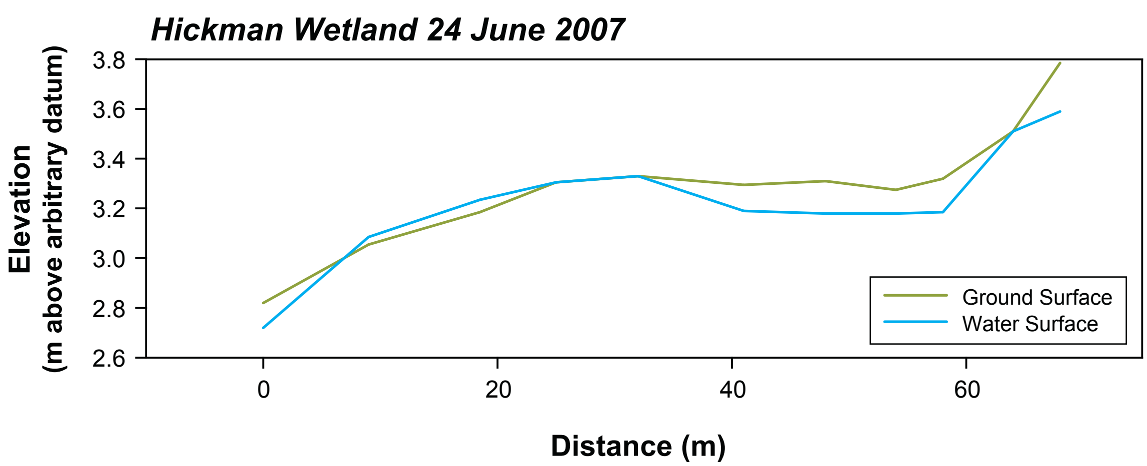


FIGURE 3.1-5

Water Table and Longitudinal Elevation Profile for Skeeter Creek and Hickman Creek Wetlands

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Total dissolved solids followed a similar pattern to hardness, though high concentrations were seen in WL2 (889 mg/L) (Figure 2.3-1). All wetlands had near neutral pH and low concentrations of total suspended solids. Water was fairly clear at most wetlands (0.36 to 1.58 NTU) though higher levels of turbidity were observed at WL3, WL6, and WL10, which had the highest turbidity at 45.9 NTU. Nutrients were relatively low at all wetlands with total phosphates having a maximum concentration of 0.0209 mg/L and total nitrogen maximum concentration of 0.81 mg/L.

Total and dissolved nickel and copper, and dissolved cadmium were considerably higher at WL7 than all other wetlands. Dissolved aluminum and iron, and total zinc were highest at Airstrip WL. Variables that exceeded B.C. or CCME aquatic life guidelines included total cyanide, sulphate, dissolved cadmium, total zinc, and total and dissolved aluminum, boron, copper and iron. Total iron exceeded guidelines at six wetland sites and total cyanide and total aluminum exceeded guidelines at three wetlands. Two wetlands sites, WL4 (Skeeter watershed) and WL9 (Mess Creek watershed), did not record any variables in excess of B.C. or CCME aquatic life guidelines.

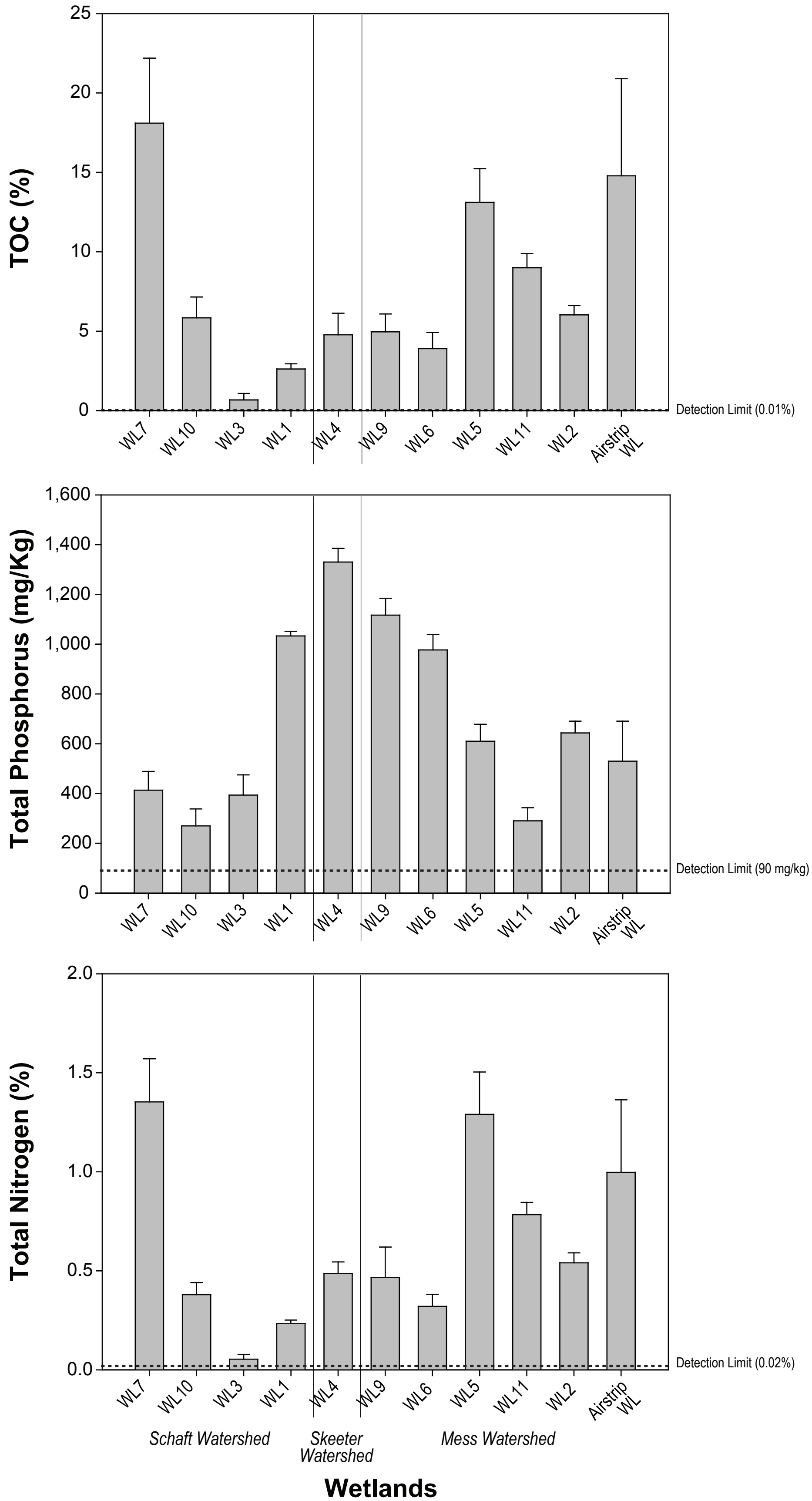
3.2.2 Sediment Quality

Wetland sediments were primarily composed of silt (33% to 64%) and clay (6% to 54%) with smaller proportions of sand and very little gravel. WL3 was the only exception to this, being dominated by sand (64%). The average total phosphorus (TP) concentration between wetlands was 692 mg/kg (Figure 3.2-1). Wetland WL4 had the highest TP concentration at 1330 mg/kg. Schaft Creek wetland WL1 and Mess Creek wetlands WL9 and WL6 also had relatively high TP concentrations. Total nitrogen (TN) and total organic carbon (TOC) followed similar trends, with the lowest values occurring at WL3 (0.05% and 0.7%, respectively) and the highest at WL7 (1.4% and 18.1 %, respectively) (Figure 3.2-1).

Of the metals analyzed, antimony, bismuth, cadmium, lead, selenium, silver, thallium and tin were not detected in more than 80% of wetland sediment samples. Lower Schaft Creek wetland (WL1), Skeeter wetland (WL4), and upper Mess Creek wetlands (WL5 and WL6) often had the highest concentrations of metals including aluminum, arsenic, chromium, cobalt, magnesium, mercury, nickel, vanadium, and zinc. Of these wetlands, WL4 and WL6 were most often the highest in the aforementioned metal concentrations. All wetland sites exceeded at least one metal guideline. Copper, iron, and nickel exceeded guidelines at most wetlands, while one wetland (WL4) exceeded zinc guidelines. Arsenic and chromium exceeded guidelines at six and three wetlands, respectively.

3.2.3 Primary Producers

Biomass is a common measurement of productivity (the formation of new organic material) in aquatic systems. Primary producer biomass is measured as the concentration of chlorophyll *a* in a sample, which represents the photosynthetic (autotrophic) portion of the community.



Note: Error bars represent the standard error of the mean
Dotted line denotes detection limits.

FIGURE 3.2-1

Total Nitrogen, Phosphorus and Total Organic Carbon (TOC) Concentrations in Wetland Sediments, 2007

Phytoplankton biomass varied widely between wetlands and was highest within the Mess Creek watershed (Figure 3.2-2). Biomass ranged from 0.02 (WL4) to 3.03 µg/L (WL6), with a mean of 0.56 µg/L chlorophyll *a*. Phytoplankton densities were also highest in the Mess Creek watershed and ranged from 2 (WL10) to 419 cells x 10^3/L (Airstrip WL), with a mean of 103 cells x 10^3/L. Genus richness between the twelve wetlands ranged from 3 to 15 phytoplankton taxa, with a mean of 9 genera (Figure 3.2-2). Chyrsophyta (golden algae) dominated most wetland communities and accounted for an average of 61% of the phytoplankton communities in surveyed wetlands. The one exception was Airstrip WL, where the wetland was dominated (84%) by Chlorophyta (green algae), although smaller proportions of cryptophytes and cyanophytes (blue-green algae) were also present. The Shannon and Simpson diversity indices did not vary widely between wetlands and ranged from 0.83 to 2.24 and 0.45 to 0.85, respectively. Both diversity indices assigned WL11 as the most diverse wetland site. The mean Shannon and Simpson diversity indices across all wetlands are 1.54 and 0.69, respectively.

3.2.4 Secondary Producers

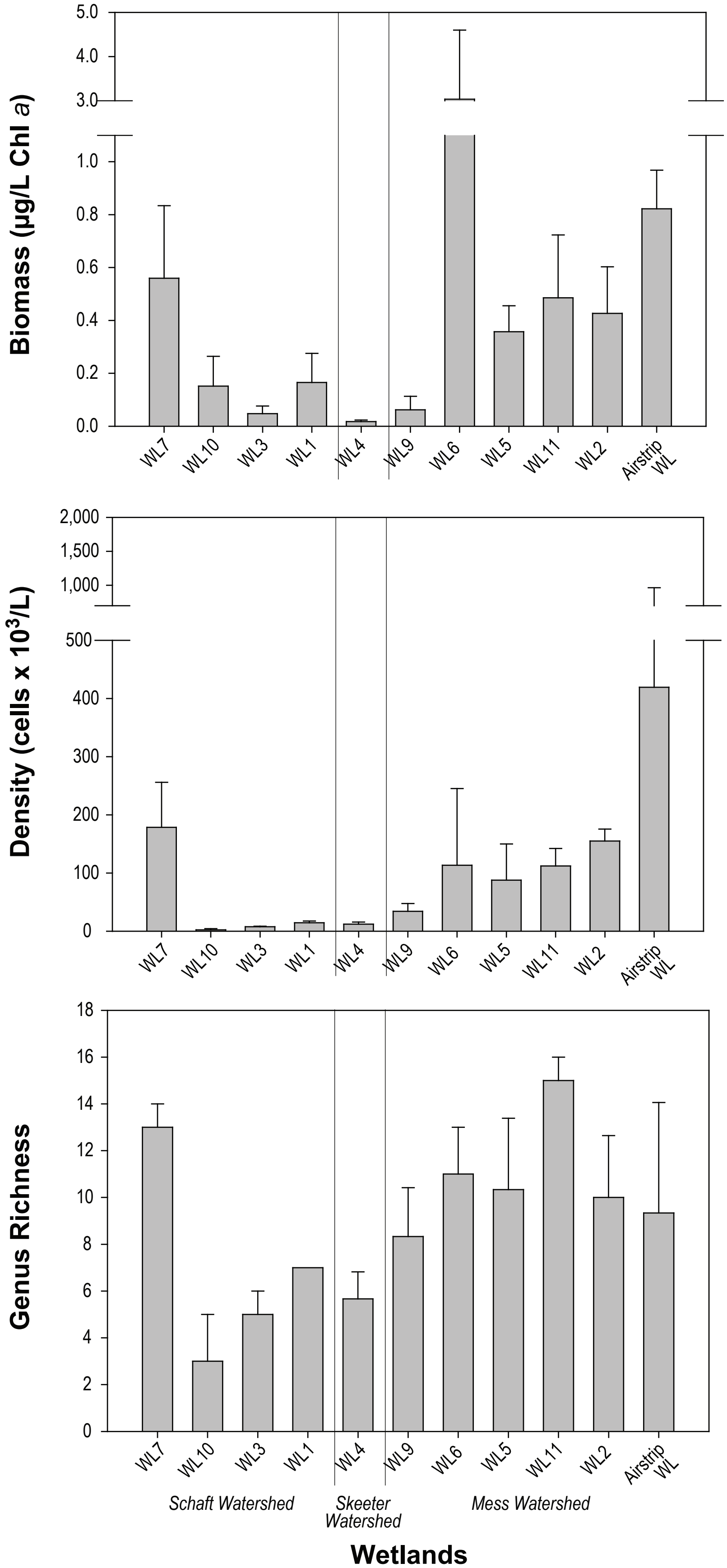
Since benthic invertebrates are sedentary and continually exposed to the chemical composition of sediments, they are ideal for monitoring ecosystem health in fresh water environments. The relatively high diversity of these communities also facilitates monitoring a variety of community reactions to a range of environmental stressors.

The average density of benthic invertebrates varied between wetlands, ranging from 1,718 (WL10) to 53,630 organisms/m^2 (WL10) (Figure 3.2-3). However, of the twelve wetlands sampled, nine had densities between 13,000 to 39,000 organisms/m^2. Wetlands within Mess Creek watershed had the highest densities of benthos. Average benthos genus richness ranged from 6 to 21, but most wetlands ranged from 10 to 13 taxa (Figure 3.2-3). Diptera (flies) were the dominant taxonomic group at eight of the twelve wetlands sampled (WL7, WL3, WL4, WL9, WL6, WL5, and WL2) accounting for over 50 percent of all organisms collected. Diptera were almost exclusively from the chrionomid family (98%). Mollusca were the second most abundant taxonomic group, followed by Oligochaeta (worms). Amphipoda were present in relatively high numbers at two wetlands (WL11 and WL7) and cladocera, hirudinea, nematoda, arachnida, ostracoda, copepoda, and bryozoa made up smaller proportions of the wetland benthos communities.

Little variation was observed between wetlands and their corresponding Shannon and Simpson Diversity Indices. The Shannon Diversity Index values ranged from 1.16 (WL4) to 2.38 (WL1), though most wetlands had between values of 1.49 and 2.05. The Simpson Diversity Index values ranged from 0.49 (WL9) to 0.85 (WL1), while most wetlands fell between 0.66 and 0.85.

3.3 Wetland Ecosystems

A total of 97 wetland ecosystem plots were surveyed in the Schaft Creek Wetland Study area. All 5 federally recognized wetland classes are present in the area with 24 distinct site associations making up the classes. Table 3.3-1 presents the number of ecosystems observed in each class. In addition to the wetlands identified, two transition ecosystems were also surveyed in the study area; a shrub-carr and flood. Transition ecosystems are similar to wetlands but lack



Note: Error bars represent the standard error of the mean

FIGURE 3.2-2

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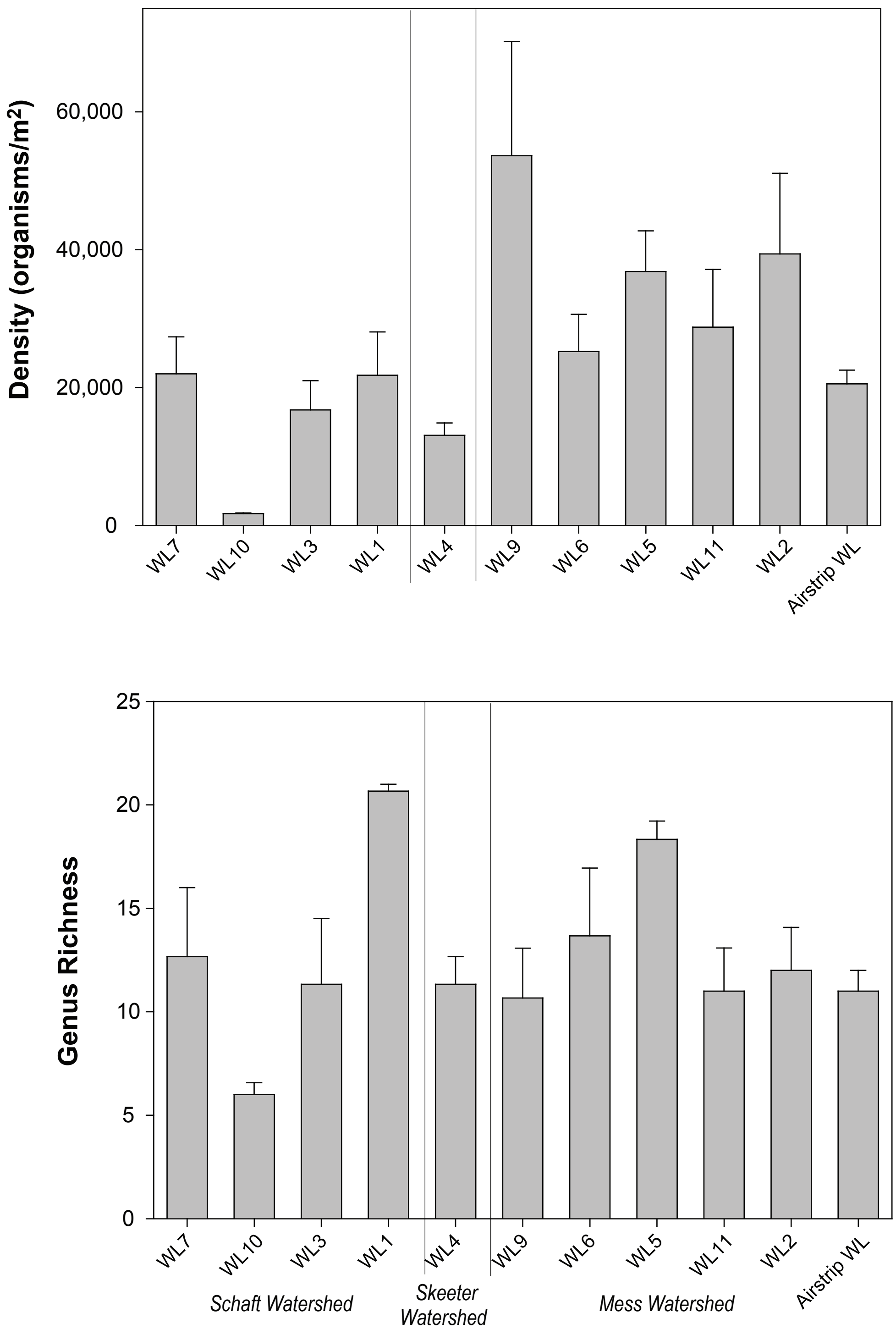
Phytoplankton Biomass, Density and Genus Richness in Schaft Creek Project Wetlands, 2007



Note: Error bars represent the standard error of the mean

FIGURE 3.2-3

Benthic Invertebrate Density and Genus Richness in Schaft Creek Project Wetlands, 2007

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Table 3.3-1
The Number of Wetlands Observed in Each Wetland Class

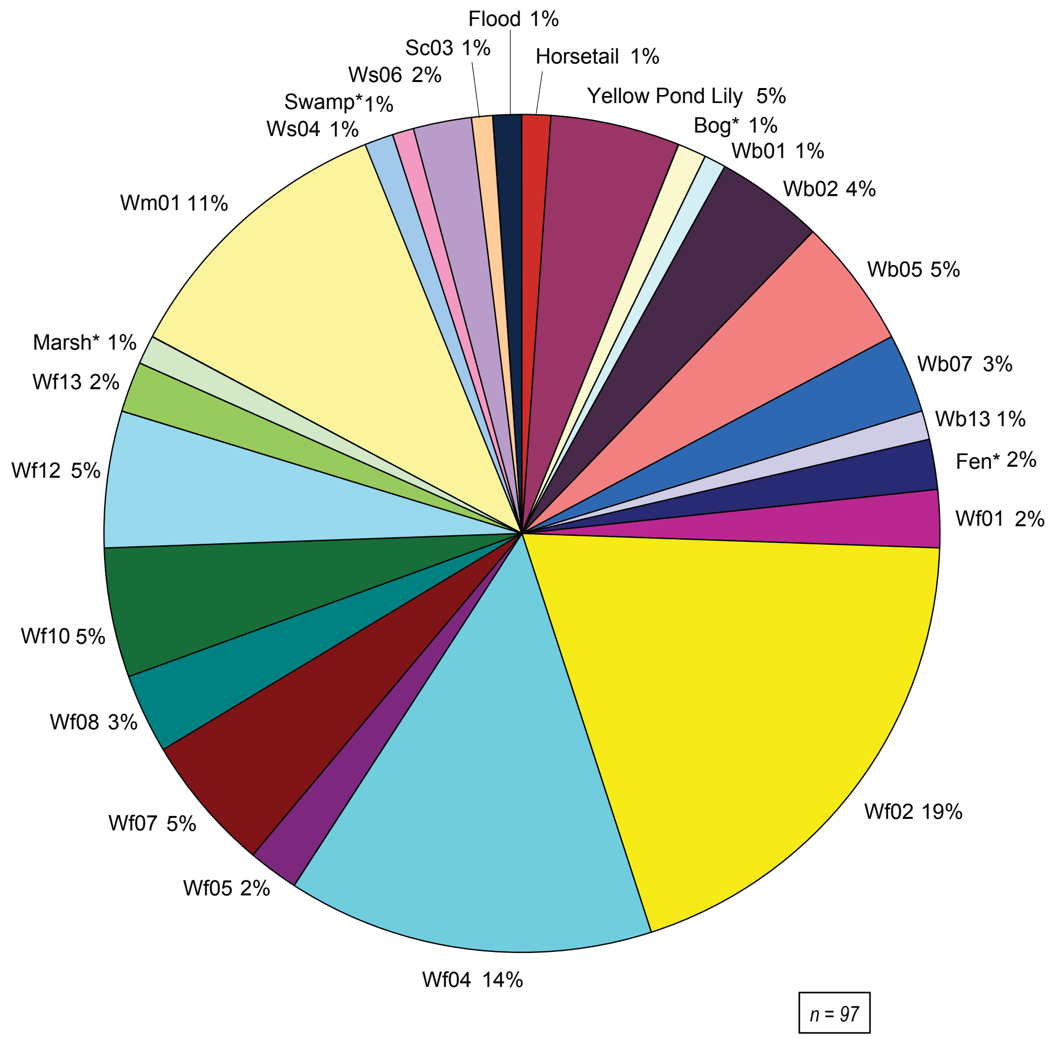
Wetland Class	Number Observed	Percentage of Total
Bog	14	14.4
Fen	60	61.8
Marsh	12	12.4
Swamp	5	5.2
Shallow Open Water	4	4.1
Transition	2	2.1
Total	**97**	

either the vegetation component, soil conditions, or water availability to be classified as a wetland. It is likely there are other transition associations in the riparian areas of Mess and Schaft Creeks; however, these communities are not the focus of this study and are only briefly described.

The most common wetland class in the study are is the fen class; 9 site associations were observed in this class (Figure 3.3-1). It is very common for wetlands in the study area to exist as a complex with other wetland ecosystems, as opposed to a distinct simple wetland community. Plate 3.3-1 shows a common wetland complex observed in the Schaft Creek wetland study area. The following sections describe the federal ecosystem class and the provincial site association.

Plate 3.3-1. Yellow Pond Lily Shallow Open Water and Scrub Birch Water Sedge Fen Wetland Complex.

Note: The Yellow Pond Lily Shallow Open Water Community is the 'pond' area in the centre of the plate. The Scrub Birch Water Sedge community is on the far side of the pond and extends from the water's edge back to the tree line.



Fen - Class	**Bog - Class**	**Marsh - Class**
Fen*	Bog*	Marsh*
Wf01	Wb01	Wm01
Wf02	Wb02	**Shallow Open Water - Class**
Wf04	Wb05	Horsetail
Wf05	Wb07	Yellow Pond Lily
Wf07	Wb13	Transistion
Wf08	**Swamp - Class**	Sc03
Wf10	Swamp*	Flood
Wf12	Ws04	
Wf13	Ws06	

** Wetland Class could not be classified into site association*

FIGURE 3.3-1

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Wetland Associations Observed in the Schaft Creek Study Area

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3.3.1 Bog

A bog is a nutrient-poor, *Sphagnum* dominated peatland ecosystem in which the rooting zone is isolated from mineral-enriched groundwater, soils are acidic and few minerotrophic plant species occur (MacKenzie and Moran, 2004). Bogs may be treed or tree-less and are usually covered with *Sphagnum spp.* and ericaceous shrubs. Precipitation, fog and snowmelt are the primary water sources, making all bogs ombrogenous. Precipitation does not usually contain dissolved minerals and is mildly acidic; subsequently bog waters are low in dissolved minerals and acidic in nature. Bog water acidity is enhanced because of organic acids formed during the decomposition of peat (Warner and Rubec, 1997). A total of 5 bog associations were identified in the study area; most of them were observed in Tailings Option A and Tailings Option C (Figure 3.3-2 and Figure 3.3-3).

Plate 3.3-2. Bog* at site SW89.

Site Association Code:	**Site Name:**
Bog*	Unidentified
Wetland Class:	**Wetland Area:**
Bog	0.51 ha

Site Description:

An unidentifiable bog community was observed at SW89 along the proposed road. A survey was not conducted at this site due to accessibility; and classification as a bog class wetland cannot be confirmed. This community is a treed seepage site at the toe of a slope. It is suspected as a bog community because coniferous tree species dominate the tree layer. The only other wetland class with significant tree cover is swamp; however, most swamp associations are dominated by tall shrubs and broadleaf trees, rather than conifers.

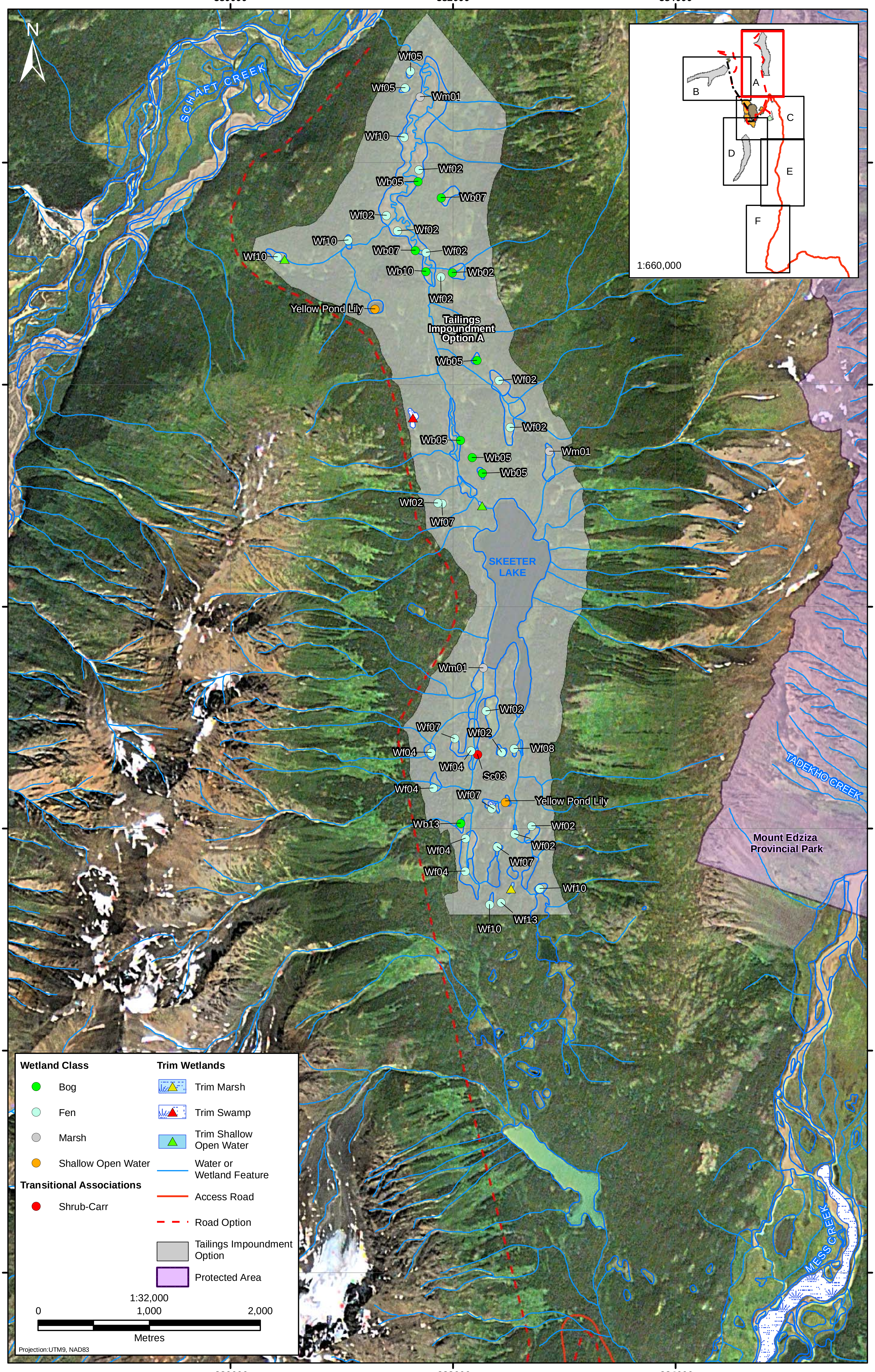

FIGURE 3.3-2

Wetland Ecosystems: Schaft Creek, Tailings Option A

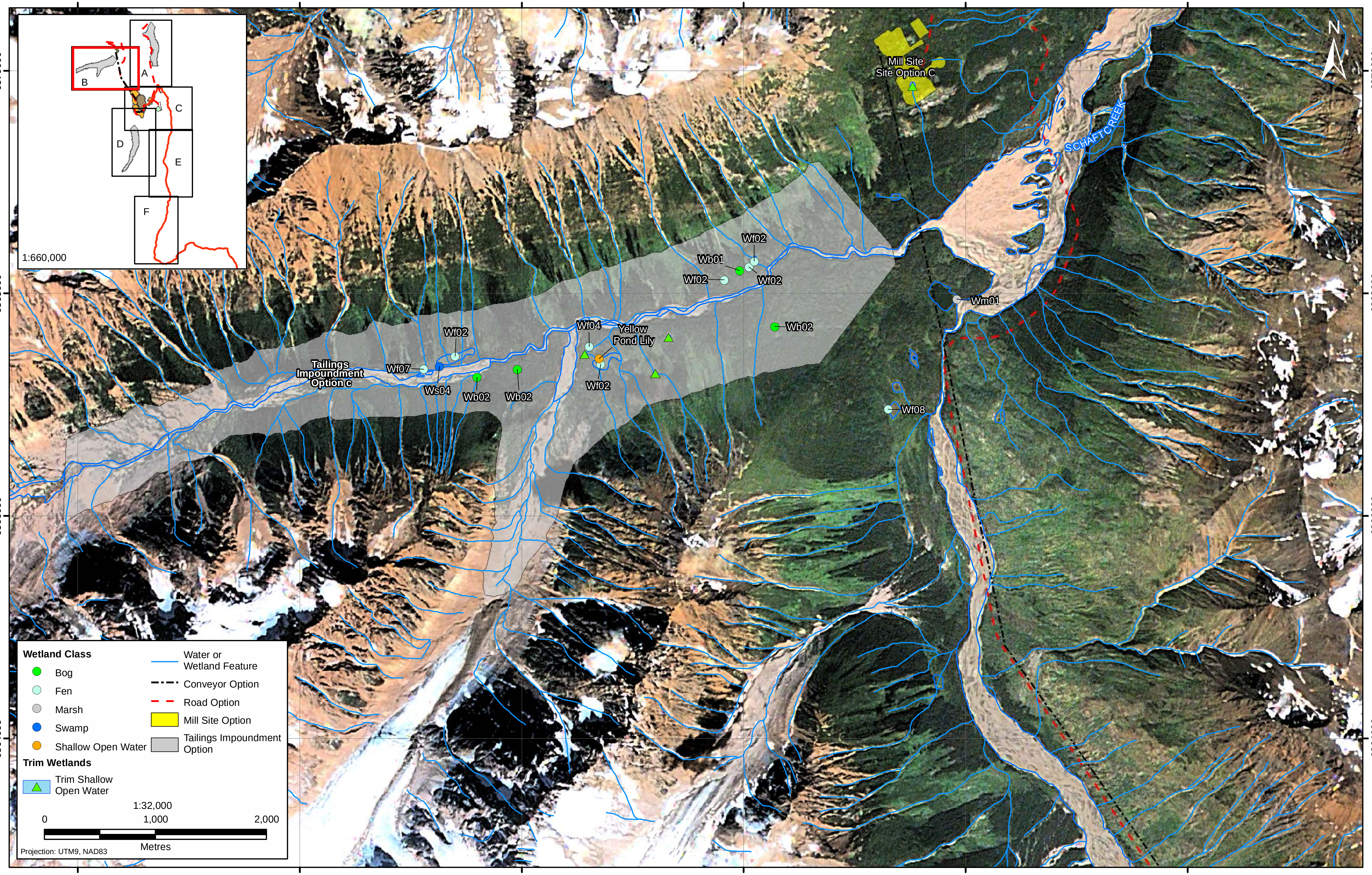

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FIGURE 3.3-3

Wetland Ecosystems: Schaft Creek, Tailings Option C

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Plate 3.3-3. Wb01 Bog at site SW5.

Site Association Code:
Wb01

Site Name:
Spruce – Creeping-snowberry – Peat-moss

Wetland Class:
Bog

Wetland Area:
0.48 ha

Site Description:

These bogs are uncommon in the boreal and sub-boreal forests at elevations between 500 and 1,000 m. They form in closed basins and in complexes with larger peatlands where there is little influence from groundwater (MacKenzie and Moran, 2004). This bog association was identified in Tailings Option C at 847 m in a complex with a Wf02 fen. Plate 3.3-3 shows the Wf02 fen in the foreground and the Wb01 bog approximately 20 m back. The vegetation is dominated by *Picea* and *Ledum groenlandicum*, which grow on raised microsites. The moss layer is dominated by *Sphagnum spp*. The soil is fibric *Sphagnum* peat and the soil nutrient regime is moderate. The hydrodynamic index is stagnant, soil water pH is approximately 6.5, and the soil moisture regime is very wet. A wildlife tree and well used game trail were observed in this community.

Plate 3.3-4. Wb02 Bog at site SW13.

Site Association Code:	**Site Name:**
Wb02	Lodgepole pine – Bog rosemary – Peat-moss
Wetland Class:	**Wetland Area:**
Bog	1.9 ha

Site Description:

These bogs are scattered throughout the central and sub-boreal interior below 1100 m. They occur in closed basins, in isolated zones in larger peatlands and around acidic peatland lakes (MacKenzie and Moran, 2004). This bog association was identified in Tailings Option C. *Pinus contorta* is a constant dominant, though other tress species are often present as well. Small shrubs such as *Kalmia microphylla* are common and often *Empetrum nigrum* is found on raised microsites. Soils are typically deep *Sphagnum* peat. The soil nutrient regime is generally poor, the hydrodynamic index is stagnant to sluggish, soil water pH is typically < 5.5, and the soil moisture regime is very wet.

Plate 3.3-5. Wb05 Bog at site SW28.

Site Association Code:	**Site Name:**
Wb05	Spruce – Water sedge – Peat-moss
Wetland Class:	**Wetland Area:**
Bog	8.32 ha

Site Description:

These bogs are common throughout the sub-boreal and central interior below 1,300 m. They occur as components of larger peatlands or in small closed basins where there is little lateral and groundwater movement and water table depression (MacKenzie and Moran, 2004). This association was surveyed in Tailings Option A. Sites are hummocky with trees and common bog species growing on elevated *Sphagnum* mounds. Soils are typically sedge-derived mesisols. The soil nutrient regime is generally moderate, the hydrodynamic index is stagnant to sluggish, soil water pH is typically < 7.0, and the soil moisture regime is very wet.

Plate 3.3-6. Wb07 Bog at site SW18.

Site Association Code:
Wb07

Site Name:
Lodgepole pine – Water sedge – Peat-moss

Wetland Class:
Bog

Wetland Area:
2.47 ha

Site Description:

These bogs are uncommon in the interior below 1,600 m. They occur in closed basins or in the peripheral areas of larger peatlands where there is some groundwater influence (MacKenzie and Moran, 2004). Three of these ecosystems were identified in Tailings Option A. *Pinus contorta* and other coniferous tree species are common. *Ledum groenlandicum* and *Carex aquatilis* are characteristic species in the understory. Soils are typically deep fibric or mesic sedge peat. The soil nutrient regime is moderately poor to medium, the hydrodynamic index is stagnant, soil water pH is typically < 7.0, and the soil moisture regime is very wet.

Plate 3.3-7. Wb13 Bog at site SW53.

Site Association Code:
Wb13

Site Name:
Shore sedge – Buckbean – Peat-moss

Wetland Class:
Bog

Wetland Area:
0.61 ha

Site Description:

These bogs are uncommon in costal transition regions below 1,600 m. They occur as components of larger peatlands and occupy the wettest portions (MacKenzie and Moran, 2004). *Carex limosa* and *Menyanthes trifoliata* are constant dominants. The moss layer is dominated by *Sphagnum spp*. The soil is *Sphagnum* peat; depth was difficult to measure at this particular site because this community is a series of floating peat mats in a complex with a Wf04 fen. The soil nutrient regime is very poor, the hydrodynamic index is stagnant, soil water pH is < 6.0, and the soil moisture regime is very wet.

3.3.2 Fen

A fen is a nutrient-medium peatland ecosystem dominated by sedges and brown mosses, where mineral-bearing groundwater is within the rooting zone and minerotrophic plant species are common (MacKenzie and Moran, 2004). Fens can have fluctuating water tables and are often rich in dissolved minerals. Surface water flow can be direct through channels, pools and other open features that can often form characteristic surface patterns. The vegetation in fens is closely related to the depth to and chemistry of groundwater. Shrubs occupy drier sites and minerotrophic graminoid vegetation is typically found in wetter sites (Warner and Rubec, 1997). A total of 10 fens were observed throughout the study area (Figures 3.3-2 through 3.3-7); however, most were observed in Tailings Option A.

Plate 3.3-8. Fen* at site SW86.

Plate 3.3-9. Fen* at site SW94.

Site Association Code:
Fen*

Site Name:
Unidentified

Wetland Class:
Fen

Wetland Area:
113.86 ha

Site Description:

Two unidentifiable fen communities were observed along the proposed road. These communities were not surveyed due to accessibility. They are large leaved fen complexes, likely of the Wf01 association. Wf01 fen complexes are some of the most common wetland associations in the province and occupy a variety of ecological niches. These wetlands are associated with the Mess Creek wetland complex and likely function as riparian area ecosystems even though they are several hundred meters from the main channel. Both sites are located at the toe of steep mountainous slopes and likely receive water from surface runoff, groundwater intrusion, and flood inundation.

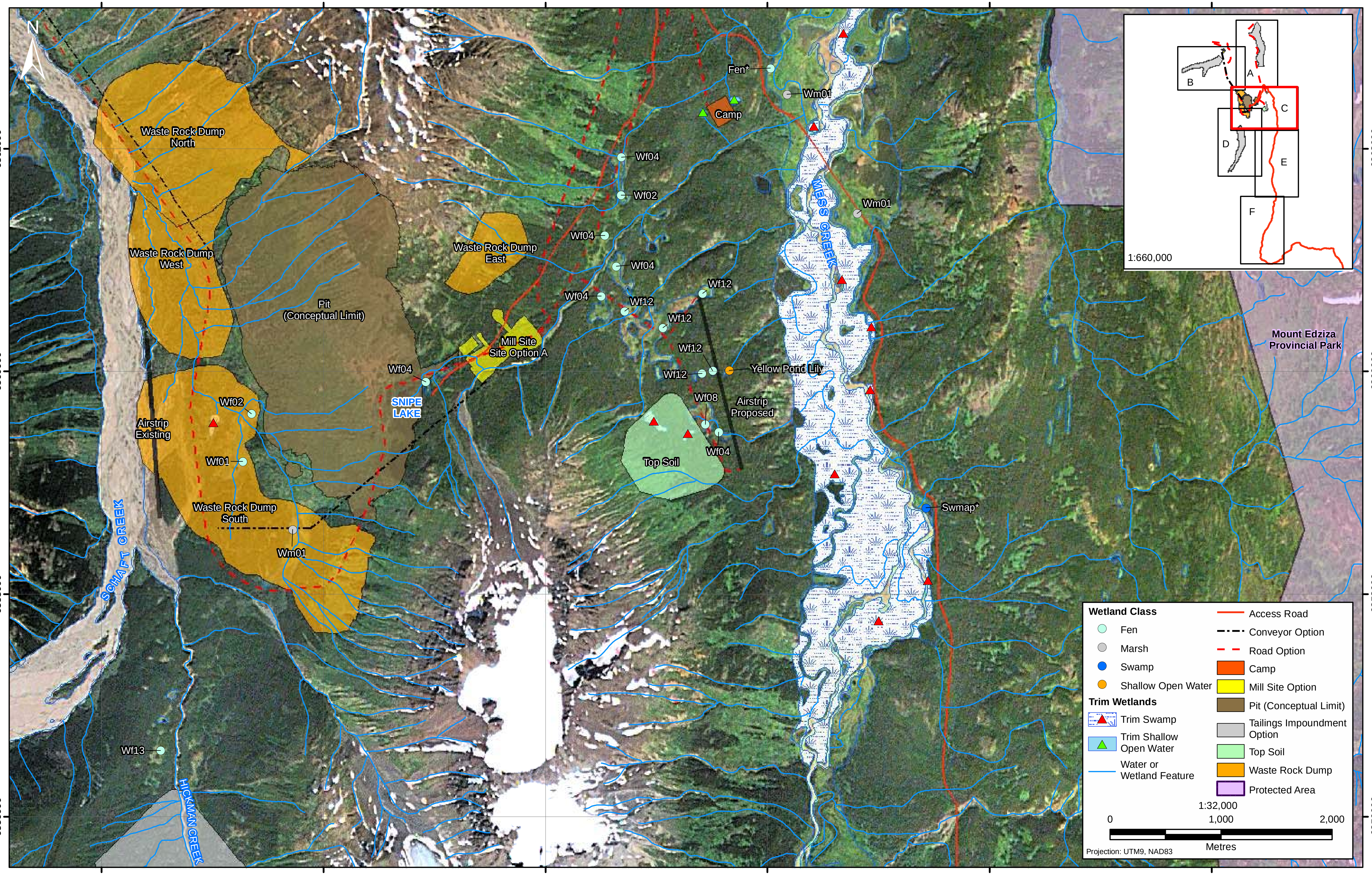

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FIGURE 3.3-4

Wetland Ecosystems: Schaft Creek, Saddle and Pit Area

Rescan

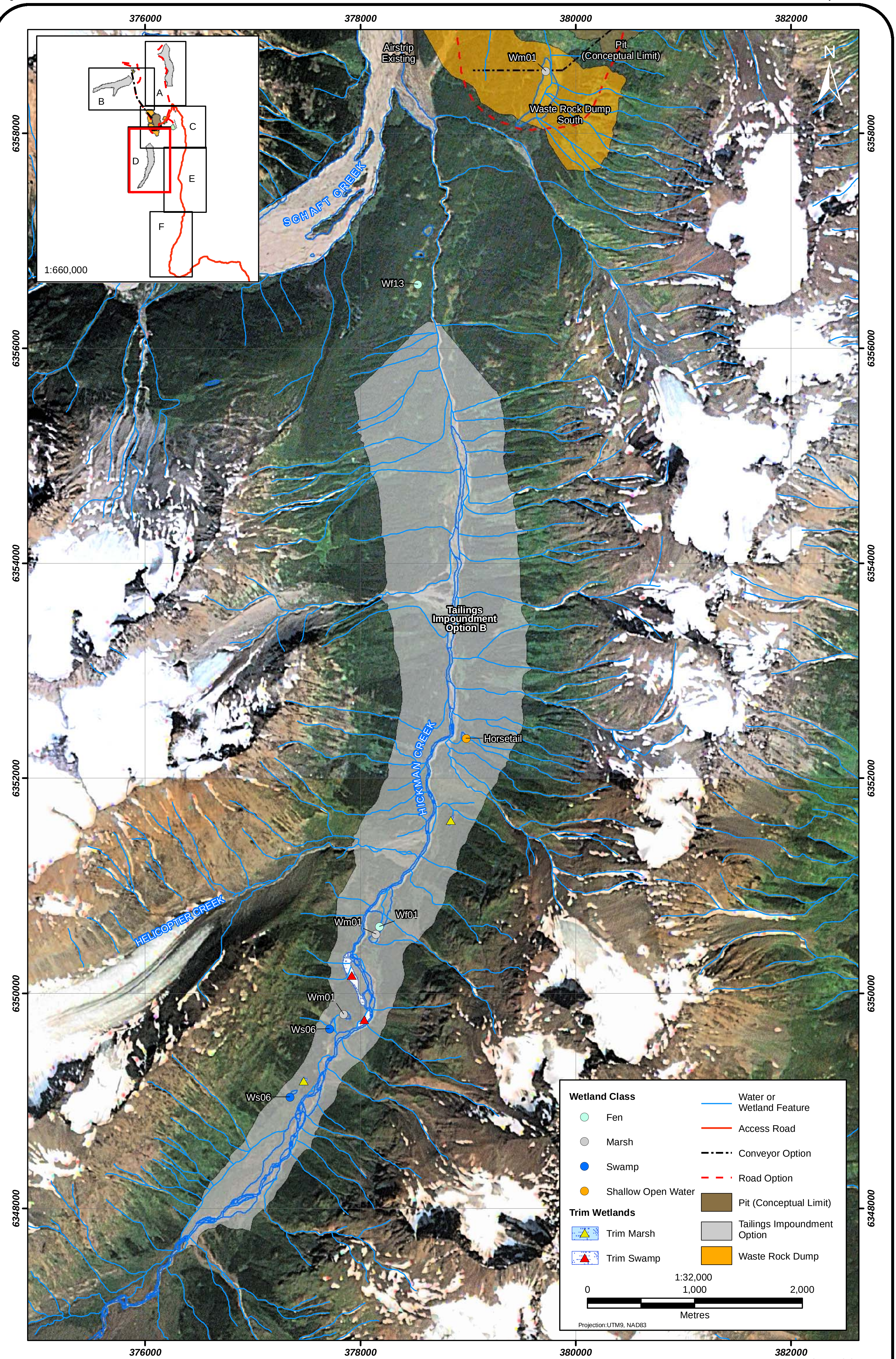

FIGURE 3.3-5

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Wetland Ecosystems: Schaft Creek, Tailings Option B

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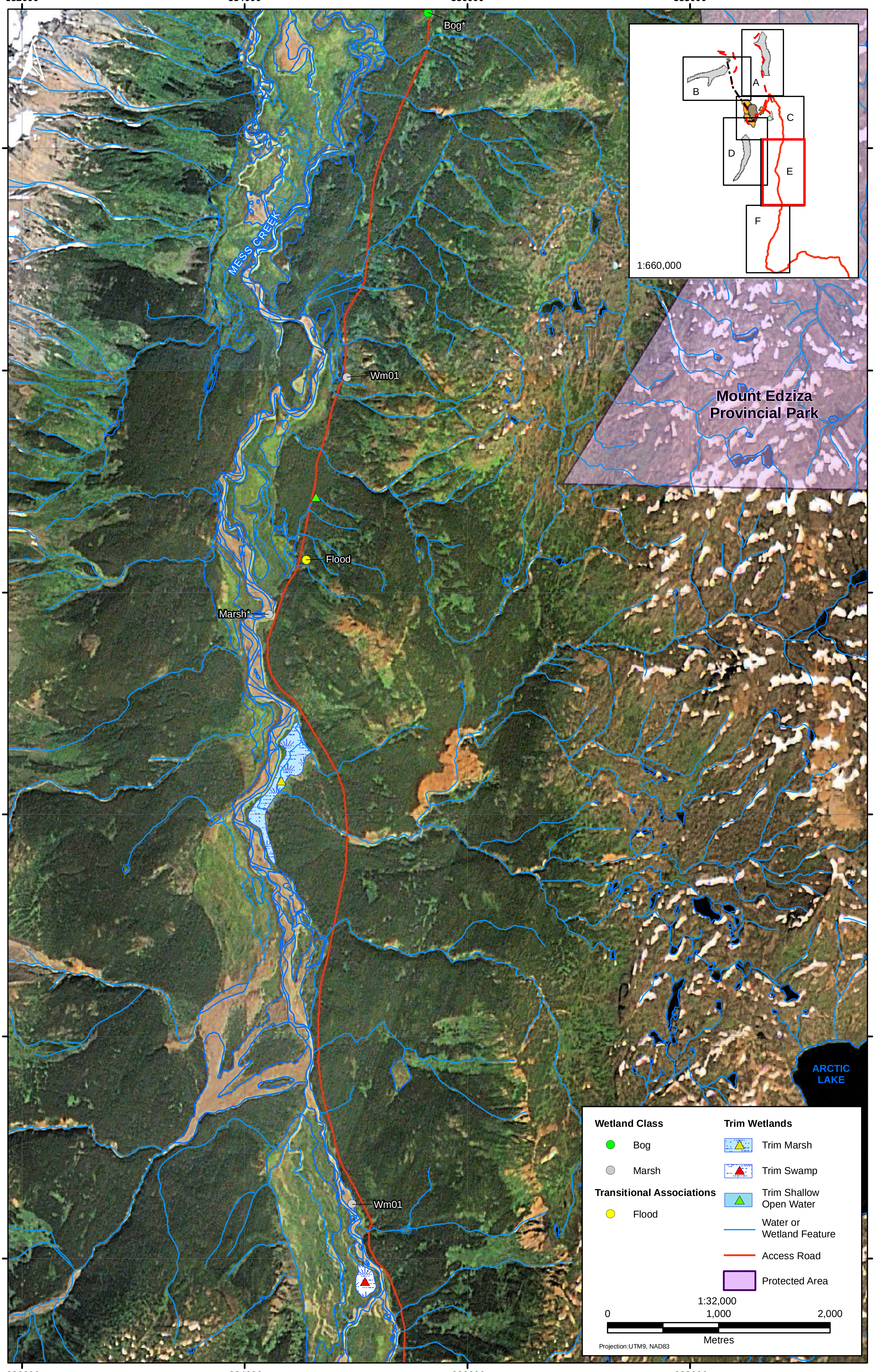

FIGURE 3.3-6

Wetland Ecosystems: Schaft Creek, Proposed Road (North)

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February 18, 2008

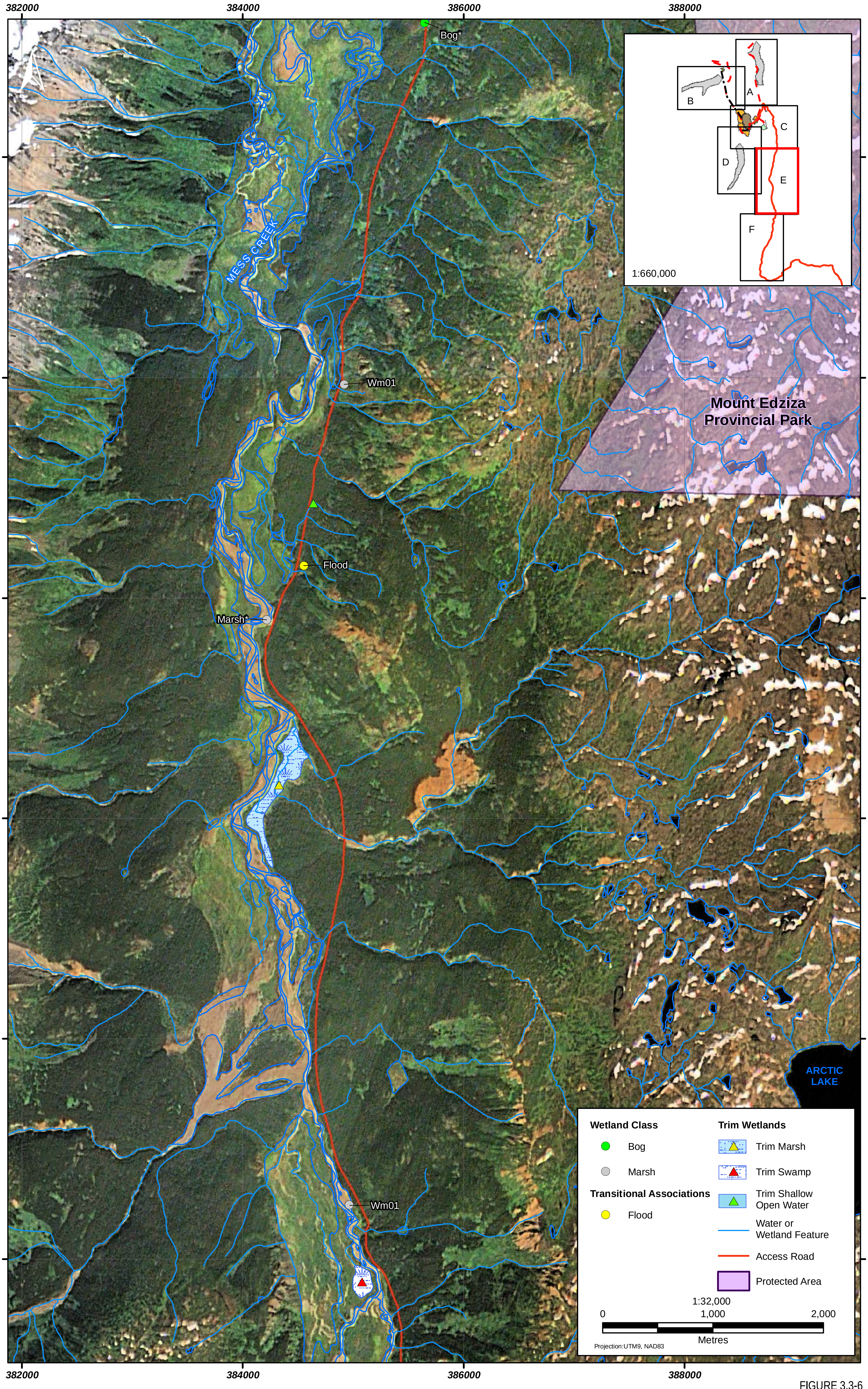

FIGURE 3.3-6

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Wetland Ecosystems: Schaft Creek, Proposed Road (North)

Rescan

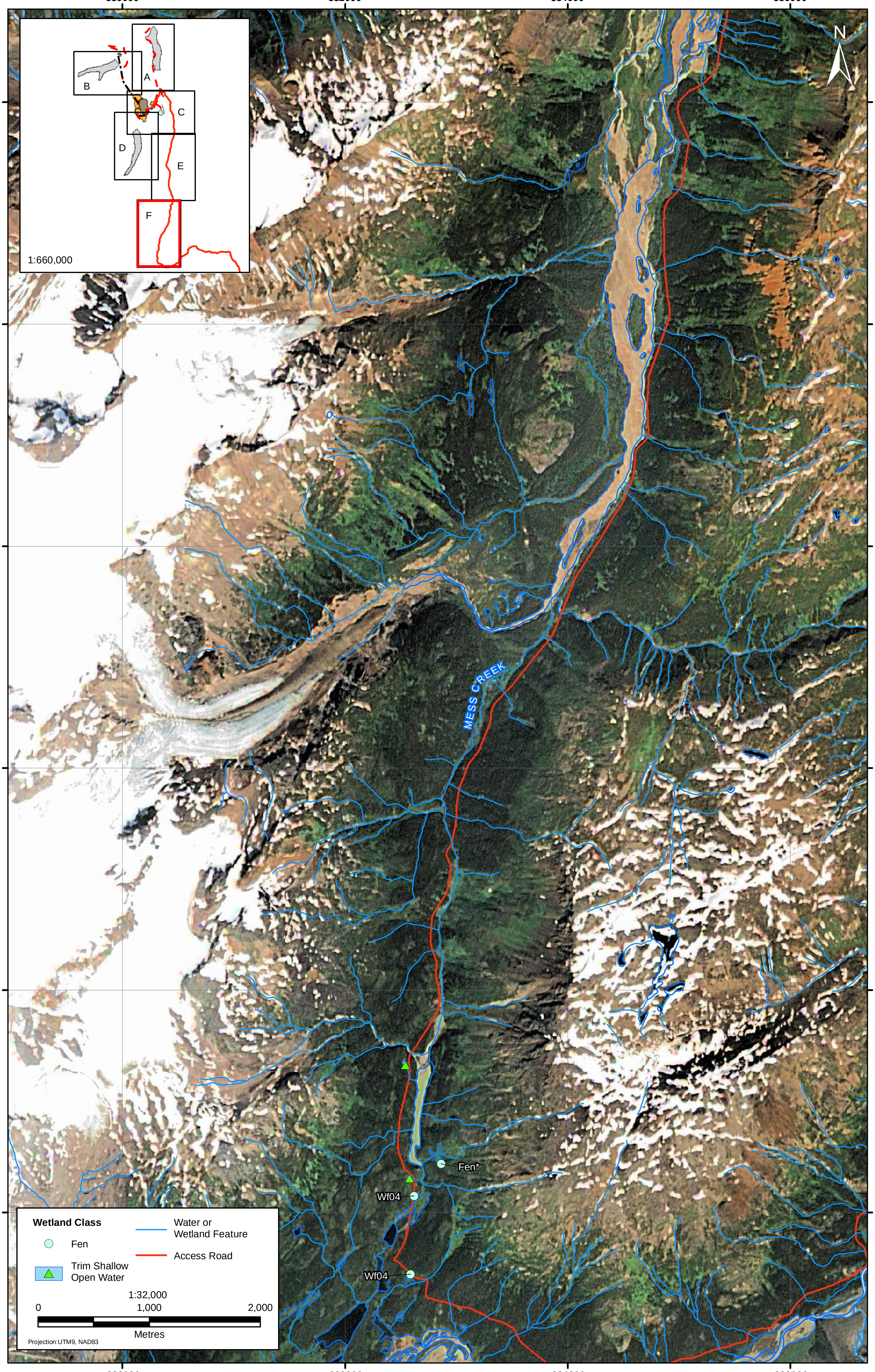

FIGURE 3.3-7

Wetland Ecosystems: Schaft Creek, Proposed Road (South)

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Plate 3.3-10. Wf01 Fen at site SW76.

Site Association Code:	**Site Name:**
Wf01	Water sedge – Beaked sedge
Wetland Class:	**Wetland Area:**
Fen	6.82 ha

Site Description:

The Wf01 fen site association is the most common fen in British Columbia. It can occupy all but the warmest and driest subzones from low to subalpine elevations. They can be found in basins and hollows, seepage slopes, potholes, fluvial, and lacustrine systems (MacKenzie and Moran, 2004). Two sites of this association were surveyed in the Pit area and Tailings Option B. Species diversity is low; Carex aquatilis and Carex utriculata dominate the herb layer. Shrubs are present on the periphery and species diversity is higher when sites are "meadow like" with little standing water. The soil is fibric sedge peat and the soil nutrient regime is moderately poor. The hydrodynamic index is sluggish to mobile, soil water pH ranges from between approximately 6.7 and 7.7, and the soil moisture regime is very wet. A wildlife tree and well used game trail were observed in this community.

Plate 3.3-11. Wf02 Fen at site SW3.

Site Association Code:
Wf02

Site Name:
Scrub birch – Water sedge

Wetland Class:
Fen

Wetland Area:
47.83 ha

Site Description:

This fen association is common throughout the interior. It is often a major component of larger peatlands where there is some water table fluctuation (MacKenzie and Moran, 2004). This association was the most common association surveyed in the study area, with 20 distinct communities identified throughout Tailings Option A, Tailings Option C, the Saddle, and The Pit area. *Betula nana* and *Carex aquatilis* are characteristic but other shrubs (*Salix spp*.) can also be present. Soils are typically deep sedge derived peat, though organic veneers are occasionally present. The soil nutrient regime is moderately poor to medium, the hydrodynamic index is stagnant to mobile, the average soil water pH is 6.5, and the soil moisture regime is very wet.

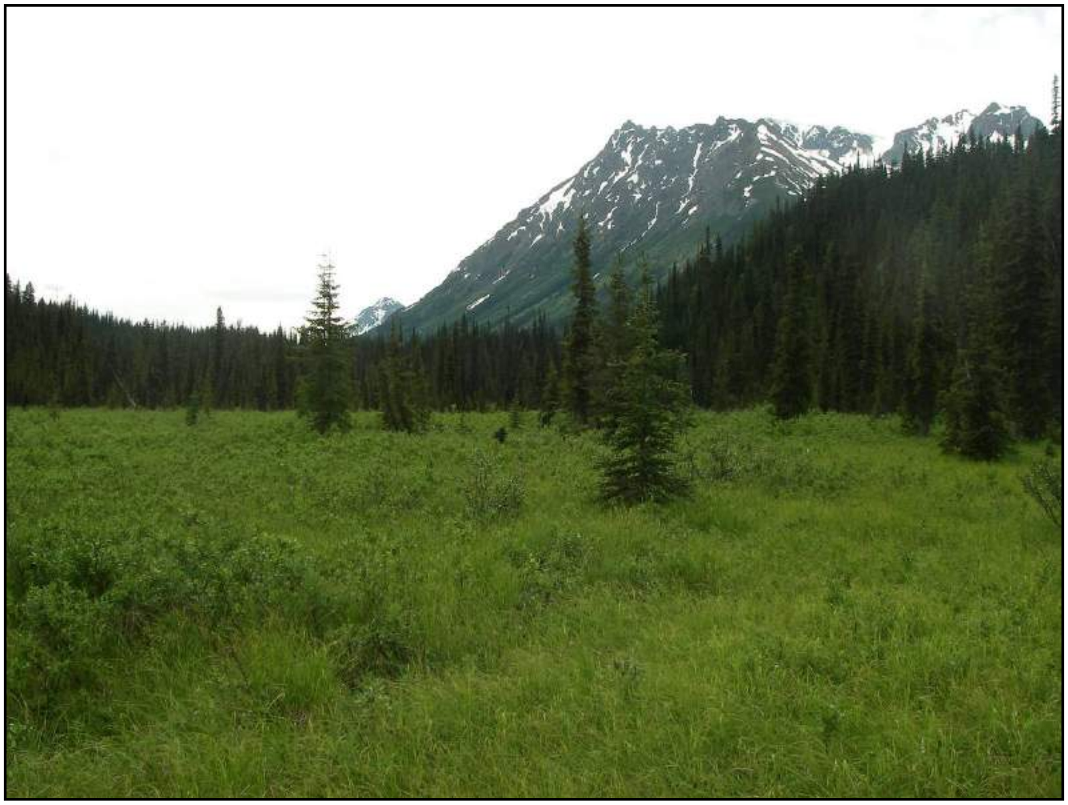

Plate 3.3-12. Wf04 Fen at site SW54.

Site Association Code:	**Site Name:**
Wf04	Barclay's willow – Water sedge – Glow moss
Wetland Class:	**Wetland Area:**
Fen	32.41 ha

Site Description:

These fens are common at subalpine elevations of the sub-boreal interior. They typically occur on seepage slopes, along glacier fed creeks, and in frost prone basins (MacKenzie and Moran, 2004). A total of 14 of this association were surveyed in Tailings Option A, the saddle, and Pit area. Sites are dominated by *Salix barclayi*, and *Carex aquatilis*. Other forbs such as *Caltha leptosepala*, *Eriophorum angustifolium*, and *Leptarrhena pyrolifolia* can be present at higher elevation sites. Soils are typically sedge-derived shallow peat mesisols. The soil nutrient regime is moderately poor to moderately rich, the hydrodynamic index is stagnant to mobile, the average soil water pH is 6.5, and the soil moisture regime is very wet.

Plate 3.3-13. Wf05 Fen at site SW36.

Site Association Code:
Wf05

Site Name:
Slender sedge – Common hook-moss

Wetland Class:
Fen

Wetland Area:
0.83 ha

Site Description:

These fens are common throughout the interior below 1,400 m. They typically form on peat flats surrounding small lakes, ponds, and infilled palustrine basins. Prolonged shallow surface flooding and peat saturation are typical (MacKenzie and Moran, 2004). Two of these communities were surveyed in Tailings Option A. Carex lasiocarpa dominates but other large water sedges such as c. aquatilis are also common. Salix spp. and Betula nana were observed scattered throughout and along the periphery. The soils are deep peat mesisols and are very saturated. The soil nutrient regime is moderately poor to moderately rich, the hydrodynamic index is stagnant, soil water pH is typically between 6.5 and 7.5, and the soil moisture regime is very wet.

Plate 3.3-14. Wf07 Fen at site SW1.

Site Association Code:
Wf07

Site Name:
Scrub birth – Buckbean – Shore sedge

Wetland Class:
Fen

Wetland Area:
6.19 ha

Site Description:

This association occurs throughout the central and sub-boreal interior at middle elevations in palustrine basins, hollows, and fluvial systems where there is a permanently high water table (Mackenzie and Moran, 2004). Four of these associations were surveyed in Tailings Option A and one was surveyed in Tailings Option C. Betula nana and Salix spp. are scattered through the sites and Carex limosa and other small leafed sedges are common. Menyanthes trifoliata occupy inundated depressions within the wetlands. The soil is Carex/Sphagnum peat > 1 m deep. The soil nutrient regime is moderately poor to medium, the hydrodynamic index is stagnant to sluggish, soil water pH ranges between 5.9 and 7.0, and the soil moisture regime is very wet.

Plate 3.3-15. Wf08 Fen at site SW80.

Site Association Code:
Wf08

Site Name:
Shore sedge – Buckbean – Hook-moss

Wetland Class:
Fen

Wetland Area:
6.8 ha

Site Description:

This fen association is uncommon throughout the interior; it occurs at higher elevations (700-1,800 m) in colder subzones. These ecosystems occur on pond-side floating mats, basins, and seepage slopes (MacKenzie and Moran, 2004). Three of these sites were surveyed in the study area; one in Tailings Option A, One in Tailings Option C, and one in the Saddle area. *Carex limosa* and *Menyanthes trifoliata* are constant dominants. The soils are fibric to mesic sedge and brown moss peat deposits > 0.5 m deep. The soil nutrient regime is moderately poor to medium, the hydrodynamic index is stagnant, soil water pH is between 6.7 and 7.2, and the soil moisture regime is very wet.

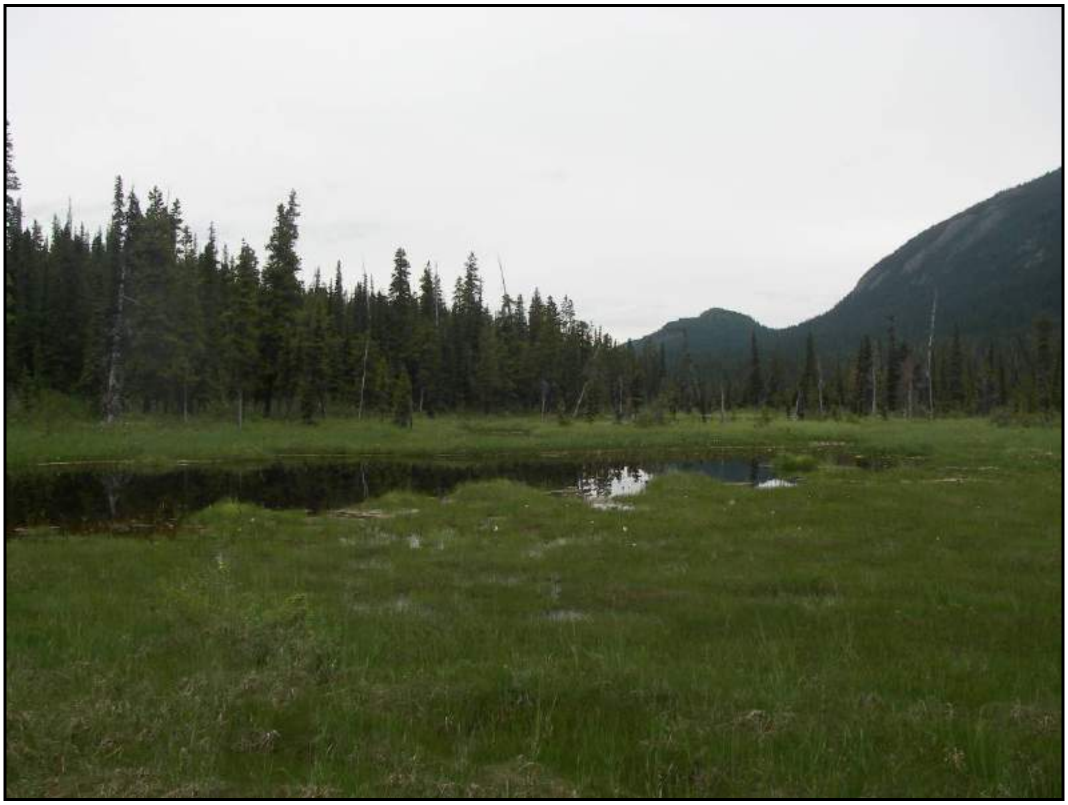

Plate 3.3-16. Wf10 Fen at site SW24.

Site Association Code:	**Site Name:**
Wf10	Hudson Bay Clubrush – Red hook-moss
Wetland Class:	**Wetland Area:**
Fen	7.97 ha

Site Description:

These fens are rare and generally only occur in the moist subzones of the Sub-Boreal Spruce (SBS). They occur where the water table is stagnant and is at or slightly above the peat surface (MacKenzie and Moran, 2004). The communities surveyed in the study area are not true Wf10 fens. They vary slightly in vegetation composition, site pH, and nutrient availability. The Wf10 ecosystems in the study area are dominated by *Trichophorum cespitosum* instead of *T. alpinum*. Five of these ecosystems were surveyed in Tailings Option A. Soils are typically sedge-derived peat fibrisols. The soil nutrient regime is very poor to medium, the hydrodynamic index is stagnant to sluggish, the average soil water pH is approximately 6.8, and the soil moisture regime is very wet.

Plate 3.3-17. Wf12 Fen at site SW68.

Site Association Code:
Wf12

Wetland Class:
Fen

Site Name:
Narrow-leaved cotton-grass – Marsh-marigold

Wetland Area:
22.88 ha

Site Description:

These fens are common at subalpine elevations throughout the sub-boreal interior. They occur on gently slopping peatlands where there is continual seepage from snowmelt and groundwater (MacKenzie and Moran, 2004). Five of these communities were identified in the Saddle area. *Eriophorum angustifolium* is dominant as is *Caltha leptosepala*. The moss layer is well developed but variable. The soils are deep spongy peat mesisols and are very saturated. The soil nutrient regime is moderately poor to medium, the hydrodynamic index is stagnant to sluggish, soil water pH is typically between 5.5 and 6.5, and the soil moisture regime is very wet.

Plate 3.3-18. Wf13 Fen at site SW79.

Site Association Code:	**Site Name:**
Wf13	Narrow-leaved cotton-grass – Shore sedge
Wetland Class:	**Wetland Area:**
Fen	1.77 ha

Site Description:

This association occurs at higher elevations in depressions or gradual seepage slopes where standing water persists for most of the growing season (MacKenzie and Moran, 2004). Two of these associations were surveyed in the study area; one in Tailings Option A and on in Tailings Option B. The community is typically *Eriophorum angistifolifum* and *Carex limosa*, although other forbs are present in different soil saturation conditions. The soil at these sites is typically deep, mesic peat with cotton-grass remains. The soil nutrient regime is moderately poor, the hydrodynamic index is stagnant, soil water pH is approximately 6.0, and the soil moisture regime is very wet.

3.3.3 Marsh

A marsh is a permanently to seasonally flooded non-tidal mineral wetland dominated by emergent grass-like vegetation (MacKenzie and Moran, 2004). Marshes are the most heavily used wetland type for most wetland-using wildlife species. They are typically eutrophic and support large standing crops of palatable vegetation, plankton and aquatic invertebrates. They are the favoured wetland class for most waterfowl, amphibians and semi-aquatic mammals because they provide good cover, open water and food. Soils are typically mineral but can also have a well decomposed organic surface tier (Warner and Rubec, 1997; MacKenzie and Moran, 2004). Two marsh association was observed in the study area; the majority of these marshes were surveyed along the road (Figure 3.3-6 and 3.3-7).

Plate 3.3-19. Marsh* at site SW92.

Site Association Code:
Marsh*

Wetland Class:
Marsh

Site Name:
Unidentified

Wetland Area:
0.06 ha

Site Description:

An unidentifiable marsh community was observed at SW92 along the proposed road. A survey was not conducted at this site due to accessibility; although, through the aerial survey, vegetation and structural components consistent with a Wm01 marsh were identified. However, classification is not carried to the association level and reflects the uncertainty of the data set. This community is a flood controlled large sedge dominated ecosystem. Flooding from Mess Creek and shallow groundwater reserves are likely the driving hydrological factors maintaining this community. A shrub dominated flood association or a swamp association are in complex with this marsh, located immediately upstream (lower left corner in Plate 3.3-19).

Plate 3.3-20. Wm01 at site SW42.

Site Association Code:
Wm01

Site Name:
Beaked sedge – Water sedge

Wetland Class:
Marsh

Wetland Area:
120.84 ha

Site Description:

This association is the most widespread marsh association in the province. They are found from low to subalpine elevations in all BEC subzones on sites that that are inundated by shallow low energy flood waters, on the margins of beaver ponds, lake margins and palustrine basins. The majority of these sites were observed along the proposed road, though a few were also surveyed in the various tailings options. Species diversity is low; sites are dominated by *Carex utriculata* and *C. aquatilis*. Soils are typically gleysols. The soil nutrient regime is moderate, the hydrodynamic index is typically mobile to dynamic, the pH ranges from 6.5 to 7.7, and the soil moisture regime is very wet.

3.3.4 Swamp

A swamp is a nutrient-rich wetland ecosystem where significant groundwater inflow, periodic surface aeration and elevated microsites support the growth of trees and tall shrubs (MacKenzie and Moran, 2004). Generally there is more than 30% tree or tall shrub cover. Soils are often gleyed mineral soils with a surface layer of anaerobically decomposed woody peat. In general, there are three physically different swamp communities (shrub-thicket, coniferous forest, and hardwood (deciduous) swamps) (Warner and Rubec, 1997). Swamps have a more vertical structure than other wetland classes and support a more diverse avifauna (MacKenzie and Moran, 2004). Forested swamps typically have an open canopy that appears to be favoured by many birds and bat species (MacKenzie and Moran, 2004; Lausen, 2006). Very few swamp ecosystems were observed in the study area, most of them observed in Tailings Option B (Figure 3.3-5).

Plate 3.3-21. Swamp* at site SW88.

Site Association Code:	**Site Name:**
Swamp*	Unidentified
Wetland Class:	**Wetland Area:**
Swamp	6.32 ha

Site Description:

An unidentifiable swamp community was observed at SW88 along the proposed road. A survey was not conducted at this site due to accessibility; although, through an aerial survey, vegetation and structural components consistent with a swamp class wetland were identified. This community is a flood controlled shrub dominated ecosystem and is likely similar to the shrub community associated with the marsh* site at SW92. Flooding from Mess Creek and shallow groundwater reserves are likely the driving hydrological factors maintaining this community. A sedge dominated marsh is in complex with this swamp, located between this community and the shrub dominated riparian area of Mess Creek (centre of Plate 3.3-21).

Plate 3.3-22. Ws04 at site SW2.

Site Association Code:	**Site Name:**
Ws04	Drummond's willow – Beaked sedge
Wetland Class:	**Wetland Area:**
Swamp	0.07 ha

Site Description:

This association is common in the central and sub-boreal interior and is often associated with fluvial systems. One of these wetland communities were observed in the study area in Tailings Option C. *Salix drummondiana* dominates with other shrubs present as well. The herb layer is dominated by *Carex aquatilis* and *Equisetum arvense*. Soils are a thin organic veneer over a gleyed mineral soil. The soil nutrient regime is moderate, the hydrodynamic index is mobile, the pH is approximately 7 and the soil moisture regime is very wet.

Plate 3.3-23. Ws06 at site SW74.

Site Association Code:	**Site Name:**
Ws06	Sitka willow – Sitka sedge
Wetland Class:	**Wetland Area:**
Swamp	0.58 ha

Site Description:

Two of these communities were observed in Tailings Option B. This association is uncommon at low elevations in the Nass Basin and sub-boreal interior. Species diversity in the shrub layer is high with a number of *Salix spp.* identified. A number of *Carex* spp were also identified; however, *C. sitchensis* is the most common. Soils are typically gleysols overlain by thin layers of sedge dominated peat. The soil nutrient regime is moderately poor to moderate, the hydrodynamic index varies substantially from sluggish to dynamic, the pH ranges from 6.9 to 7.4, and the soil moisture regime is very wet.

3.3.5 Shallow Open Water

Shallow open water wetlands are ecosystems permanently flooded by still or slow-moving water and dominated by rooted and floating leaved aquatic plants. Shallow open water wetlands are often the transition from bogs, fens, marshes and swamps to permanent deep water bodies (*i.e.*, sluggish streams and lakes) (Warner and Rubec, 1997; MacKenzie and Moran, 2004). Shallow open water wetlands also include wetlands created and controlled by beavers (*Castor canadensis*). They are important habitat for wildlife and fish because of vegetation cover and high prey densities (MacKenzie and Moran, 2004). Sedimentation and nutrient loading are the biggest concern for shallow open water wetlands. Changes in turbidity block light penetration and alter where rooted submerged aquatic vegetation can grow (MacKenzie and Moran, 2004). Shallow open water ecosystems were observed scattered throughout the study area and typically formed complexes with other wetland associations (Figures 3.3-2 through 3.3-7).

Two shallow open water ecosystems were identified as the primary community type in the wetland ecosystem study. The most common shallow open water community is dominated by the yellow pond lily (Plate 3.3-24). These sites exist throughout the study area as the primary community type in a wetland complex, the associated ecosystem in a wetland complex, and as a stand-alone wetland association. The other shallow open water community surveyed as the primary community type is a horsetail dominated pool in Tailings Option B (Plate 3.3-25).

Two other shallow open water communities were observed as the associated ecosystem in a wetland complex. One was a pond weed community dominated by *Potamogeton sp* (Plate 3.3-26). The other was a non-vegetated ecosystem, which are pools in peat wetlands where no submergent vegetation is growing (Plate 3.3-27).

Plate 3.3-24. Yellow Pond Lily community at site SW60.

Plate 3.3-25. Horsetail community at site SW78.

Plate 3.3-26. Pond Weed community at site SW47.

Plate 3.3-27. Non-vegetated shallow open water ecosystem at SW43.

3.3.6 Transition and Other Associations

There are many transition association and associated wetland associations likely present in the study area. These ecosystems are not wetlands because they lack the specific soil, vegetation, or water requirements to be classified as wetlands; however, they function in a similar manner and are often connected with wetland ecosystems. Two of the most common associated ecosystems observed throughout the study area are the Shrub-carr Sc03 Barclay's willow – Arrow-leaved groundsel and various flood associations.

The Sc03 community is common in the subalpine of the northern boreal mountains. They form extensive communities on moist to very wet soils. Barclay's willow is always present in Sc03 communities and the herb layer is often diverse but usually dominated by *Senecio triangularis* and *Valeriana sitchensis*. The soils are imperfectly drained mineral soils. Plate 3.3-28 is of a Shrub-carr community surveyed at SW34.

Various flood associations are connected with Schaft and Mess Creeks. These creek systems are dynamic systems and flooding occurs annually. The riparian communities along Schaft and Mess Creeks have developed to withstand this annual inundation. The flood associations of both rivers dominated by *Salix spp.* and they are often strongly connected with swamp associations or upland forest (Plate 3.3-29).

Plate 3.3-28. Shrub-carr community at SW34.

Plate 3.3-29. Flood association on Mess Creek connected to upland forest.

3.3.7 Rare Ecosystem Associations

This section presents a summary of ecosystems that were either listed on the provincial red/blue list or uncommon within the study area. Ecosystem survey notes were compared against information compiled by the B.C. Conservation Data Centre (CDC) for consideration as provincially rare ecosystems. This was done to ensure due diligence and to identify whether ecosystems in the study area have been classified by the BC Ministry of Environment as:

- Red Listed – Any ecological community that is extirpated, endangered, or threatened in British Columbia (MOE, 2007).
- Blue Listed – Any ecological community considered to be of Special Concern (formerly Vulnerable) in British Columbia (MOE, 2007).

Three blue listed fens and two blue listed bog associations were identified in the study area. Table 3.3-2 presents a summary of the rare ecosystem information.

Table 3.3-2
Summary of Rare Wetland Ecosystems

Class	Association Code	Location	Site	Area (ha)
Fen	Wf05	Tailings Option A	SW36	0.44
Fen	Wf05	Tailings Option A	SW37	0.39
Fen	Wf08	Tailings Option A	SW48	0.87
Fen	Wf08	Tailings Option C	SW80	1.00
Fen	Wf08	Saddle	SW66	4.93
Fen	Wf13	Tailings Option A	SW58	0.27
Fen	Wf13	Tailings Option B	SW79	1.50
Bog	Wb07	Tailings Option A	SW18	1.58
Bog	Wb07	Tailings Option A	SW21	0.89
Bog	Wb10	Tailings Option A	SW14	1.2

3.4 Wetland Area

The area for each wetland association is presented in the association descriptions in section 3.3. This section summaries the wetland area for each wetland class and in each proposed mine feature. Wetland areas were estimated using TRIM GIS data. Where multiple wetland associations were surveyed in a single TRIM wetland polygon, high resolution satellite imagery was used to digitize distinct community types. Table 3.4-1 presents the wetland area for each wetland class including non surveyed TRIM wetlands. Table 3.4-2 presents the area of wetland communities inside the foot print of the proposed mine features.

Table 3.4-1
Wetland Area of each Wetland Class of the Schaft Creek Study Area

Wetland Class	Area (ha)
Bog	14.3
Fen	247.37
Marsh	120.0
Swamp	6.98
Shallow Open Water	2.51
TRIM Marsh	18.9
TRIM Swamp	432.26[1]
TRIM Shallow Open Water	1.88
Total	**844.2**

[1] This area is large because the TRIM Swamp wetland data used to estimate this value likely includes riparian and flood associated ecosystems. Approximately 50% of this area was estimated from one TRIM Swamp polygon on Mess Creek.

Table 3.4-2
Wetland Area in Proposed Mine Development Areas

Proposed Development Areas	Area (ha)
100 m of Mess Creek Access Option	662.01[1]
150 m of Proposed Infrastructure (Runways, roads, waste rock piles, plant sites, *etc.*)	67.0
Tailings Option A	97.64
Tailings Option B	6.61
Tailings Option C	11.62

[1] This area is large because the TRIM Swamp wetland data used to estimate this value likely includes riparian and flood associated ecosystems. Approximately 30% of this area was estimated from one TRIM Swamp polygon on Mess Creek.

3.5 Wetland Wildlife Observations

A number of wildlife and wildlife features were observed in wetlands in the study area. Table 3.5-1 presents the wildlife species/ feature observed and the location.

These species and features are incidental observations and part of a scientific survey. For complete wildlife results refer to Rescan (2007a), Rescan (2007b), Rescan (2007c), and Rescan (2008c).

Table 3.5-1
Wildlife Observations from Schaft Creek Study Area Wetlands

Plot	Location	Species or Feature
SW3	Tailings Option C	Wildlife Tree
SW4	Tailings Option C	Columbia Spotted Frog
SW5	Tailings Option C	Game Trail/Wildlife Tree
SW11	Tailings Option C	Game Trail
SW13	Tailings Option C	Game Trail
SW14	Tailings Option A	Game Trail
SW23	Tailings Option A	2 Columbia Spotted Frogs
SW26	Tailings Option A	Moose
SW28	Tailings Option A	Game Trail
SW29	Tailings Option A	Columbia Spotted Frog
SW35	Tailings Option A	Beaver Dam/Pond
SW37	Tailings Option A	Game Trail to Open Water
SW41	Tailings Option A	Mud wallow
SW47	Tailings Option A	Wildlife Tree
SW49	Tailings Option A	Columbia Spotted Frog
SW54	Tailings Option A	Columbia Spotted Frog
SW61	Saddle	Western Toad and Columbia Spotted Frog
SW65	Saddle	Columbia Spotted Frog
SW66	Saddle	Tadpoles (Western Toad)
SW73	Tailings Option B	Waterfowl[1]
SW77	Tailings Option B	Beaver
SW78	Tailings Option B	Game Trail to Open Water
SW83	Pit	Game Trail (Beaver and Moose sign)
SW85	Pit	Beaver Dam/Pond

[1] Waterfowl were observed at a number of shallow open water features

4. DISCUSSION

4. Discussion

Wetland functions and values are described following Environment Canada (2003) (Section 2.5.2). The survey results from the ecosystem survey, hydrology survey, and aquatic biological sampling are considered within the context of known current and traditional land uses to describe functions and identify wetland value.

Current land uses within the Project area included active guide outfitting and trapping. These activities generate revenue for local communities and maintain culturally important traditions (Rescan 2007d). The Project area is also adjacent to Mount Edziza Provincial Park. Although this park is remote and receives few visitors every year, it does provide important recreational activities in the area (MOE, 2008).

4.1 Wetland Functions and Values

4.1.1 Wetland Functions

The field data collected during the hydrology survey, ecosystem assessment, and aquatic biology sampling were selected to identify the functions of wetlands in the study area. Table 4.1-1 shows which wetland functions are described by the field data.

Table 4.1-1
Wetland Function and Associated Fieldwork Component

Wetland Function	Fieldwork Component
Hydrological Function	Hydrology monitoring and Ecosystem survey (Hydrodynamics)
Biochemical Function	Aquatic Biology(Sediment and water quality) Ecosystem Survey (Soil Water pH and Soil Horizon Identification)
Ecological Function	Aquatic biology (Productivity) and Ecosystem survey (Classification)
Habitat Function	Fisheries Sampling/Habitat Assessment and Ecosystem survey (Classification and Wildlife observations)

4.1.1.1 Hydrological Function

The hydrological function of a wetland is described as a wetlands ability to regulate water contributions to and from surface and groundwater reserves. The hydrological function is quantified through hydrological surveys at a sample of wetlands and ecosystem observations. Ecosystem observations incorporate two indicators to describe hydrological function:

1. Minerotrophic plant species (The presence of minerotrophic species indicates mineral rich groundwater is supplying the wetland with water.)
2. Hydrodynamic index (This index categorizes the amounts of vertical and horizontal movement of water at a site. The index rating is arrived at through observations of surface erosion, soil pit infiltration and mineral leaching in soil layers.)

Continuous water level monitoring at SC wetland indicates that the water level rose above the ground level numerous times throughout the monitoring period. A comparison with the precipitation data suggests that increases in the SC wetland are due to precipitation events. It also takes approximately 7-10 days for water levels to recede to pre-precipitation event levels. The continuous water level monitoring data from the MC wetland is slightly different; it shows that water levels do not change dramatically after precipitation events, indicating that water from precipitation quickly infiltrates into the ground or enters Mess Creek.

Wetlands in the study area play a prominent role in the regions hydrology. They store water and buffer the surface water environment from flooding, providing flood protection and erosion control benefits. Riparian area and wetlands with shallow open water features regulate surface water while small terrestrial fens, marshes and swamps regulate water contributions to groundwater. Plate 4.1-1 shows water seeping from a fen into Tailings Option C Creek.

Plate 4.1-1. Water seeping from a Wf07 Fen into Tailings Option C Creek.

Wetlands help maintain the level of the water table and exert control on the hydraulic head, which provides the force for groundwater recharge and discharge. The extent of groundwater recharge by a wetland is dependent upon its soil, vegetation, site, perimeter to volume ratio and water table gradient. A high perimeter to volume ratio, such as in small fen wetlands, means that there is a large surface area through which water can infiltrate into the groundwater. Groundwater recharge of up to 20% of wetland volume per season is typical (Turner and Gannon, 2003).

4.1.1.2 Biochemical Function

Biochemical function is defined as a wetland's contribution to the quality of surface water and groundwater. This function is identified through sediment and water sampling as well as through field pH measurements and soil horizon identification.

Particle size analysis shows that the bedload of most wetlands is dominated by silt. Wetlands are known for their filtration properties and have often been constructed as a passive water purification measure (Hammer, 1989). As sediments and particles settle out in the slow moving wetland water, nutrients, metals and toxins bound to these particles also settle out. Plants, microorganisms and chemical processes specific to wetlands help to breakdown, sequester and metabolize nutrients, metals and toxins, effectively removing them from the larger surface water network and facilitating the energy transfer of nutrients from aquatic species to terrestrial ecosystems.

Wetlands in the study area play a prominent role in the aquatic biochemical cycle. They remove sediments and prevent metals trapped within those sediments from being released into the larger aquatic environment.

4.1.1.3 Ecological Function

Ecological function is the role of the wetland in the surrounding ecosystem. It is qualified through aquatic biology productivity sampling and through ecosystem structure observations during the ecosystem classification.

Wetlands in the study area are strongly connected with the upland environment and often form complexes of multiple wetland associations before transitioning into upland environments. There are a number of beaver controlled shallow open water wetlands with various marsh associations occupying the more shallow water near the shore. These marsh associations then transition into tall shrub and forested swamp associations before eventually drying out and becoming upland forest.

The aquatic biology study found that wetlands and stream sites have similar levels of primary productivity as identified through genus richness and the Simpson diversity index. However, wetland sites have more dense benthic communities and slightly more secondary production genera. This underlies the difference between stream and wetland aquatic habitat. Given that wetlands play a significant role in providing habitat for a number of organisms, it is not a component of the ecological function that all wetlands have higher primary and secondary productivity than streams. It is rather the diversity between wetland and stream aquatic communities that lead to an ecologically strong environment. The ecological function is supported through a diversity of aquatic habitats.

Wetlands in the study area have many important ecological functions. They typically are an integral part of an important water drainage system. They often form complexes with several types of wetland associations but maintain a similar level of productivity, thereby offering various types of habitat and different ecological niches.

4.1.1.4 Habitat Function

The habitat function is the terrestrial and aquatic habitat provided by wetlands. It is identified during fisheries sampling and fish habitat assessments and through wildlife observations during the ecosystem survey.

The study area fens provide important browse habitat for moose and bears. In the summer, moose will also feed upon aquatic vegetation such as lily (*Nuphar spp.*) rhizomes and pondweed (*Potamogeton spp.*) that grow in marshes and shallow water wetlands (Belovsky and Jordan, 1981). Moose also visit marshes and shallow water wetlands in the summer to cool off and escape from insect pests (Flook, 1959; Renecker and Hudson, 1986). In the winter, willows (*Salix spp.*) found in many of the study area's fens (Wf04) and swamps, provide valuable forage for moose.

Wetlands in the study area provide habitat for many mammals, birds, reptiles, amphibians, molluscs, crustaceans, invertebrates, fish and plants. The wetlands provide food, cover, rearing and nesting and migration habitats for a multitude of species. Wetlands also function to maintain other habitats by protecting natural shorelines from erosion. Wetlands provide critical early spring forage habitat for moose and bears and habitat for the western toad, a COSEWIC species of special concern.

In addition to providing habitat to species of concern, five provincially blue-listed wetland ecosystems were identified in the study area. These ecosystems are of special concern because they represent communities that are potentially vulnerable or not common throughout the province. Project planning and development should follow best practices so that the habitat function to species and ecosystems of special concern is maintained.

4.1.2 Wetland Values

4.1.2.1 Commercial and Social/Cultural

There are a number of direct and indirect commercial uses for wetlands in the study area. The most direct commercial use is trapping. There are a number of trap lines operated in close proximity to the study area that provide individuals and small communities with a financial resource base. Some of the species trapped completely rely on wetlands (beaver); other species use wetlands more opportunistically. Other commercial uses of wetlands include guided hunting. Some of the species sought during guiding use wetlands for portions of their respective life cycles (*i.e.*, moose). Moose and bears are popular species associated with hunting activities and both species rely on wetlands for forage. Without the habitat functions provided by wetlands, their commercial value would not be realised.

Wetlands in the study area have a social and cultural value. The social/cultural value was identified because the most popular big game species for resident and First Nation hunters is moose. Moose are very dependant on wetlands. The hunting of moose allows for the preservation of social and cultural values for both First Nation and commercial hunters and provides sustenance for a number of families. Although the area is generally inaccessible, there are a few active guide outfitting and trapping tenures in the area and the cultural values associated with these activities is important to the local community (Rescan, 2006). Without the habitat and ecological functions, the social and cultural values of wetland habitats would not be realised.

4.1.2.2 Maintenance of Ecosystem Health

Hydrological

Wetlands are an important part of the study area's hydrologic cycle, including both surface water and groundwater. As observed in the continuous hydrologic monitoring, water is absorbed by the wetland SC and held as shallow groundwater; it is then released slowly after precipitation events into the surface water network or into shallow groundwater reserves. This holding capacity prevents excessive runoff from overwhelming the local surface drainage network. It is likely that deeper groundwater reserves are also recharged as shallow groundwater percolates downward to these areas.

The hydrologic function of wetlands within the study area contributes to the creation of unique and varied habitats. Changes to wetland hydrology may result in shifts in floral and faunal species composition, which could in turn further affect the hydrology of the surrounding ecosystems (Martin and Chambers, 2001; Price and Whitehead, 2001).

Biodiversity and Habitat

Wetlands maintain ecosystem health through the biodiversity, habitat, and wildlife they support. The ability of wetlands to provide different aquatic habitat from stream networks strengthens the diversity in the aquatic environment. Wetlands also provide a wide variety of ecosystems in the study area, allowing for the development and specialization of floral and faunal communities. Five provincially listed wetland ecosystems were found in the study area as well as the western toad, a COSEWIC species of special concern. The observation of these communities and species highlights the value wetlands have with respect to biodiversity and the maintenance of ecosystem health.

5. SUMMARY

5. Summary

A total of 97 wetland sites were surveyed in July, 2007. A further 34 wetlands were identified and mapped using available TRIM GIS data for a total of 131 mapped wetland communities within the study area. All five federally recognized wetland classes were surveyed in the study area (bog, fen, marsh, swamp, and shallow open water) and many of the wetland communities were found to be in a wetland complex (more than one wetland community type). The fen wetland class was the most abundant in the study area representing approximately 62% of all wetlands surveyed. Fens also covered the largest area of surveyed wetlands, covering approximately 246 ha. TRIM swamp wetlands accounted for the largest overall area (approximately 432 ha); however, almost 50% of this area was represented by one wetland near Mess Creek which likely includes Shrub-carr transition associations and willow dominated flood associated riparian ecosystems.

Wetlands are distributed evenly throughout the study area, with the exception of the proposed Mess Creek access option. A larger area of wetlands was identified in the Mess Creek access option because Mess Creek is a dynamic river system and large tracts of wetland and riparian flood ecosystems cover the Mess Creek valley floor. Although any potential development in this zone is likely to be limited to the access road, all wetland communities contained entirely or partially within a 100 m buffer of the road were mapped. Aside from the Mess Creek access road option, Tailings Option A has the largest area of wetland ecosystems (approximately 98 ha). Tailings Option A contains a variety of wetland classes and associations; however, fen wetlands were the most dominant.

A total of five provincially blue-listed wetland ecosystem associations were surveyed in the study area; and all five of them were identified in Tailings Option A. The five blue-listed wetland ecosystems are designated by British Columbia as an ecological community of special concern and included three fen associations and two bog associations. The Wf08 and Wf13 fen associations, on the blue-list, were also identified in the Saddle and Tailings Option B areas, respectively.

A variety of wildlife and wildlife features were also identified in or near wetlands of the study area. A total of 4 moose sightings occurred while surveying wetlands in Tailings Option A and an active beaver pond/lodge was also observed in this zone. A number of frogs were observed in wetlands in Tailings Option A and the Saddle areas. The western toad (*Bufo boreas*), a species of special concern (COSEWIC, 2003), was also observed in the Saddle area. Lastly, a well used mud wallow and a number of wildlife trees were also observed in the Tailings Option A area.

5.1 Wetland Hydrology

The four monitored wetlands are considered to be typical of wetlands in the Schaft Creek Project area. Data collected as part of the wetland hydrology monitoring program can be used to infer the hydrology of wetlands throughout the Project area.

By definition, wetlands have shallow water tables. Observed water levels of the monitored wetlands ranged from approximately 0.5 m below the ground surface to being above the ground surface as ponds and streams.

The water table in each wetland was observed to fluctuate throughout the monitoring period in response to hydrological inputs, such as rainfall and snow melt. Wetland water table levels are expected to be highest after the spring snow melt period, which will generally occur in late May or early June and result in substantial areas of open water. High water levels are also expected in September and October, which are normally the wettest months of the year. Lowest annual water table levels are expected to occur in the late summer, after snow pack from the previous winter has been depleted and prior to the commencement of the wet fall period.

5.2 Wetland Aquatic Biology

Water and sediment quality varied substantially between wetland sites, highlighting the biogeochemical diversity of wetlands. Turbidity was relatively low in most wetlands, supporting the claim that wetlands act as water filters and purifiers. A number of metals exceeded various environmental quality guidelines in both water and sediment; however, these excess metal concentrations were spread relatively evenly between wetlands and no discernable pattern was observed.

Generally wetlands exceeded water quality guidelines for organic parameters more often than stream sites; however, stream sites exceeded metals guidelines substantially more than wetlands (Rescan 2008a). Total nitrogen and TOC concentrations were generally higher in wetland sediments compared to stream sediments and the same metals (AS, Cr, Cu, Fe, Ni, and Zn) exceeded guidelines in both stream and wetland sediments, with the exception of Hg. Mercury only exceeded environmental quality guidelines in stream sites.

Productivity, as measured by primary production communities was highest at WL11 (Figure 2.3-1); however, diversity as measured by the Shannon and Simpson diversity indices did not vary widely between wetlands. This uniformity of primary production indicates that all wetlands in the study area have the same level of function when it comes to productivity. In addition, the genus richness and Simpson diversity indices are approximately the same between wetland and stream sites. This suggests a level of uniformity in all aquatic habitats with respect to primary production.

The uniformity of the productivity function between wetlands is supported by the results from the secondary community samples. Results show that there was little variation between wetlands and their corresponding Shannon and Simpson diversity indices for secondary production communities. Benthic community densities and genus richness are higher in wetlands than stream sites. However, the Simpson diversity index is roughly the same between wetland and stream sites, although it is much more variable in the streams (Rescan, 2008a). This shows that, although primary production communities are roughly the same between stream and wetland sites, the secondary production communities in wetlands are more dense, have greater genus richness and are less variable than stream sites. These data show that there is a uniformity of primary and secondary productivity within wetlands, and that wetlands in the study area have similar levels of biological function.

5.3 Wetland Function and Value

Wetlands in the study area carry out the four wetland functions as identified by Environment Canada (2003) (section 2.5.5). There are a variety of wetland associations in the study area and these wetlands tend to function to different degrees. The wetland complexes associated with Mess and Schaft Creeks tend to have a more important flood control hydrological function than do the fen wetlands in Tailings Option A, which function more as a source for water recharge rather than flood control.

There is a level of uniformity between wetlands surveyed for aquatic biology, which indicates that different wetland classes in the study area have similar ecological and biochemical functions. The wetlands surveyed had similar levels of benthic diversity and that diversity tended to be greater than in stream sites. This difference in benthic diversity highlights the ecological importance of wetland habitats in maintaining biodiversity, *e.g.*, wetland dependent flora and fauna, in the study area.

A number of species/ecosystems of concern were also identified in the study area illustrating the ecological function of wetland habitat within the study area. The diversity of wetland habitat and their higher secondary producer diversities support wetland contributions to habitat for species of concern and the development and maintenance of ecosystems of concern.

These functions coupled with known land use practices support two primary wetland values. The first value identified is the commercial and social/cultural value. Wetlands support wildlife habitat for species such as moose, bears, and beaver; all of which are important wildlife species for trapping and guide outfitting. The longevity of wetland ecosystems will ultimately maintain these wildlife populations for recreational activities, which in turn generates revenue for local communities. The continued harvest of these species also maintains social and cultural practices for native and resident hunters as well as outdoor enthusiasts.

The second value identified, maintenance of ecosystem health, is more difficult to quantify as it is realised by a social impetus for the maintenance of healthy ecosystems and the continuation of species and ecosystems of concern. The maintenance of ecosystem health value is supported by wetland hydrology and biodiversity. Hydraulically functioning wetlands maintain ecosystem health by buffering surface water systems, such as Mess and Schaft Creeks, from flooding events which could have negative down stream implications. They also maintain water flow throughout the summer months by acting as a sponge in the spring seasons and slowly releasing water in to groundwater reserves and the surface water environment throughout the summer, such as the fen wetlands in Tailings Option A. The biodiversity of wetlands in the study area also maintain ecosystem health by supporting a variety of habitat for culturally important species (moose, bears and beaver) and species of concern (western toad). The variety of wetland habitat supports biodiversity, through the maintenance of ecosystems of concern and ultimately the overall maintenance of ecosystem health.

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APPENDIX 1A – SUMMARY OF 2006 WATER TABLE ELEVATIONS

Appendix 1A
Summary of 2006 Water Table Elevations

	Schaft Creek-A (SC-A)		Schaft Creek-B (SC-B)		Mess Creek-A (MS-A)		Mess Creek-B (MS-B)	
Date	Raw Water Table (cm)	Referenced to Survey (m)	Raw Water Table (cm)	Referenced to Survey (m)	Raw Water Table (cm)	Referenced to Survey (m)	Raw Water Table (cm)	Referenced to Survey (m)
18-06-06	139	2.76	208	2.52				
19-06-06	139	2.75	205	2.49	201	4.27	211	3.79
20-06-06	135	2.71	202	2.46	198	4.23	209	3.78
21-06-06	130	2.67	201	2.45	194	4.2	207	3.76
22-06-06	132	2.69	204	2.48	196	4.21	211	3.8
23-06-06	132	2.69	205	2.49	197	4.22	213	3.82
24-06-06	134	2.7	205	2.49	196	4.22	213	3.82
25-06-06	136	2.72	205	2.49	195	4.21	212	3.81
26-06-06	132	2.69	202	2.46	191	4.17	207	3.76
27-06-06	125	2.62	197	2.41	187	4.12	203	3.72
28-06-06	126	2.62	198	2.42	188	4.13	204	3.73
29-06-06	127	2.63	200	2.44	191	4.16	208	3.77
30-06-06	120	2.57	200	2.44	189	4.15	207	3.76
01-07-06	114	2.51	199	2.43	186	4.12	204	3.73
02-07-06	112	2.49	200	2.44	185	4.11	204	3.73
03-07-06	110	2.47	201	2.45	184	4.09	203	3.72
04-07-06	110	2.46	202	2.46	183	4.09	203	3.72
05-07-06	108	2.44	200	2.44	180	4.06	200	3.69
06-07-06	109	2.46	198	2.42	178	4.03	197	3.66
07-07-06	149	2.86	204	2.48	184	4.1	202	3.71
08-07-06	155	2.91	198	2.42	181	4.06	199	3.68
09-07-06	152	2.89	198	2.42	182	4.08	200	3.69
10-07-06	140	2.76	192	2.36	178	4.03	196	3.65
11-07-06	131	2.68	188	2.32	174	3.99	192	3.61
12-07-06	124	2.6	184	2.28	170	3.96	189	3.57
13-07-06	133	2.7	187	2.31	173	3.98	192	3.61
14-07-06	129	2.66	190	2.34	176	4.02	196	3.65
15-07-06	129	2.66	194	2.38	181	4.07	201	3.7
16-07-06	129	2.66	197	2.41	184	4.1	205	3.74
17-07-06	127	2.64	197	2.41	182	4.08	204	3.73
18-07-06	123	2.6	196	2.4	181	4.07	203	3.72
19-07-06	117	2.53	193	2.37	177	4.03	200	3.69
20-07-06	120	2.57	195	2.39	179	4.04	202	3.71
21-07-06	161	2.98	205	2.49	182	4.08	206	3.74
22-07-06	187	3.24	246	2.9	185	4.11	205	3.74
23-07-06	181	3.18	238	2.82	187	4.13	204	3.73
24-07-06	173	3.1	217	2.61	180	4.06	199	3.68
25-07-06	169	3.05	211	2.55	176	4.02	195	3.64
26-07-06	166	3.03	210	2.54	177	4.03	196	3.65
27-07-06	167	3.04	209	2.53	181	4.07	201	3.7
28-07-06	168	3.05	204	2.48	183	4.08	203	3.72
29-07-06	155	2.91	196	2.4	176	4.02	197	3.66
30-07-06	140	2.76	192	2.36	171	3.97	192	3.61
31-07-06	134	2.7	195	2.39	172	3.98	194	3.63
01-08-06	131	2.67	192	2.36	173	3.98	195	3.64
02-08-06	131	2.68	197	2.41	179	4.05	202	3.71
03-08-06	128	2.64	196	2.4	179	4.05	203	3.72
04-08-06	122	2.58	193	2.37	176	4.02	200	3.69
05-08-06	123	2.59	189	2.33	173	3.99	198	3.67
06-08-06	121	2.58	190	2.34	174	4	199	3.67
07-08-06	120	2.57	186	2.3	170	3.95	195	3.64
08-08-06	137	2.73	186	2.3	171	3.96	195	3.64
09-08-06	130	2.67	192	2.36	176	4.01	201	3.7
10-08-06	127	2.64	193	2.37	176	4.02	202	3.71
11-08-06	121	2.58	190	2.34	174	4	201	3.7
12-08-06	116	2.53	189	2.33	173	3.99	200	3.69
13-08-06	116	2.52	188	2.32	171	3.97	199	3.67
14-08-06	124	2.61	190	2.34	172	3.98	200	3.68
15-08-06	122	2.59	192	2.36	174	3.99	202	3.71
16-08-06	117	2.54	191	2.35	173	3.99	202	3.71
17-08-06	126	2.63	192	2.36	173	3.99	202	3.71
18-08-06	140	2.77	196	2.4	175	4	204	3.73
19-08-06	132	2.69	195	2.39	175	4	205	3.73
20-08-06	123	2.6	192	2.36	171	3.97	201	3.7
21-08-06	116	2.53	187	2.31	167	3.93	198	3.66
22-08-06	116	2.53	189	2.33	169	3.95	200	3.69
23-08-06	119	2.56	190	2.34	169	3.95	200	3.69
24-08-06	122	2.59	191	2.35	171	3.96	202	3.71
25-08-06	117	2.54	187	2.31	167	3.92	198	3.67
26-08-06	120	2.56	190	2.34	169	3.94	200	3.69
27-08-06	122	2.59	187	2.31	165	3.91	197	3.66
28-08-06	137	2.74	182	2.26	161	3.87	191	3.6
29-08-06	149	2.86	181	2.25	161	3.86	191	3.6
30-08-06	147	2.84	187	2.31	167	3.93	198	3.67
31-08-06	136	2.73	187	2.31	168	3.94	199	3.68
01-09-06	168	3.05	189	2.33	168	3.94	198	3.67
02-09-06	165	3.02	200	2.44	168	3.94	198	3.67
03-09-06	158	2.95	192	2.36	169	3.94	199	3.68
04-09-06	151	2.88	190	2.34	169	3.95	200	3.69
05-09-06	155	2.91	202	2.45	178	4.03	208	3.77
06-09-06	149	2.86	198	2.42	177	4.02	208	3.77
07-09-06	142	2.79	189	2.33	169	3.94	199	3.68
08-09-06	134	2.7	180	2.24	161	3.87	191	3.6
09-09-06	131	2.67	182	2.26	162	3.88	193	3.62

APPENDIX 1B – SUMMARY OF 2007 WATER TABLE ELEVATIONS

Appendix 1B
Summary of 2007 Water Table Elevations

	Schaft Creek-A (SC-A)		Mess Creek-A (MS-A)	
Date	Raw Water Table (cm)	Referenced to Survey (m)	Raw Water Table (cm)	Referenced to Survey (m)
24-06-07	51	5.06	77	3.49
25-06-07	46	5.01	78	3.5
26-06-07	40	4.95	77	3.49
27-06-07	53	5.08	77	3.49
28-06-07	67	5.22	78	3.5
29-06-07	74	5.29	80	3.52
30-06-07	75	5.3	87	3.59
01-07-07	67	5.22	95	3.67
02-07-07	55	5.1	93	3.65
03-07-07	50	5.05	88	3.6
04-07-07	58	5.13	87	3.59
05-07-07	67	5.22	93	3.65
06-07-07	54	5.09	90	3.62
07-07-07	46	5.01	84	3.56
08-07-07	46	5.01	82	3.54
09-07-07	53	5.08	81	3.53
10-07-07	85	5.4	88	3.6
11-07-07	94	5.49	119	3.91
12-07-07	90	5.45	122	3.94
13-07-07	100	5.55	127	3.99
14-07-07	94	5.49	119	3.91
15-07-07	92	5.47	120	3.92
16-07-07	89	5.44	111	3.83
17-07-07	86	5.41	107	3.79
18-07-07	88	5.43	96	3.67
19-07-07	89	5.44	92	3.64
20-07-07	90	5.45	91	3.63
21-07-07	87	5.42	88	3.6
22-07-07	82	5.37	82	3.54
23-07-07	78	5.33	80	3.52
24-07-07	79	5.34	78	3.5
25-07-07	68	5.23	77	3.49
26-07-07	62	5.17	76	3.48
27-07-07	57	5.12	76	3.48
28-07-07	59	5.14	75	3.47
29-07-07	55	5.1	75	3.47
30-07-07	54	5.09	75	3.47
31-07-07	49	5.04	74	3.46
01-08-07	41	4.96	73	3.45
02-08-07	35	4.9	72	3.44
03-08-07	32	4.87	71	3.43
04-08-07	29	4.84	70	3.42
05-08-07	28	4.83	69	3.41
06-08-07	26	4.81	70	3.42
07-08-07	33	4.88	68	3.4
08-08-07	56	5.11	68	3.4
09-08-07	57	5.12	67	3.39
10-08-07	86	5.41	67	3.39
11-08-07	77	5.32	67	3.39
12-08-07	66	5.21	66	3.38
13-08-07	53	5.08	66	3.38
14-08-07	46	5.01	66	3.38
15-08-07	40	4.95	65	3.37
16-08-07	37	4.92	65	3.37
17-08-07	57	5.12	65	3.37
18-08-07	73	5.28	65	3.37
19-08-07	72	5.27	65	3.37
20-08-07	61	5.16	64	3.36
21-08-07	51	5.06	63	3.35
22-08-07	46	5.01	62	3.34
23-08-07	44	4.99	63	3.35
24-08-07	43	4.98	62	3.34
25-08-07	83	5.38	63	3.35
26-08-07	85	5.4	62	3.34
27-08-07	74	5.29	61	3.33
28-08-07	65	5.19	62	3.34
29-08-07	73	5.28	63	3.34
30-08-07	68	5.23	64	3.36
31-08-07	60	5.15	63	3.35
01-09-07	52	5.07	63	3.35
02-09-07	51	5.06	62	3.34
03-09-07	67	5.22	62	3.34
04-09-07	67	5.22	61	3.33
05-09-07	62	5.17	62	3.34
06-09-07	51	5.06	61	3.33

(continued)

Appendix 1B
Summary of 2007 Water Table Elevations (completed)

	Schaft Creek-A (SC-A)		Mess Creek-A (MS-A)	
Date	Raw Water Table (cm)	Referenced to Survey (m)	Raw Water Table (cm)	Referenced to Survey (m)
07-09-07	43	4.98	60	3.32
08-09-07	41	4.96	59	3.31
09-09-07	40	4.95	61	3.32
10-09-07	39	4.93	59	3.31
11-09-07	39	4.94	58	3.3
12-09-07	39	4.94	58	3.3
13-09-07	39	4.94	58	3.3
14-09-07	39	4.94	58	3.3
15-09-07	50	5.04	59	3.31
16-09-07	56	5.11	58	3.3
17-09-07	46	5.01	58	3.3
18-09-07	39	4.93	56	3.28
19-09-07	44	4.99	57	3.29
20-09-07	42	4.97	58	3.3
21-09-07	85	5.4	61	3.33
22-09-07	78	5.33	60	3.32
23-09-07	64	5.18	59	3.31
24-09-07	66	5.21	61	3.33
25-09-07	58	5.13	62	3.34
26-09-07	50	5.05	61	3.33
27-09-07	56	5.11	60	3.32
28-09-07	65	5.2	61	3.33
29-09-07	61	5.16	61	3.33
30-09-07	61	5.16	61	3.33
01-10-07	57	5.12	62	3.34
02-10-07	57	5.12	63	3.35
03-10-07	45	5	61	3.33
04-10-07	40	4.95	60	3.32
05-10-07	45	5	61	3.33
06-10-07	60	5.15	61	3.33
07-10-07	55	5.1	62	3.34
08-10-07	53	5.08	60	3.32
09-10-07	58	5.13	61	3.32
10-10-07	73	5.28	62	3.34
11-10-07	77	5.32	62	3.34
12-10-07	61	5.16	61	3.33
13-10-07	83	5.38	65	3.37
14-10-07	90	5.45	66	3.38
15-10-07	89	5.44	67	3.39
16-10-07	81	5.36	66	3.38
17-10-07	70	5.25	65	3.37
18-10-07	64	5.19	65	3.37
19-10-07	45	5	63	3.35
20-10-07	28	4.83	62	3.34
21-10-07	28	4.83	63	3.35
22-10-07	56	5.11	64	3.36
23-10-07	51	5.06	63	3.35
24-10-07	48	5.03	65	3.37
25-10-07	42	4.97	62	3.34
26-10-07	53	5.08	63	3.35
27-10-07	89	5.44	65	3.37
28-10-07	84	5.39	65	3.37
29-10-07	71	5.26	65	3.37
30-10-07	71	5.26	67	3.39
31-10-07	92	5.47	68	3.4
01-11-07	85	5.4	68	3.4
02-11-07	77	5.32	68	3.4
03-11-07	62	5.16	66	3.38
04-11-07	35	4.9	63	3.35
05-11-07	27	4.82	65	3.37
06-11-07	26	4.8	64	3.36
07-11-07	24	4.79	64	3.36
08-11-07	22	4.77	62	3.34
09-11-07	25	4.8	64	3.36
10-11-07	28	4.83	66	3.38
11-11-07	26	4.8	64	3.36
12-11-07	29	4.83	65	3.37
13-11-07	23	4.78	64	3.36
14-11-07	26	4.81	64	3.36
15-11-07	32	4.87	65	3.37
16-11-07	31	4.86		

APPENDIX 2 – WETLAND VEGETATION SPECIES LIST

Appendix 2
Wetland Vegetation Species List

Plot	Genus	Species
SW1	*Platanthra*	*dilatata*
SW1	*Betula*	*nana*
SW1	*Meananthius*	*trifoliata*
SW1	*Sanguisorba*	*officinalis*
SW1	*Carex*	*albonigra*
SW1	*Trichophorum*	*cespitosum*
SW1	*Viola*	*spp*
SW1	*Rubus*	*sp*
SW1	*Equisetum*	*arvense*
SW1	*Epilobium*	*angustifolium*
SW2	*Equisetum*	*arvense*
SW2	*Sanguisorba*	*officinalis*
SW2	*Carex*	*aquatilis*
SW2	*Epilobium*	*angustifolium*
SW2	*Salix*	*drummondiana*
SW2	*Mneum*	*spp*
SW3	*Carex*	*aquatilis*
SW3	*Betula*	*nana*
SW3	*Salix*	*barclayi*
SW3	*Potentilla*	*palustris*
SW3	*Equisetum*	*arvense*
SW4	*Carex*	*aquatilis*
SW4	*Betula*	*nana*
SW4	*Rubus*	*sp*
SW4	*Sanguisorba*	*officinalis*
SW4	*Salix*	*sp*
SW4	*Fragaria*	*sp*
SW4	*Equisetum*	*arvense*
SW5	*Salix*	*sp*
SW5	*Betula*	*nana*
SW5	*Sanguisorba*	*officinalis*
SW5	*Carex*	*aquatilis*
SW5	*Rubus*	*arcticus*
SW5	*Equisetum*	*arvense*
SW5	*Sphagnum*	*spp*
SW5	*Ledum*	*groenlandicum*
SW5	*Picea*	*sp*
SW6	*Carex*	*aquatilis*
SW6	*Betula*	*nana*
SW6	*Sanguisorba*	*officinalis*
SW6	*Epilobium*	*angustifolium*
SW6	*Carex*	*limosa*
SW6	*Rubus*	*arcticus*
SW6	*Sphagnum*	*spp*
SW6	*Viola*	*spp*
SW6	*Platanthra*	*dilatata*
SW6	*Trientalis*	*latifolia*
SW7	*Carex*	*aquatilis*
SW7	*Betula*	*nana*
SW7	*Sanguisorba*	*officinalis*
SW7	*Epilobium*	*angustifolium*
SW7	*Carex*	*limosa*
SW7	*Rubus*	*arcticus*
SW7	*Sphagnum*	*spp*
SW7	*Viola*	*spp*
SW7	*Platanthra*	*dilatata*
SW7	*Trientalis*	*latifolia*
SW8	*Betula*	*nana*
SW8	*Pinus*	*contorta*
SW8	*Abies*	*lasiocarpa*
SW8	*Kalmia*	*microphylla*
SW8	*Empetrum*	*nigrum*
SW8	*Polytrichum*	*sp*

Plot	Genus	Species
SW8	*Sanguisorba*	*officinalis*
SW8	*Carex*	*macrochaeta*
SW8	*Vaccinium*	*caespitosum*
SW8	*Equisetum*	*arvense*
SW8	*Salix*	*sp*
SW9	*Vaccinium*	*membranaceum*
SW9	*Empetrum*	*nigrum*
SW9	*Pinus*	*contorta*
SW9	*Abies*	*lasiocarpa*
SW9	*Valeriana*	*sitchensis*
SW9	*Sphagnum*	*sp*
SW10	*Carex*	*aquatilis*
SW10	*Betula*	*nana*
SW10	*Sanguisorba*	*officinalis*
SW10	*Rubus*	*arcticus*
SW10	*Trichophorum*	*cespitosum*
SW10	*Platanthra*	*dilatata*
SW10	*Sphagnum*	*sp*
SW10	*Salix*	*sp*
SW11	*Carex*	*aquatilis*
SW11	*Meananthius*	*trifoliata*
SW11	*Trichophorum*	*cespitosum*
SW11	*Betula*	*nana*
SW11	*Pinus*	*contorta*
SW11	*Ledum*	*groenlandicum*
SW11	*Kalmia*	*microphylla*
SW11	*Phyllodoce*	*glanduliflora*
SW11	*Nuphar*	*polysepalum*
SW11	*Carex*	*macrochaeta*
SW11	*Sanguisorba*	*officinalis*
SW11	*Equisetum*	*arvense*
SW11	*Trientalis*	*arctica*
SW11	*Rubus*	*arcticus*
SW11	*Leptarrhena*	*pyrolifolia*
SW11	*Salix*	*sp*
SW11	*Platanthra*	*dilatata*
SW11	*Oxycoccus*	*oxycoccos*
SW11	*Vaccinium*	*caespitosum*
SW12	*Salix*	*barclayi*
SW12	*Betula*	*nana*
SW12	*Salix*	*commutata*
SW12	*Carex*	*aquatilis*
SW12	*Equisetum*	*arvense*
SW12	*Rubus*	*arcticus*
SW12	*Ledum*	*groenlandicum*
SW12	*Sanguisorba*	*officinalis*
SW12	*Pinus*	*contorta*
SW13	*Senecio*	*triangularis*
SW13	*Platanthra*	*dilatata*
SW13	*Sanguisorba*	*officinalis*
SW13	*Equisetum*	*arvense*
SW13	*Ledum*	*groenlandicum*
SW13	*Leptarrhena*	*pyrolifolia*
SW13	*Carex*	*sp*
SW13	*Disporum*	*hookeri*
SW13	*Kalmia*	*microphylla*
SW13	*Rubus*	*chamaemorus*
SW13	*Salix*	*barclayi*
SW13	*Sorbus*	*sitchensis*
SW13	*Sphagnum*	*sp*
SW13	*Phyllodoce*	*glanduliflora*
SW13	*Lycopodium*	*annotinum*
SW13	*Anemone*	*parviflora*

Plot	Genus	Species
SW13	*Vaccinium*	*membranaceum*
SW13	*Salix*	*commutata*
SW13	*Abies*	*lasiocarpa*
SW13	*Pinus*	*contorta*
SW14	*Pinus*	*contorta*
SW14	*Abies*	*lasiocarpa*
SW14	*Betula*	*nana*
SW14	*Potentilla*	*fruticosa*
SW14	*Rubus*	*arcticus*
SW14	*Oxycoccus*	*oxycoccos*
SW14	*Empetrum*	*nigrum*
SW14	*Gaultheria*	*humifusa*
SW14	*Sanguisorba*	*officinalis*
SW14	*Cornus*	*canadensis*
SW14	*Trientalis*	*arctica*
SW14	*Eriophorum*	*angustifolium*
SW14	*Carex*	*aquatilis*
SW14	*Trichophorum*	*cespitosum*
SW14	*Carex*	*disperma*
SW15	*Picea*	*sp*
SW15	*Betula*	*nana*
SW15	*Potentilla*	*fruticosa*
SW15	*Salix*	*sp*
SW15	*Rubus*	*arcticus*
SW15	*Gaultheria*	*humifusa*
SW15	*Ledum*	*groenlandicum*
SW15	*Carex*	*aquatilis*
SW15	*Equisetum*	*hyemale*
SW15	*Trichophorum*	*cespitosum*
SW15	*Viola*	*spp*
SW15	*Pyrola*	*asarifolia*
SW15	*Platanthra*	*dilatata*
SW15	*Anemone*	*parviflora*
SW16	*Picea*	*sp*
SW16	*Betula*	*nana*
SW16	*Salix*	*sp*
SW16	*Oxycoccus*	*oxycoccos*
SW16	*Ledum*	*groenlandicum*
SW16	*Carex*	*aquatilis*
SW16	*Equisetum*	*arvense*
SW16	*Viola*	*spp*
SW16	*Sphagnum*	*spp*
SW16	*Mneum*	*spp*
SW17	*Picea*	*sp*
SW17	*Alnus*	*sp*
SW17	*Salix*	*sp*
SW17	*Ledum*	*groenlandicum*
SW17	*Betula*	*nana*
SW17	*Rubus*	*arcticus*
SW17	*Oxycoccus*	*oxycoccos*
SW17	*Empetrum*	*nigrum*
SW17	*Potentilla*	*fruticosa*
SW17	*Sanguisorba*	*officinalis*
SW17	*Equisetum*	*arvense*
SW17	*Carex*	*aquatilis*
SW17	*Cornus*	*canadensis*
SW17	*Gaultheria*	*humifusa*
SW17	*Sphagnum*	*spp*
SW18	*Pinus*	*contorta*
SW18	*Picea*	*sp*
SW18	*Potentilla*	*fruticosa*
SW18	*Betula*	*nana*
SW18	*Ledum*	*groenlandicum*

Plot	Genus	Species
SW18	*Gaultheria*	*hispidula*
SW18	*Eriophorum*	*angustifolium*
SW18	*Carex*	*aquatilis*
SW18	*Platanthra*	*dilatata*
SW18	*Trichophorum*	*cespitosum*
SW18	*Sanguisorba*	*officinalis*
SW18	*Tofieldia*	*glutinosa*
SW19	*Picea*	*sp*
SW19	*Ledum*	*groenlandicum*
SW19	*Betula*	*nana*
SW19	*Salix*	*spp*
SW19	*Potentilla*	*fruticosa*
SW19	*Empetrum*	*nigrum*
SW19	*Rubus*	*arcticus*
SW19	*Equisetum*	*arvense*
SW19	*Sanguisorba*	*officinalis*
SW19	*Carex*	*aquatilis*
SW19	*Trientalis*	*arctica*
SW20	*Potentilla*	*fruticosa*
SW20	*Ledum*	*groenlandicum*
SW20	*Betula*	*nana*
SW20	*Carex*	*aquatilis*
SW20	*Trichophorum*	*cespitosum*
SW20	*Eriophorum*	*angustifolium*
SW20	*Carex*	*pauciflora*
SW21	*Picea*	*sp*
SW21	*Betula*	*nana*
SW21	*Ledum*	*groenlandicum*
SW21	*Potentilla*	*fruticosa*
SW21	*Rubus*	*arcticus*
SW21	*Gaultheria*	*humifusa*
SW21	*Oxycoccus*	*oxycoccos*
SW21	*Empetrum*	*nigrum*
SW21	*Carex*	*aquatilis*
SW21	*Platanthra*	*dilatata*
SW21	*Equisetum*	*arvense*
SW21	*Sanguisorba*	*officinalis*
SW21	*Trichophorum*	*cespitosum*
SW21	*Equisetum*	*hyemale*
SW21	*Cornus*	*canadensis*
SW21	*Eriophorum*	*angustifolium*
SW21	*Sphagnum*	*spp*
SW22	*Pinus*	*contorta*
SW22	*Potentilla*	*fruticosa*
SW22	*Betula*	*nana*
SW22	*Rubus*	*arcticus*
SW22	*Oxycoccus*	*oxycoccos*
SW22	*Gaultheria*	*humifusa*
SW22	*Empetrum*	*nigrum*
SW22	*Salix*	*sp*
SW22	*Carex*	*aquatilis*
SW22	*Trichophorum*	*cespitosum*
SW22	*Cornus*	*canadensis*
SW23	*Picea*	*sp*
SW23	*Betula*	*nana*
SW23	*Potentilla*	*fruticosa*
SW23	*Rubus*	*arcticus*
SW23	*Carex*	*aquatilis*
SW23	*Trichophorum*	*cespitosum*
SW23	*Carex*	*utriculata*
SW24	*Pinus*	*contorta*
SW24	*Potentilla*	*fruticosa*
SW24	*Ledum*	*groenlandicum*

(continued)

Appendix 2
Wetland Vegetation Species List (continued)

Plot	Genus	Species
SW24	*Betula*	*nana*
SW24	*Oxycoccus*	*oxycoccos*
SW24	*Empetrum*	*nigrum*
SW24	*Carex*	*aquatilis*
SW24	*Meananthius*	*trifoliata*
SW24	*Trichophorum*	*cespitosum*
SW24	*Eriophorum*	*angustifolium*
SW24	*Sphagnum*	*sp*
SW25	*Potentilla*	*fruticosa*
SW25	*Betula*	*nana*
SW25	*Gaultheria*	*humifusa*
SW25	*Salix*	sp
SW25	*Ledum*	*groenlandicum*
SW25	*Empetrum*	*nigrum*
SW25	*Rubus*	*arcticus*
SW25	*Anemone*	*parviflora*
SW25	*Viola*	*sp*
SW25	*Carex*	*aquatilis*
SW25	*Platanthra*	*dilatata*
SW25	*Equisetum*	*hyemale*
SW25	*Pyrola*	*asarifolia*
SW25	*Tofieldia*	*glutinosa*
SW25	*Carex*	*pluriflora*
SW25	*Triglochin*	*maritimum*
SW25	*Pinguicula*	*vulgaris*
SW25	*Meananthius*	*trifoliata*
SW25	*Eriophorum*	*angustifolium*
SW26	*Betula*	*nana*
SW26	*Potentilla*	*fruticosa*
SW26	*Trichophorum*	*cespitosum*
SW26	*Tofieldia*	*glutinosa*
SW26	*Carex*	*aquatilis*
SW26	*Pinguicula*	*vulgaris*
SW27	*Pinus*	*contorta*
SW27	*Picea*	*sp*
SW27	*Potentilla*	*fruticosa*
SW27	*Betula*	*nana*
SW27	*Empetrum*	*nigrum*
SW27	*Gaultheria*	*humifusa*
SW27	*Rosa*	*sp*
SW27	*Ledum*	*groenlandicum*
SW27	*Carex*	*aquatilis*
SW27	*Trichophorum*	*cespitosum*
SW27	*Pyrola*	*asarifolia*
SW27	*Meananthius*	*trifoliata*
SW27	*Anemone*	*parviflora*
SW28	*Picea*	*sp*
SW28	*Pinus*	*contorta*
SW28	*Ledum*	*groenlandicum*
SW28	*Empetrum*	*nigrum*
SW28	*Oxycoccus*	*oxycoccos*
SW28	*Gaultheria*	*hispidula*
SW28	*Gaultheria*	*humifusa*
SW28	*Rubus*	*chamaemorus*
SW28	*Rubus*	*arcticus*
SW28	*Betula*	*nana*
SW28	*Potentilla*	*fruticosa*
SW28	*Carex*	*aquatilis*
SW28	*Equisetum*	*hyemale*
SW28	*Trichophorum*	*cespitosum*
SW28	*Cornus*	*canadensis*
SW28	*Sphagnum*	*sp*
SW29	*Picea*	*sp*

Plot	Genus	Species
SW29	*Pinus*	*contorta*
SW29	*Ledum*	*groenlandicum*
SW29	*Empetrum*	*nigrum*
SW29	*Oxycoccus*	*oxycoccos*
SW29	*Gaultheria*	*humifusa*
SW29	*Rubus*	*chamaemorus*
SW29	*Rubus*	*arcticus*
SW29	*Salix*	*spp*
SW29	*Carex*	*aquatilis*
SW29	*Platanthra*	*dilatata*
SW29	*Equisetum*	*arvense*
SW29	*Eriophorum*	*angustifolium*
SW29	*Angelica*	*arguta*
SW29	*Galium*	*triflorum*
SW29	*Viola*	*sp*
SW29	*Sphagnum*	*spp*
SW30	*Picea*	*sp*
SW30	*Pinus*	*contorta*
SW30	*Ledum*	*groenlandicum*
SW30	*Empetrum*	*nigrum*
SW30	*Oxycoccus*	*oxycoccos*
SW30	*Gaultheria*	*humifusa*
SW30	*Rubus*	*chamaemorus*
SW30	*Rubus*	*arcticus*
SW30	*Salix*	*spp*
SW30	*Carex*	*aquatilis*
SW30	*Platanthra*	*dilatata*
SW30	*Equisetum*	*arvense*
SW30	*Eriophorum*	*angustifolium*
SW30	*Angelica*	*arguta*
SW30	*Galium*	*triflorum*
SW30	*Viola*	*sp*
SW30	*Sphagnum*	*spp*
SW31	*Picea*	*sp*
SW31	*Salix*	*barclayi*
SW31	*Rubus*	*arcticus*
SW31	*Salix*	*commutata*
SW31	*Betula*	*nana*
SW31	*Pinus*	*contorta*
SW31	*Carex*	*aquatilis*
SW31	*Equisetum*	*arvense*
SW31	*Viola*	*sp*
SW31	*Platanthra*	*dilatata*
SW31	*Sphagnum*	*sp*
SW32	*Salix*	*barclayi*
SW32	*Betula*	*nana*
SW32	*Picea*	*sp*
SW32	*Rubus*	*arcticus*
SW32	*Calamagrostis*	*canadensis*
SW32	*Equisetum*	*arvense*
SW32	*Trientalis*	*arctica*
SW32	*Viola*	*sp*
SW32	*Sphagnum*	*sp*
SW33	*Picea*	*sp*
SW33	*Betula*	*nana*
SW33	*Rubus*	*arcticus*
SW33	*Ledum*	*groenlandicum*
SW33	*Salix*	*barclayi*
SW33	*Carex*	*aquatilis*
SW33	*Carex*	*limosa*
SW33	*Trichophorum*	*cespitosum*
SW33	*Eriophorum*	*angustifolium*
SW33	*Equisetum*	*arvense*

Plot	Genus	Species
SW33	*Meananthius*	*trifoliata*
SW34	*Picea*	*sp*
SW34	*Salix*	*barclayi*
SW34	*Rubus*	*arcticus*
SW34	*Salix*	*commutata*
SW34	*Pinus*	*contorta*
SW34	*Platanthra*	*dilatata*
SW34	*Equisetum*	*arvense*
SW34	*Carex*	*disperma*
SW34	*Juncus*	*arcticus*
SW34	*Senecio*	*triangularis*
SW34	*Luzula*	*parviflora*
SW34	*Calamagrostis*	*canadensis*
SW34	*Carex*	*aquatilis*
SW35	*Salix*	*barclayi*
SW35	*Rubus*	*arcticus*
SW35	*Equisetum*	*arvense*
SW35	*Carex*	*lasiocarpa*
SW35	*Sphagnum*	*sp*
SW36	*Pinus*	*contorta*
SW36	*Potentilla*	*fruticosa*
SW36	*Ledum*	*groenlandicum*
SW36	*Betula*	*nana*
SW36	*Rubus*	*arcticus*
SW36	*Oxycoccus*	*oxycoccos*
SW36	*Picea*	*sp*
SW36	*Trichophorum*	*alpinum*
SW36	*Eriophorum*	*angustifolium*
SW36	*Meananthius*	*trifoliata*
SW36	*Drosera*	*rotundifolia*
SW36	*Sanguisorba*	*officinalis*
SW36	*Carex*	*aquatilis*
SW36	*Carex*	*limosa*
SW37	*Pinus*	*contorta*
SW37	*Betula*	*nana*
SW37	*Potentilla*	*fruticosa*
SW37	*Ledum*	*groenlandicum*
SW37	*Oxycoccus*	*oxycoccos*
SW37	*Picea*	*sp*
SW37	*Carex*	*lasiocarpa*
SW37	*Trichophorum*	*alpinum*
SW37	*Platanthra*	*dilatata*
SW37	*Drosera*	*rotundifolia*
SW37	*Meananthius*	*trifoliata*
SW37	*Carex*	*limosa*
SW37	*Sphagnum*	*sp*
SW38	*Potentilla*	*fruticosa*
SW38	*Betula*	*nana*
SW38	*Salix*	*barclayi*
SW38	*Pinus*	*contorta*
SW38	*Salix*	*commutata*
SW38	*Picea*	*sp*
SW38	*Carex*	*aquatilis*
SW38	*Eriophorum*	*angustifolium*
SW38	*Trichophorum*	*alpinum*
SW38	*Viola*	*spp*
SW38	*Platanthra*	*dilatata*
SW39	*Pinus*	*contorta*
SW39	*Picea*	*sp*
SW39	*Potentilla*	*fruticosa*
SW39	*Rubus*	*arcticus*
SW39	*Betula*	*nana*
SW39	*Oxycoccus*	*oxycoccos*

Plot	Genus	Species
SW39	*Ledum*	*groenlandicum*
SW39	*Empetrum*	*nigrum*
SW39	*Carex*	*aquatilis*
SW39	*Trichophorum*	*alpinum*
SW39	*Platanthra*	*dilatata*
SW39	*Sanguisorba*	*officinalis*
SW39	*Eriophorum*	*angustifolium*
SW40	*Nuphar*	*polysepalum*
SW41	*Picea*	*sp*
SW41	*Pinus*	*contorta*
SW41	*Potentilla*	*fruticosa*
SW41	*Oxycoccus*	*oxycoccos*
SW41	*Ledum*	*groenlandicum*
SW41	*Empetrum*	*nigrum*
SW41	*Rubus*	*arcticus*
SW41	*Eriophorum*	*angustifolium*
SW41	*Platanthra*	*dilatata*
SW41	*Trichophorum*	*cespitosum*
SW41	*Carex*	*aquatilis*
SW41	*Drosera*	*rotundifolia*
SW41	*Equisetum*	*arvense*
SW41	*Carex*	*stylosa*
SW42	*Alnus*	*sp*
SW42	*Salix*	*barclayi*
SW42	*Oxycoccus*	*oxycoccos*
SW42	*Ledum*	*groenlandicum*
SW42	*Rubus*	*arcticus*
SW42	*Salix*	*sp*
SW42	*Betula*	*nana*
SW42	*Potentilla*	*palustris*
SW42	*Carex*	*aquatilis*
SW42	*Meananthius*	*trifoliata*
SW42	*Carex*	*kelloggii*
SW42	*Viola*	*sp*
SW42	*Sphagnum*	*sp*
SW42	*Mneum*	*sp*
SW43	*Picea*	*sp*
SW43	*Betula*	*nana*
SW43	*Potentilla*	*fruticosa*
SW43	*Rubus*	*arcticus*
SW43	*Ledum*	*groenlandicum*
SW43	*Empetrum*	*nigrum*
SW43	*Oxycoccus*	*oxycoccos*
SW43	*Salix*	*sp*
SW43	*Meananthius*	*trifoliata*
SW43	*Carex*	*limosa*
SW43	*Platanthra*	*dilatata*
SW43	*Equisetum*	*arvense*
SW43	*Eriophorum*	*angustifolium*
SW43	*Parnassia*	*fimbriata*
SW43	*Viola*	*sp*
SW43	*Pinus*	*contorta*
SW43	*Alnus*	*sp*
SW43	*Salix*	*commutata*
SW43	*Trientalis*	*arctica*
SW43	*Antennaria*	*pulcherrima*
SW44	*Picea*	*sp*
SW44	*Betula*	*nana*
SW44	*Potentilla*	*fruticosa*
SW44	*Rosa*	*sp*
SW44	*Rubus*	*arcticus*
SW44	*Ledum*	*groenlandicum*
SW44	*Oxycoccus*	*oxycoccos*

(continued)

Appendix 2
Wetland Vegetation Species List (continued)

Plot	Genus	Species
SW44	*Eriophorum*	*angustifolium*
SW44	*Salix*	*sp*
SW44	*Gaultheria*	*humifusa*
SW44	*Carex*	*aquatilis*
SW44	*Trichophorum*	*cespitosum*
SW44	*Platanthra*	*dilatata*
SW44	*Viola*	*sp*
SW44	*Sphagnum*	*sp*
SW45	*Salix*	*barclayi*
SW45	*Betula*	*nana*
SW45	*Oxycoccus*	*oxycoccos*
SW45	*Platanthra*	*dilatata*
SW45	*Carex*	*aquatilis*
SW45	*Equisetum*	*arvense*
SW45	*Pyrola*	*asarifolia*
SW45	*Potentilla*	*palustris*
SW45	*Sphagnum*	*sp*
SW45	*Mneum*	*sp*
SW46	*Picea*	*sp*
SW46	*Betula*	*nana*
SW46	*Rubus*	*arcticus*
SW46	*Carex*	*utriculata*
SW46	*Potentilla*	*palustris*
SW46	*Carex*	*aquatilis*
SW46	*Viola*	*sp*
SW46	*Mneum*	*sp*
SW47	*Picea*	*sp*
SW47	*Pinus*	*contorta*
SW47	*Betula*	*nana*
SW47	*Potentilla*	*fruticosa*
SW47	*Ledum*	*groenlandicum*
SW47	*Gaultheria*	*humifusa*
SW47	*Oxycoccus*	*oxycoccos*
SW47	*Carex*	*aquatilis*
SW47	*Trichophorum*	*cespitosum*
SW47	*Tofieldia*	*glutinosa*
SW47	*Antennaria*	*pulcherrima*
SW47	*Eriophorum*	*angustifolium*
SW47	*Carex*	*limosa*
SW47	*Potamogeton*	*natans*
SW48	*Picea*	*sp*
SW48	*Betula*	*nana*
SW48	*Rubus*	*arcticus*
SW48	*Oxycoccus*	*oxycoccos*
SW48	*Gaultheria*	*humifusa*
SW48	*Salix*	*sp*
SW48	*Carex*	*limosa*
SW48	*Meananthius*	*trifoliata*
SW48	*Trichophorum*	*cespitosum*
SW48	*Eriophorum*	*angustifolium*
SW48	*Mneum*	*sp*
SW49	*Picea*	*sp*
SW49	*Pinus*	*contorta*
SW49	*Betula*	*nana*
SW49	*Potentilla*	*fruticosa*
SW49	*Ledum*	*groenlandicum*
SW49	*Oxycoccus*	*oxycoccos*
SW49	*Empetrum*	*nigrum*
SW49	*Rubus*	*arcticus*
SW49	*Carex*	*aquatilis*
SW49	*Meananthius*	*trifoliata*
SW49	*Trichophorum*	*cespitosum*
SW49	*Drosera*	*rotundifolia*

Plot	Genus	Species
SW49	*Carex*	*limosa*
SW49	*Sanguisorba*	*officinalis*
SW49	*Arctostaphylos*	*uva-ursi*
SW49	*Sphagnum*	*sp*
SW50	*Meananthius*	*trifoliata*
SW50	*Nuphar*	*polysepalum*
SW51	*Picea*	*sp*
SW51	*Betula*	*nana*
SW51	*Potentilla*	*fruticosa*
SW51	*Rubus*	*arcticus*
SW51	*Salix*	*spp*
SW51	*Carex*	*aquatilis*
SW51	*Sanguisorba*	*officinalis*
SW51	*Viola*	*sp*
SW51	*Parnassia*	*fimbriata*
SW52	*Picea*	*sp*
SW52	*Pinus*	*contorta*
SW52	*Betula*	*nana*
SW52	*Potentilla*	*fruticosa*
SW52	*Ledum*	*groenlandicum*
SW52	*Carex*	*aquatilis*
SW52	*Platanthra*	*dilatata*
SW52	*Antennaria*	*pulcherrima*
SW52	*Trichophorum*	*cespitosum*
SW52	*Sanguisorba*	*officinalis*
SW52	*Eriophorum*	*angustifolium*
SW53	*Salix*	*barclayi*
SW53	*Carex*	*limosa*
SW53	*Meananthius*	*trifoliata*
SW53	*Potentilla*	*palustris*
SW53	*Sphagnum*	*sp*
SW54	*Picea*	*sp*
SW54	*Betula*	*nana*
SW54	*Salix*	*barclayi*
SW54	*Platanthra*	*dilatata*
SW54	*Rubus*	*arcticus*
SW54	*Carex*	*aquatilis*
SW54	*Carex*	*disperma*
SW54	*Carex*	*sp*
SW54	*Calamagrostis*	*canadensis*
SW54	*Epilobium*	*angustifolium*
SW54	*Sphagnum*	*sp*
SW55	*Salix*	*barclayi*
SW55	*Rubus*	*arcticus*
SW55	*Salix*	*commutata*
SW55	*Pinus*	*contorta*
SW55	*Carex*	*aquatilis*
SW55	*Equisetum*	*arvense*
SW55	*Epilobium*	*angustifolium*
SW55	*Platanthra*	*dilatata*
SW55	*Pyrola*	*asarifolia*
SW55	*Sphagnum*	*sp*
SW55	*Mneum*	*sp*
SW56	*Betula*	*nana*
SW56	*Rubus*	*arcticus*
SW56	*Arctostaphylos*	*uva-ursi*
SW56	*Oxycoccus*	*oxycoccos*
SW56	*Ledum*	*groenlandicum*
SW56	*Empetrum*	*nigrum*
SW56	*Pinus*	*contorta*
SW56	*Picea*	*sp*
SW56	*Carex*	*limosa*
SW56	*Eriophorum*	*angustifolium*

Plot	Genus	Species
SW56	*Carex*	*aquatilis*
SW56	*Trichophorum*	*cespitosum*
SW56	*Platanthra*	*dilatata*
SW56	*Sanguisorba*	*officinalis*
SW56	*Meananthius*	*trifoliata*
SW56	*Trientalis*	*arctica*
SW56	*Potentilla*	*palustris*
SW57	*Juniperus*	*communis*
SW57	*Pinus*	*contorta*
SW57	*Empetrum*	*nigrum*
SW57	*Arctostaphylos*	*uva-ursi*
SW57	*Ledum*	*groenlandicum*
SW57	*Oxycoccus*	*oxycoccos*
SW57	*Betula*	*nana*
SW57	*Rubus*	*arcticus*
SW57	*Sanguisorba*	*officinalis*
SW57	*Eriophorum*	*angustifolium*
SW57	*Carex*	*aquatilis*
SW57	*Platanthra*	*dilatata*
SW57	*Trichophorum*	*cespitosum*
SW57	*Meananthius*	*trifoliata*
SW57	*Equisetum*	*arvense*
SW57	*Carex*	*limosa*
SW57	*Trientalis*	*arctica*
SW57	*Equisetum*	*fluviatile*
SW57	*Carex*	*lanuginosa*
SW58	*Pinus*	*contorta*
SW58	*Picea*	*sp*
SW58	*Betula*	*nana*
SW58	*Potentilla*	*fruticosa*
SW58	*Rubus*	*arcticus*
SW58	*Ledum*	*groenlandicum*
SW58	*Gaultheria*	*humifusa*
SW58	*Kalmia*	*microphylla*
SW58	*Salix*	*sp*
SW58	*Carex*	*limosa*
SW58	*Meananthius*	*trifoliata*
SW58	*Trichophorum*	*cespitosum*
SW58	*Platanthra*	*dilatata*
SW58	*Trientalis*	*arctica*
SW58	*Sanguisorba*	*officinalis*
SW58	*Carex*	*lanuginosa*
SW59	*Salix*	*commutata*
SW59	*Picea*	*sp*
SW59	*Pinus*	*contorta*
SW59	*Betula*	*nana*
SW59	*Potentilla*	*fruticosa*
SW59	*Ledum*	*groenlandicum*
SW59	*Gaultheria*	*humifusa*
SW59	*Platanthra*	*dilatata*
SW59	*Trichophorum*	*cespitosum*
SW59	*Triglochin*	*maritimum*
SW59	*Antennaria*	*pulcherrima*
SW59	*Carex*	*aquatilis*
SW59	*Anemone*	*parviflora*
SW60	*Picea*	*sp*
SW60	*Betula*	*nana*
SW60	*Salix*	*barclayi*
SW60	*Rubus*	*arcticus*
SW60	*Salix*	*commutata*
SW60	*Pinus*	*contorta*
SW60	*Leptarrhena*	*pyrolifolia*
SW60	*Carex*	*aquatilis*

Plot	Genus	Species
SW60	*Eriophorum*	*angustifolium*
SW60	*Equisetum*	*arvense*
SW60	*Platanthra*	*dilatata*
SW60	*Sphagnum*	*sp*
SW60	*Nuphar*	*polysepalum*
SW61	*Pinus*	*contorta*
SW61	*Picea*	*sp*
SW61	*Betula*	*nana*
SW61	*Empetrum*	*nigrum*
SW61	*Rubus*	*arcticus*
SW61	*Sanguisorba*	*officinalis*
SW61	*Trichophorum*	*cespitosum*
SW61	*Leptarrhena*	*pyrolifolia*
SW61	*Equisetum*	*arvense*
SW61	*Epilobium*	*angustifolium*
SW61	*Carex*	*sp*
SW61	*Platanthra*	*dilatata*
SW61	*Viola*	*sp*
SW61	*Sphagnum*	*sp*
SW61	*Meananthius*	*trifoliata*
SW61	*Nuphar*	*polysepalum*
SW62	*Picea*	*sp*
SW62	*Salix*	*barclayi*
SW62	*Salix*	*commutata*
SW62	*Oxycoccus*	*oxycoccos*
SW62	*Betula*	*nana*
SW62	*Ledum*	*groenlandicum*
SW62	*Rubus*	*arcticus*
SW62	*Pinus*	*contorta*
SW62	*Salix*	*sp*
SW62	*Equisetum*	*arvense*
SW62	*Carex*	*aquatilis*
SW62	*Sanguisorba*	*officinalis*
SW62	*Leptarrhena*	*pyrolifolia*
SW62	*Trientalis*	*arctica*
SW62	*Eriophorum*	*angustifolium*
SW62	*Platanthra*	*dilatata*
SW62	*Epilobium*	*angustifolium*
SW62	*Valeriana*	*sitchensis*
SW62	*Sphagnum*	*sp*
SW63	*Salix*	*barclayi*
SW63	*Salix*	*sp*
SW63	*Picea*	*sp*
SW63	*Salix*	*commutata*
SW63	*Leptarrhena*	*pyrolifolia*
SW63	*Carex*	*aquatilis*
SW63	*Sanguisorba*	*officinalis*
SW63	*Rubus*	*arcticus*
SW63	*Equisetum*	*arvense*
SW63	*Epilobium*	*angustifolium*
SW63	*Platanthra*	*dilatata*
SW64	*Salix*	*barclayi*
SW64	*Rubus*	*arcticus*
SW64	*Equisetum*	*arvense*
SW64	*Carex*	*aquatilis*
SW64	*Sanguisorba*	*officinalis*
SW64	*Platanthra*	*dilatata*
SW64	*Leptarrhena*	*pyrolifolia*
SW64	*Ranunculus*	*sp*
SW64	*Equisetum*	*fluviatile*
SW64	*Mneum*	*sp*
SW65	*Picea*	*sp*
SW65	*Betula*	*nana*

(continued)

Appendix 2
Wetland Vegetation Species List (completed)

Plot	Genus	Species
SW65	*Alnus*	*sp*
SW65	*Salix*	*spp*
SW65	*Meananthius*	*trifoliata*
SW65	*Nuphar*	*polysepalum*
SW65	*Trichophorum*	*cespitosum*
SW65	*Carex*	*aquatilis*
SW65	*Eriophorum*	*angustifolium*
SW65	*Rubus*	*arcticus*
SW65	*Leptarrhena*	*pyrolifolia*
SW65	*Caltha*	*leptosepala*
SW65	*Platanthra*	*dilatata*
SW65	*Trientalis*	*arctica*
SW65	*Sanguisorba*	*officinalis*
SW65	*Pinguicula*	*vulgaris*
SW65	*Veratrum*	*viride*
SW65	*Epilobium*	*angustifolium*
SW65	*Carex*	*kelloggii*
SW65	*Carex*	*limosa*
SW66	*Vaccinium*	*caespitosum*
SW66	*Kalmia*	*microphylla*
SW66	*Salix*	*sp*
SW66	*Meananthius*	*trifoliata*
SW66	*Carex*	*limosa*
SW66	*Trichophorum*	*cespitosum*
SW66	*Nuphar*	*polysepalum*
SW66	*Eriophorum*	*angustifolium*
SW66	*Sphagnum*	*sp*
SW67	*Salix*	*barclayi*
SW67	*Salix*	*spp*
SW67	*Carex*	*aquatilis*
SW67	*Equisetum*	*arvense*
SW67	*Leptarrhena*	*pyrolifolia*
SW67	*Eriophorum*	*angustifolium*
SW67	*Sanguisorba*	*officinalis*
SW67	*Caltha*	*leptosepala*
SW67	*Sphagnum*	*sp*
SW68	*Eriophorum*	*angustifolium*
SW68	*Caltha*	*leptosepala*
SW68	*Sanguisorba*	*officinalis*
SW68	*Equisetum*	*arvense*
SW68	*Platanthra*	*dilatata*
SW68	*Trientalis*	*arctica*
SW68	*Rubus*	*arcticus*
SW68	*Trichophorum*	*cespitosum*
SW68	*Viola*	*sp*
SW68	*Senecio*	*triangularis*
SW68	*Kalmia*	*microphylla*
SW68	*Sphagnum*	*sp*
SW69	*Nuphar*	*polysepalum*
SW69	*Caltha*	*leptosepala*
SW69	*Eriophorum*	*angustifolium*
SW69	*Carex*	*sp*
SW70	*Kalmia*	*microphylla*
SW70	*Carex*	*limosa*
SW70	*Caltha*	*leptosepala*
SW70	*Trichophorum*	*cespitosum*
SW70	*Sanguisorba*	*officinalis*
SW70	*Leptarrhena*	*pyrolifolia*
SW70	*Eriophorum*	*angustifolium*
SW70	*Equisetum*	*arvense*
SW70	*Platanthra*	*dilatata*
SW71	*Betula*	*nana*
SW71	*Pinus*	*contorta*

Plot	Genus	Species
SW71	*Picea*	*sp*
SW71	*Sanguisorba*	*officinalis*
SW71	*Trichophorum*	*cespitosum*
SW71	*Caltha*	*leptosepala*
SW71	*Eriophorum*	*angustifolium*
SW71	*Viola*	*sp*
SW71	*Leptarrhena*	*pyrolifolia*
SW71	*Platanthra*	*dilatata*
SW71	*Carex*	*sp*
SW72	*Salix*	*sp*
SW72	*Salix*	*barclayi*
SW72	*Trichophorum*	*cespitosum*
SW72	*Sanguisorba*	*officinalis*
SW72	*Eriophorum*	*angustifolium*
SW72	*Carex*	*sp*
SW72	*Caltha*	*leptosepala*
SW73	*Salix*	*sitchensis*
SW73	*Salix*	*reticulata*
SW73	*Salix*	*sp*
SW73	*Pyrola*	*asarifolia*
SW73	*Viola*	*sp*
SW73	*Equisetum*	*fluviatile*
SW73	*Pinguicula*	*vulgaris*
SW73	*Tofieldia*	*glutinosa*
SW73	*Oxytropis*	*sp*
SW73	*Eriophorum*	*chamissonis*
SW73	*Eriophorum*	*angustifolium*
SW73	*Pedicularis*	*ornithorhyncha*
SW73	*Carex*	*sp*
SW74	*Salix*	*sp*
SW74	*Salix*	*commutata*
SW74	*Salix*	*barclayi*
SW74	*Salix*	*reticulata*
SW74	*Rubus*	*arcticus*
SW74	*Sanguisorba*	*officinalis*
SW74	*Equisetum*	*arvense*
SW74	*Pedicularis*	*ornithorhyncha*
SW74	*Carex*	*aquatilis*
SW74	*Equisetum*	*fluviatile*
SW75	*Salix*	*barclayi*
SW75	*Salix*	*sp*
SW75	*Carex*	*aquatilis*
SW76	*Salix*	*barclayi*
SW76	*Salix*	*commutata*
SW76	*Salix*	*sp*
SW76	*Carex*	*aquatilis*
SW76	*Equisetum*	*arvense*
SW76	*Platanthra*	*dilatata*
SW76	*Juncus*	*balticus*
SW76	*Equisetum*	*fluviatile*
SW76	*Pinguicula*	*vulgaris*
SW76	*Tofieldia*	*glutinosa*
SW76	*Mneum*	*sp*
SW77	*Salix*	*barclayi*
SW77	*Carex*	*utriculata*
SW78	*Equisetum*	*arvense*
SW79	*Rubus*	*arcticus*
SW79	*Pinus*	*contorta*
SW79	*Picea*	*sp*
SW79	*Ledum*	*groenlandicum*
SW79	*Betula*	*nana*
SW79	*Empetrum*	*nigrum*
SW79	*Carex*	*aquatilis*

Plot	Genus	Species
SW79	*Eriophorum*	*angustifolium*
SW79	*Trichophorum*	*cespitosum*
SW79	*Drosera*	*rotundifolia*
SW79	*Meananthius*	*trifoliata*
SW79	*Platanthra*	*dilatata*
SW79	*Sanguisorba*	*officinalis*
SW79	*Carex*	*utriculata*
SW79	*Potamogeton*	*natans*
SW80	*Oxycoccus*	*oxycoccos*
SW80	*Potentilla*	*fruticosa*
SW80	*Betula*	*nana*
SW80	*Salix*	*sp*
SW80	*Carex*	*aquatilis*
SW80	*Trichophorum*	*cespitosum*
SW80	*Meananthius*	*trifoliata*
SW80	*Drosera*	*rotundifolia*
SW80	*Drosera*	*sp*
SW80	*Equisetum*	*arvense*
SW80	*Sphagnum*	*sp*
SW81	*Carex*	*utriculata*
SW81	*Equisetum*	*fluviatile*
SW81	*Calamagrostis*	*canadensis*
SW81	*Salix*	*sp*
SW82	*Salix*	*barclayi*
SW82	*Picea*	*sp*
SW82	*Salix*	*commutata*
SW82	*Senecio*	*triangularis*
SW82	*Platanthra*	*dilatata*
SW82	*Carex*	*aquatilis*
SW82	*Sanguisorba*	*officinalis*
SW82	*Equisetum*	*arvense*
SW82	*Pedicularis*	*ornithorhyncha*
SW82	*Pyrola*	*asarifolia*
SW82	*Equisetum*	*fluviatile*
SW82	*Leptarrhena*	*pyrolifolia*
SW82	*Eriophorum*	*angustifolium*
SW83	*Salix*	*commutata*
SW83	*Betula*	*nana*
SW83	*Salix*	*spp*
SW83	*Carex*	*utriculata*
SW83	*Carex*	*aquatilis*
SW84	*Salix*	*sp*
SW84	*Ledum*	*groenlandicum*
SW84	*Rubus*	*arcticus*
SW84	*Salix*	*barclayi*
SW84	*Alnus*	*sp*
SW84	*Picea*	*sp*
SW84	*Oxycoccus*	*oxycoccos*
SW84	*Carex*	*aquatilis*
SW84	*Carex*	*utriculata*
SW84	*Sanguisorba*	*officinalis*
SW84	*Sphagnum*	*sp*
SW85	*Betula*	*nana*
SW85	*Rubus*	*arcticus*
SW85	*Ledum*	*groenlandicum*
SW85	*Gaultheria*	*humifusa*
SW85	*Empetrum*	*nigrum*
SW85	*Oxycoccus*	*oxycoccos*
SW85	*Picea*	*sp*
SW85	*Sanguisorba*	*officinalis*
SW85	*Parnassia*	*fimbriata*
SW85	*Equisetum*	*fluviatile*
SW85	*Cornus*	*canadensis*

Plot	Genus	Species
SW85	*Carex*	*aquatilis*
SW85	*Pinguicula*	*vulgaris*
SW85	*Platanthra*	*dilatata*
SW85	*Sphagnum*	*sp*
SW86	-	-
SW87a	*Salix*	*sp*
SW87a	*Carex*	*aquatilis*
SW87a	*Equisetum*	*arvense*
SW87b	*Carex*	*utriculata*
SW87b	*Carex*	*aquatilis*
SW87b	*Potentilla*	*palustris*
SW87b	*Equisetum*	*arvense*
SW88	-	-
SW89	-	-
SW90	*Salix*	*barclayi*
SW90	*Salix*	*sp*
SW90	*Picea*	*sp*
SW90	*Carex*	*aquatilis*
SW91	-	-
SW92	-	-
SW93	*Salix*	*sp*
SW93	*Carex*	*aquatilis*
SW93	*Platanthra*	*dilatata*
SW93	*Juncus*	*balticus*
SW93	*Equisetum*	*arvense*
SW93	*Eriophorum*	*angustifolium*
SW94	-	-
SW95	*Salix*	*barclayi*
SW95	*Carex*	*aquatilis*
SW95	*Leptarrhena*	*pyrolifolia*
SW95	*Sanguisorba*	*officinalis*
SW95	*Mneum*	*sp*
SW96	*Salix*	*spp*
SW96	*Leptarrhena*	*pyrolifolia*
SW96	*Equisetum*	*arvense*
SW96	*Sanguisorba*	*officinalis*
SW96	*Platanthra*	*dilatata*
SW96	*Eriophorum*	*angustifolium*
SW96	*Caltha*	*leptosepala*
SW96	*Viola*	*sp*
SW96	*Carex*	*aquatilis*
SW96	*Pedicularis*	*sp*
SW96	*Sphagnum*	*sp*

APPENDIX 3 – WETLAND ECOSYSTEM, FIELD DATA, CLASSIFICATION, AND AREA

Appendix 3
Wetland Ecosystem, Field Data, Classification, and Area

ID	Plot	Date	Location	Easting	Northing	Elevation	Aspect ^{0}	Slope %	SMR	SNR	Von Post	Soil Water pH	Open Water pH
1	SW1	12-Jul-07	Tailings Option C	371118	6367321	908	192	<5	Sl	B	3	7	6.8
2	SW2	12-Jul-07	Tailings Option C	371257	6367345	891	142	<5	Mo	C	-	7.2	7
3	SW3	12-Jul-07	Tailings Option C	371400	6367437	898	92	1	Sl	B	-	7.2	7.2
4	SW4	12-Jul-07	Tailings Option C	373824	6368122	847	140	<5	St	B	-	6.9	6.8
5	SW5	12-Jul-07	Tailings Option C	373961	6368207	847	-1	0	St	C	-	6.5	6.9
6	SW6	12-Jul-07	Tailings Option C	374045	6368240	857	165	<5	Sl	C	5	7	7
7	SW7	12-Jul-07	Tailings Option C	374095	6368290	854	165	<5	Sl	C	5	7	7
8	SW8	13-Jul-07	Tailings Option C	371596	6367247	896	334	<5	Sl	B	-	5.6	5.5
9	SW9	13-Jul-07	Tailings Option C	371960	6367318	912	-1	0	St	B	-	4.8	5.2
10	SW10	13-Jul-07	Tailings Option C	372711	6367364	869	320	<5	Sl	B	-	6.3	6.3
11	SW11	13-Jul-07	Tailings Option C	372696	6367415	880	-1	0	Sl	C/D	4	5.4	-
12	SW12	13-Jul-07	Tailings Option C	372606	6367523	881	-1	0	Sl	B	-	-	-
13	SW13	14-Jul-07	Tailings Option C	374278	6367703	923	320	<5	Sl	C	6	5.7	5.8
14	SW14	14-Jul-07	Tailings Option A	381756	6373020	785	-1	0	Sl	C	5	6.1	6.3
15	SW15	14-Jul-07	Tailings Option A	381889	6372972	809	-1	0	Sl	B/C	3	6.8	7.9
16	SW16	14-Jul-07	Tailings Option A	381993	6373009	803	-1	0	St	C	-	7.3	7.6
17	SW17	14-Jul-07	Tailings Option A	381758	6373191	796	-1	0	St	C	-	6.9	7.1
18	SW18	14-Jul-07	Tailings Option A	381892	6373684	825	276	2	St	B	-	6.4	6.9
19	SW19	14-Jul-07	Tailings Option A	381686	6373830	802	330	2	Sl	C	-	7.1	7
20	SW20	14-Jul-07	Tailings Option A	381695	6373935	807	-1	0	Sl	C	-	6.5	6.6
21	SW21	15-Jul-07	Tailings Option A	381660	6373211	806	88	7	St	C	-	6.9	7.1
22	SW22	15-Jul-07	Tailings Option A	381502	6373385	789	-1	0	Sl	B/C	4	-	7.1
23	SW23	15-Jul-07	Tailings Option A	381402	6373524	805	-1	0	Mo	C	-	-	-
24	SW24	15-Jul-07	Tailings Option A	381561	6374229	802	-1	0	Sl	B	-	-	7.3
25	SW25	15-Jul-07	Tailings Option A	382214	6372218	846	-1	0	Sl	C	-	7.1	7.4
26	SW26	15-Jul-07	Tailings Option A	382412	6372037	842	-1	0	Sl	B	-	6.7	7.8
27	SW27	15-Jul-07	Tailings Option A	382513	6371613	843	-1	0	Sl	C	4	6.8	7.3
28	SW28	16-Jul-07	Tailings Option A	382264	6371202	848	-1	0	Sl	B/C	4	6.3	7.6
29	SW29	16-Jul-07	Tailings Option A	382171	6371344	842	-1	0	St	C	3	6.7	6.6
30	SW30	16-Jul-07	Tailings Option A	382064	6371497	832	290	<5	Sl	-	-	-	-
31	SW31	16-Jul-07	Tailings Option A	381822	6368365	881	104	2	St	B	-	6.2	6.2
32	SW32	16-Jul-07	Tailings Option A	381804	6368685	869	38	<5	Mo	C/D	6	6.3	6.7
33	SW33	16-Jul-07	Tailings Option A	382014	6368813	858	-1	0	Sl	C	3	6.2	6.6
34	SW34	16-Jul-07	Tailings Option A	382219	6368670	853	-1	0	Mo	C	-	-	-
35	SW35	16-Jul-07	Tailings Option A	382160	6368702	851	-1	0	Sl	C/D	3	6.7	7
36	SW36	17-Jul-07	Tailings Option A	381618	6374825	801	-1	0	St	C/D	5	6.3	6.5
37	SW37	17-Jul-07	Tailings Option A	381569	6374672	804	-1	0	St	B/C	4	-	7.1
38	SW38	17-Jul-07	Tailings Option A	381705	6374592	798	-1	0	Mo	-	-	-	6.9
39	SW39	17-Jul-07	Tailings Option A	380423	6373149	862	-1	0	St	B/C	5	5.8	6.2
40	SW40	17-Jul-07	Tailings Option A	381297	6372681	-	-1	0	Dy	-	-	-	-
41	SW41	17-Jul-07	Tailings Option A	381057	6373302	844	-1	0	Sl	C/D	5	6.2	6.2
42	SW42	17-Jul-07	Tailings Option A	382863	6371401	872	-1	0	St	C	2	6.8	6.5
43	SW43	17-Jul-07	Tailings Option A	381901	6370929	864	82	7	St	B	4	6.6	6.8
44	SW44	17-Jul-07	Tailings Option A	381862	6370933	877	69	<5	Sl	-	5	6.4	7.2
45	SW45	17-Jul-07	Tailings Option A	382295	6369063	838	-1	0	St	B	3	-	6.8
46	SW46	17-Jul-07	Tailings Option A	382270	6369448	833	-1	0	Mo	C	-	-	-
47	SW47	18-Jul-07	Tailings Option A	382435	6368687	850	-1	0	St	B	5	-	7.7
48	SW48	18-Jul-07	Tailings Option A	382546	6368720	836	-1	0	St	B/C	2	7.2	7.1
49	SW49	18-Jul-07	Tailings Option A	382347	6368180	880	-1	0	St	B	3	6.5	6.9
50	SW50	18-Jul-07	Tailings Option A	382468	6368238	874	-1	0	St	-	-	-	-
51	SW51	18-Jul-07	Tailings Option A	382554	6367955	891	-1	0	Mo	B	4	6.8	7.2
52	SW52	18-Jul-07	Tailings Option A	382705	6368023	873	-1	0	St	B	4	6.7	6.6
53	SW53	18-Jul-07	Tailings Option A	382069	6368049	877	-1	0	St	A	1	5.7	5.9
54	SW54	18-Jul-07	Tailings Option A	382110	6367913	882	-1	0	-	-	2	-	6.3
55	SW55	18-Jul-07	Tailings Option A	382107	6367619	881	-1	0	St	C	3	6.7	7.1
56	SW56	18-Jul-07	Tailings Option A	382396	6367836	892	-1	0	St	C	6	5.9	6.9
57	SW57	18-Jul-07	Tailings Option A	382328	6367317	888	-1	0	St	C	5	-	6.7
58	SW58	18-Jul-07	Tailings Option A	382432	6367335	892	-1	0	St	B	-	6.1	6.6
59	SW59	18-Jul-07	Tailings Option A	382778	6367462	881	182	<5	St	A	2	6.4	6.9
60	SW60	19-Jul-07	Saddle	382681	6361925	951	19	<5	Sl	B	-	6.2	6.6
61	SW61	19-Jul-07	Saddle	382680	6361585	969	340	<5	Sl	B	3	6.3	6.8
62	SW62	19-Jul-07	Saddle	382534	6361221	982		7	Sl	B/C	3	6.3	6.9
63	SW63	21-Jul-07	Saddle	382637	6360946	987	8	<5	Mo	B	2	6.4	6.9
64	SW64	21-Jul-07	Saddle	382502	6360678	1001	350	10	St	B	-	6.6	7
65	SW65	21-Jul-07	Saddle	382711	6360540	994		20	St	C	5	-	6.4

(continued)

Appendix 3
Wetland Ecosystem, Field Data, Classification, and Area (continued)

ID	Plot	Date	Location	Easting	Northing	Elevation	Aspect °	Slope %	SMR	SNR	Von Post	Soil Water pH	Open Water pH
66	SW66	21-Jul-07	Saddle	383438	6359524	1037	-1	0	St	C	7	-	6.3
67	SW67	21-Jul-07	Saddle	383560	6359455	1025	134	<5	-	-	-	6.2	6
68	SW68	21-Jul-07	Saddle	383507	6360007	1049	278	10	St	B	8	-	5.6
69	SW69	21-Jul-07	Saddle	383655	6360009	1066	-1	0	-	-	-	-	-
70	SW70	21-Jul-07	Saddle	383409	6359984	1038	262	<5	Sl	C	6	6	-
71	SW71	21-Jul-07	Saddle	383414	6360700	975	-1	0	St	C	5	-	6.4
72	SW72	21-Jul-07	Saddle	383055	6360392	984	40	<5	Sl	B	5	-	6.4
73	SW73	22-Jul-07	Tailings Option B	377345	6349038	1089	-1	0	St - Dy	B	-	6.7	6.9
74	SW74	22-Jul-07	Tailings Option B	377712	6349670	1075	-1	0	St	C	-	-	7.4
75	SW75	22-Jul-07	Tailings Option B	377842	6349807	1091	-1	0	Mo	-	-	-	-
76	SW76	22-Jul-07	Tailings Option B	378176	6350622	1074	36	<5	Sl	B	-	6.7	7.2
77	SW77	22-Jul-07	Tailings Option B	378144	6350551	1069	-1	0	Mo	-	-	-	-
78	SW78	22-Jul-07	Tailings Option B	378980	6352372	1031	-1	0	-	-	-	-	-
79	SW79	22-Jul-07	Tailings Option B	378532	6356597	953	138	<5	St	B	6	6.4	7.5
80	SW80	22-Jul-07	Tailings Option C	375301	6366961	803	-1	0	St	B	2	6.7	7
81	SW81	23-Jul-07	Tailings Option C	375918	6367949	763	-1	0	-	-	-	-	-
82	SW82	23-Jul-07	Saddle	380922	6359906	1168	-1	0	Mo	B	1	7.4	7.3
83	SW83	23-Jul-07	Pit Area	379721	6358579	937	-1	0	Sl	B	1	7.4	7.4
84	SW84	23-Jul-07	Pit Area	379271	6359193	873	-1	0	Mo	B	1	7.7	7.7
85	SW85	23-Jul-07	Pit Area	379350	6359620	-	-1	0	Sl	B	4	6.9	7
86	SW86	24-Jul-07	Road	384025	6362725	-	-	-	-	-	-	-	-
87	SW87a	24-Jul-07	Road	384174	6362488	730	-1	0	Dy	B	2	6.8	7.1
88	SW87b	24-Jul-07	Road	384807	6361420	-	-1	0	Mo	B	2	7	6.7
89	SW88	24-Jul-07	Road	385427	6358774	-	-	-	-	-	-	-	-
90	SW89	24-Jul-07	Road	385645	6355224	-	-	-	-	-	-	-	-
91	SW90	24-Jul-07	Road	384918	6351939	-	-1	0	Mo	B	1	7.1	7.7
92	SW91	24-Jul-07	Road	384551	6350295	-	-	-	-	-	-	-	-
93	SW92	24-Jul-07	Road	384216	6349803	-	-	-	-	-	-	-	-
94	SW93	24-Jul-07	Road	384962	6344494	-	-1	0	Mo	B	1	7	6.8
95	SW94	24-Jul-07	Road	382860	6332436	-	-	-	-	-	-	-	-
96	SW95	24-Jul-07	Road	382620	6332147	-	-1	0	Sl	C	4	-	7.9
97	SW96	24-Jul-07	Road	382587	6331444	-	-1	0	Sl	D	6	-	7.9
98	SW97	-	Provisional Infrastructure Line100	383417	6362332	-	-	-	-	-	-	-	-
99	SW98	-	AccessRoad 100	385406	6358126	-	-	-	-	-	-	-	-
100	SW99	-	AccessRoad 100	384998	6357761	-	-	-	-	-	-	-	-
101	SW100	-	AccessRoad 100	384923	6359837	-	-	-	-	-	-	-	-
102	SW101	-	AccessRoad 100	384934	6360403	-	-	-	-	-	-	-	-
103	SW102	-	AccessRoad 100	384603	6359085	-	-	-	-	-	-	-	-
104	SW103	-	AccessRoad 100	384669	6360827	-	-	-	-	-	-	-	-
105	SW104	-	AccessRoad 100	384854	6363039	-	-	-	-	-	-	-	-
106	SW105	-	AccessRoad 100	384638	6350861	-	-	-	-	-	-	-	-
107	SW106	-	AccessRoad 100	382543	6333330	-	-	-	-	-	-	-	-
108	SW107	-	AccessRoad 100	382580	6332307	-	-	-	-	-	-	-	-
109	SW108	-	AccessRoad 100	384326	6348307	-	-	-	-	-	-	-	-
110	SW109	-	AccessRoad 100	385080	6343793	-	-	-	-	-	-	-	-
111	SW110	-	AccessRoad 100	402016	6324826	-	-	-	-	-	-	-	-
112	SW111	-	AccessRoad 100	403410	6324914	-	-	-	-	-	-	-	-
113	SW112	-	AccessRoad 100	404528	6324776	-	-	-	-	-	-	-	-
114	SW113	-	AccessRoad 100	404550	6324893	-	-	-	-	-	-	-	-
115	SW114	-	AccessRoad 100	384416	6362206	-	-	-	-	-	-	-	-
116	SW115	-	Infrastructure 150m	383699	6362445	-	-	-	-	-	-	-	-
117	SW116	-	Infrastructure 150m	373202	6367282	-	-	-	-	-	-	-	-
118	SW117	-	Infrastructure 150m	373322	6367608	-	-	-	-	-	-	-	-
119	SW118	-	Infrastructure 150m	375521	6369864	-	-	-	-	-	-	-	-
120	SW119	-	Infrastructure 150m	382261	6370908	-	-	-	-	-	-	-	-
121	SW120	-	Infrastructure 150m	380486	6373132	-	-	-	-	-	-	-	-
122	SW121	-	Infrastructure 150m	383280	6359444	-	-	-	-	-	-	-	-
123	SW122	-	Infrastructure 150m	379005	6359541	-	-	-	-	-	-	-	-
124	SW123	-	Infrastructure 150m	382974	6359556	-	-	-	-	-	-	-	-
125	SW124	-	Infrastructure 150m	381640	6371701	-	-	-	-	-	-	-	-
126	SW125	-	Infrastructure 150m	377471	6349188	-	-	-	-	-	-	-	-
127	SW126	-	Infrastructure 150m	378838	6351611	-	-	-	-	-	-	-	-
128	SW127	-	Infrastructure 150m	378034	6349758	-	-	-	-	-	-	-	-
129	SW128	-	Infrastructure 150m	377918	6350169	-	-	-	-	-	-	-	-
130	SW129	-	Infrastructure 150m	372566	6367455	-	-	-	-	-	-	-	-
131	SW130	-	Infrastructure 150m	382521	6367461	-	-	-	-	-	-	-	-

(continued)

Appendix 3
Wetland Ecosystem, Field Data, Classification, and Area (continued)

ID	Plot	Date	Location	Wetland Class_1	Assoc_Code_1	Wetland Class_2	Assoc_Code_2	Wetland Class_3	Assoc_Code_3	Area_ha	Area_M2	BECLABEL
1	SW1	12-Jul-07	Tailings Option C	Fen	Wf07	-	-	-	-	0.16	1639.50	ESSFwv
2	SW2	12-Jul-07	Tailings Option C	Swamp	Ws04	-	-	-	-	0.07	711.71	ESSFwv
3	SW3	12-Jul-07	Tailings Option C	Fen	Wf02	-	-	-	-	2.29	22890.99	ESSFwv
4	SW4	12-Jul-07	Tailings Option C	Fen	Wf02	-	-	-	-	0.15	1543.84	ESSFwv
5	SW5	12-Jul-07	Tailings Option C	Bog	Wb01	Fen	Wf02	-	-	0.48	4849.43	ESSFwv
6	SW6	12-Jul-07	Tailings Option C	Fen	Wf02	-	-	-	-	0.42	4150.76	ESSFwv
7	SW7	12-Jul-07	Tailings Option C	Fen	Wf02	Shallow Open Water		-	-	0.11	1107.00	ESSFwv
8	SW8	13-Jul-07	Tailings Option C	Bog	Wb02	-	-	-	-	0.09	906.12	ESSFwv
9	SW9	13-Jul-07	Tailings Option C	Bog	Wb02	Shallow Open Water		-	-	0.11	1121.58	ESSFwv
10	SW10	13-Jul-07	Tailings Option C	Fen	Wf02	Shallow Open Water		-	-	1.87	18745.50	ESSFwv
11	SW11	13-Jul-07	Tailings Option C	Shallow Open Water	Yellow Pond Lily	Fen	Wf01	Bog	Wb02	0.20	1962.45	ESSFwv
12	SW12	13-Jul-07	Tailings Option C	Fen	Wf04	Bog	-	-	-	0.49	4877.99	ESSFwv
13	SW13	14-Jul-07	Tailings Option C	Bog	Wb02	-	-	-	-	0.12	1156.29	ESSFwv
14	SW14	14-Jul-07	Tailings Option A	Fen	Wf02	Bog	Wb10	-	-	1.20	12025.70	ESSFwv
15	SW15	14-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	0.60	6019.92	ESSFwv
16	SW16	14-Jul-07	Tailings Option A	Bog	Wb02	-	-	-	-	1.58	15752.50	ESSFwv
17	SW17	14-Jul-07	Tailings Option A	Fen	Wf02	Bog	Wb02	-	-	1.94	19357.79	ESSFwv
18	SW18	14-Jul-07	Tailings Option A	Bog	Wb07	Fen	Wf02	-	-	1.58	15773.00	ESSFwv
19	SW19	14-Jul-07	Tailings Option A	Bog	Wb05	Marsh	Wm01	-	-	4.03	40306.50	ESSFwv
20	SW20	14-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	13.94	139398.30	ESSFwv
21	SW21	15-Jul-07	Tailings Option A	Bog	Wb07	-	-	-	-	0.89	8921.67	ESSFwv
22	SW22	15-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	2.70	27014.64	ESSFwv
23	SW23	15-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	5.65	56476.58	ESSFwv
24	SW24	15-Jul-07	Tailings Option A	Fen	Wf10	Fen	Wf02	Bog	Wb07	5.08	50791.10	ESSFwv
25	SW25	15-Jul-07	Tailings Option A	Bog	Wb05	-	-	-	-	0.51	5070.00	ESSFwv
26	SW26	15-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	2.47	24726.00	ESSFwv
27	SW27	15-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	5.27	52666.00	ESSFwv
28	SW28	16-Jul-07	Tailings Option A	Bog	Wb05	-	-	-	-	0.48	4810.00	ESSFwv
29	SW29	16-Jul-07	Tailings Option A	Bog	Wb05	-	-	-	-	0.12	1248.40	ESSFwv
30	SW30	16-Jul-07	Tailings Option A	Bog	Wb05	-	-	-	-	3.18	31844.50	ESSFwv
31	SW31	16-Jul-07	Tailings Option A	Fen	Wf04	-	-	-	-	1.10	10988.00	ESSFwv
32	SW32	16-Jul-07	Tailings Option A	Fen	Wf04	-	-	-	-	1.11	11142.50	ESSFwv
33	SW33	16-Jul-07	Tailings Option A	Fen	Wf07	Fen	Wf02	-	-	4.33	43287.00	ESSFwv
34	SW34	16-Jul-07	Tailings Option A	Shrub-Carr	Sc03	-	-	-	-	1.12	11150.50	ESSFwv
35	SW35	16-Jul-07	Tailings Option A	Fen	Wf04	-	-	-	-	4.33	43287.00	ESSFwv
36	SW36	17-Jul-07	Tailings Option A	Fen	Wf05	-	-	-	-	0.44	4398.60	ESSFwv
37	SW37	17-Jul-07	Tailings Option A	Fen	Wf05	-	-	-	-	0.39	3865.50	ESSFwv
38	SW38	17-Jul-07	Tailings Option A	Marsh	Wm01	Fen	Wf02	-	-	4.55	45469.23	ESSFwv
39	SW39	17-Jul-07	Tailings Option A	Fen	Wf10	-	-	-	-	1.08	10799.50	ESSFwv
40	SW40	17-Jul-07	Tailings Option A	Shallow Open Water	Yellow Pond Lily	-	-	-	-	1.43	14323.50	ESSFwv
41	SW41	17-Jul-07	Tailings Option A	Fen	Wf10	-	-	-	-	0.58	5792.00	ESSFwv
42	SW42	17-Jul-07	Tailings Option A	Marsh	Wm01	-	-	-	-	2.35	23480.00	ESSFwv
43	SW43	17-Jul-07	Tailings Option A	Fen	Wf07	-	-	-	-	0.13	1327.57	ESSFwv
44	SW44	17-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	0.14	1392.22	ESSFwv
45	SW45	17-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	3.41	34139.00	ESSFwv
46	SW46	17-Jul-07	Tailings Option A	Marsh	Wm01	-	-	-	-	6.57	65662.51	ESSFwv
47	SW47	18-Jul-07	Tailings Option A	Fen	Wf02	Shallow Open Water	Pond Weed	-	-	0.67	6708.50	ESSFwv
48	SW48	18-Jul-07	Tailings Option A	Fen	Wf08	-	-	-	-	0.87	8743.00	ESSFwv
49	SW49	18-Jul-07	Tailings Option A	Fen	Wf07	Shallow Open Water	Yellow Pond Lily	-	-	1.02	10228.50	ESSFwv
50	SW50	18-Jul-07	Tailings Option A	Shallow Open Water	Yellow Pond Lily	Fen	Wf07	-	-	0.37	3732.00	ESSFwv
51	SW51	18-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	0.37	3716.00	ESSFwv
52	SW52	18-Jul-07	Tailings Option A	Fen	Wf02	-	-	-	-	1.19	11909.50	ESSFwv
53	SW53	18-Jul-07	Tailings Option A	Bog	Wb13	Fen	Wf04	-	-	0.61	6121.50	ESSFwv
54	SW54	18-Jul-07	Tailings Option A	Fen	Wf04	-	-	-	-	3.66	36624.00	ESSFwv
55	SW55	18-Jul-07	Tailings Option A	Fen	Wf04	-	-	-	-	3.66	36624.00	ESSFwv
56	SW56	18-Jul-07	Tailings Option A	Fen	Wf07	-	-	-	-	0.55	5490.50	ESSFwv
57	SW57	18-Jul-07	Tailings Option A	Fen	Wf10	Fen	Wf02	-	-	0.43	4308.00	ESSFwv
58	SW58	18-Jul-07	Tailings Option A	Fen	Wf13	Fen	Wf13	-	-	0.27	2656.98	ESSFwv
59	SW59	18-Jul-07	Tailings Option A	Fen	Wf10	-	-	-	-	0.80	8002.50	ESSFwv
60	SW60	19-Jul-07	Saddle	Fen	Wf04	Shallow Open Water	Yellow Pond Lily	-	-	2.78	27844.95	ESSFwv
61	SW61	19-Jul-07	Saddle	Fen	Wf02	Shallow Open Water	Yellow Pond Lily	-	-	1.51	15065.55	ESSFwv
62	SW62	19-Jul-07	Saddle	Fen	Wf04	-	-	-	-	0.92	9151.04	ESSFwv
63	SW63	21-Jul-07	Saddle	Fen	Wf04	-	-	-	-	3.61	36144.50	ESSFwv
64	SW64	21-Jul-07	Saddle	Fen	Wf04	-	-	-	-	3.17	31716.00	ESSFwv
65	SW65	21-Jul-07	Saddle	Fen	Wf12	Shallow Open Water	Yellow Pond Lily	-	-	9.44	94385.05	ESSFwv

(continued)

Appendix 3
Wetland Ecosystem, Field Data, Classification, and Area (completed)

ID	Plot	Date	Location	Wetland Class_1	Assoc_Code_1	Wetland Class_2	Assoc_Code_2	Wetland Class_3	Assoc_Code_3	Area_ha	Area_M2	BECLABEL
66	SW66	21-Jul-07	Saddle	Fen	Wf08	Shallow Open Water	Yellow Pond Lily	-	-	4.93	49275.50	ESSFwv
67	SW67	21-Jul-07	Saddle	Fen	Wf04	-	-	-	-	0.73	7329.50	ESSFwv
68	SW68	21-Jul-07	Saddle	Fen	Wf12	-	-	-	-	0.32	3171.50	ESSFwv
69	SW69	21-Jul-07	Saddle	Shallow Open Water	Yellow Pond Lily	Fen	Wf12	-	-	0.17	1743.50	ESSFwv
70	SW70	21-Jul-07	Saddle	Fen	Wf12	-	-	-	-	0.52	5180.00	ESSFwv
71	SW71	21-Jul-07	Saddle	Fen	Wf12	Fen	Wf02	-	-	4.53	45282.45	ESSFwv
72	SW72	21-Jul-07	Saddle	Fen	Wf12	Fen	Wf04	-	-	8.07	80676.00	ESSFwv
73	SW73	22-Jul-07	Tailings Option B	Swamp	Ws06	Flood	-	-	-	0.14	1445.50	ESSFwv
74	SW74	22-Jul-07	Tailings Option B	Swamp	Ws06	Flood	-	-	-	0.44	4446.50	ESSFwv
75	SW75	22-Jul-07	Tailings Option B	Marsh	Wm01	Shallow Open Water	-	-	-	0.22	2186.00	ESSFwv
76	SW76	22-Jul-07	Tailings Option B	Fen	Wf01	Fen	Wf04	-	-	3.55	35507.00	ESSFwv
77	SW77	22-Jul-07	Tailings Option B	Marsh	Wm01	-	-	-	-	0.43	4309.00	ESSFwv
78	SW78	22-Jul-07	Tailings Option B	Shallow Open Water	Horsetail	-	-	-	-	0.33	3297.50	ESSFwv
79	SW79	22-Jul-07	Tailings Option B	Fen	Wf13	Shallow Open Water	Pond Weed	-	-	1.50	14952.95	ESSFwv
80	SW80	22-Jul-07	Tailings Option C	Fen	Wf08	-	-	-	-	1.00	9998.50	ESSFwv
81	SW81	23-Jul-07	Tailings Option C	Marsh	Wm01	Shallow Open Water	Horsetail	-	-	4.06	40576.50	ESSFwv
82	SW82	23-Jul-07	Saddle	Fen	Wf04	-	-	-	-	3.67	36721.00	ESSFwv
83	SW83	23-Jul-07	Pit Area	Marsh	Wm01	Fen	Wf04	-	-	8.32	83212.50	ESSFwv
84	SW84	23-Jul-07	Pit Area	Fen	Wf01	Fen	Wf04	-	-	3.27	32707.50	ESSFwv
85	SW85	23-Jul-07	Pit Area	Fen	Wf02	-	-	-	-	1.93	19295.00	ESSFwv
86	SW86	24-Jul-07	Road	Fen	Fen*	-	-	-	-	112.87	1128709.48	ESSFwv
87	SW87a	24-Jul-07	Road	Marsh	Wm01	-	-	-	-	14.09	140874.01	ESSFwv
88	SW87b	24-Jul-07	Road	Marsh	Wm01	-	-	-	-	60.61	606057.00	ESSFwv
89	SW88	24-Jul-07	Road	Swamp	Swmap*	Flood	-	-	-	6.32	63173.00	ESSFwv
90	SW89	24-Jul-07	Road	Bog	Bog*	-	-	-	-	0.51	5098.53	ESSFwv
91	SW90	24-Jul-07	Road	Marsh	Wm01	Shallow Open Water	-	-	-	19.53	195319.77	ESSFwv
92	SW91	24-Jul-07	Road	Flood	Flood	-	-	-	-	5.43	54265.00	ESSFwv
93	SW92	24-Jul-07	Road	Marsh	Marsh*	Swamp	-	Flood	-	0.06	575.76	ESSFwv
94	SW93	24-Jul-07	Road	Marsh	Wm01	-	-	-	-	0.11	1076.11	ESSFwv
95	SW94	24-Jul-07	Road	Fen	Fen*	-	-	-	-	0.99	9919.50	ESSFwv
96	SW95	24-Jul-07	Road	Fen	Wf04	-	-	-	-	2.70	26983.00	ESSFwv
97	SW96	24-Jul-07	Road	Fen	Wf04	-	-	-	-	0.48	4829.00	ESSFwv
98	SW97	-	Provisional Infrastructure Line100	TRIM Shallow Open Water	-	-	-	-	-	0.18	1844.00	ESSFwv
99	SW98	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	5.75	57527.00	ESSFwv
100	SW99	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	48.94	489362.50	ESSFwv
101	SW100	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	0.50	5043.50	ESSFwv
102	SW101	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	0.90	9043.00	ESSFwv
103	SW102	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	208.00	2080034.50	ESSFwv
104	SW103	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	36.53	365348.52	ESSFwv
105	SW104	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	54.85	548549.00	ESSFwv
106	SW105	-	AccessRoad 100	TRIM Shallow Open Water	-	-	-	-	-	0.09	884.00	ESSFwv
107	SW106	-	AccessRoad 100	TRIM Shallow Open Water	-	-	-	-	-	0.21	2109.00	ESSFwv
108	SW107	-	AccessRoad 100	TRIM Shallow Open Water	-	-	-	-	-	0.17	1731.50	ESSFwv
109	SW108	-	AccessRoad 100	TRIM Marsh	-	-	-	-	-	15.64	156381.50	ESSFwv
110	SW109	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	3.76	37588.00	ESSFwv
111	SW110	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	37.95	379509.00	ICH wc
112	SW111	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	25.02	250195.00	ICH wc
113	SW112	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	1.94	19387.00	ICH wc
114	SW113	-	AccessRoad 100	TRIM Marsh	-	-	-	-	-	2.68	26795.00	ICH wc
115	SW114	-	AccessRoad 100	TRIM Swamp	-	-	-	-	-	0.80	8022.50	ESSFwv
116	SW115	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.49	4947.00	ESSFwv
117	SW116	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.09	909.50	ESSFwv
118	SW117	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.07	661.00	ESSFwv
119	SW118	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.25	2503.00	ESSFwv
120	SW119	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.20	1982.50	ESSFwv
121	SW120	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.03	332.00	ESSFwv
122	SW121	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	0.51	5051.00	ESSFwv
123	SW122	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	1.12	11195.50	ESSFwv
124	SW123	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	1.58	15836.00	ESSFwv
125	SW124	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	0.85	8497.50	ESSFwv
126	SW125	-	Infrastructure 150m	TRIM Marsh	-	-	-	-	-	0.14	1434.00	ESSFwv
127	SW126	-	Infrastructure 150m	TRIM Marsh	-	-	-	-	-	0.16	1627.00	ESSFwv
128	SW127	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	0.67	6726.00	ESSFwv
129	SW128	-	Infrastructure 150m	TRIM Swamp	-	-	-	-	-	2.57	25650.50	ESSFwv
130	SW129	-	Infrastructure 150m	TRIM Shallow Open Water	-	-	-	-	-	0.09	905.50	ESSFwv
131	SW130	-	Infrastructure 150m	TRIM Marsh	-	-	-	-	-	0.28	2798.50	ESSFwv