Appendix 7. Marl Fen Management Plan 2025 Update

SITE C CLEAN ENERGY PROJECT

MARL FEN WETLAND PROPERTY MANAGEMENT PLAN, V3

Prepared by:

P. Christie-Talisman Resource Consultants
Darryl Kroeker Ducks Unlimited Canada
and
K. Anré McIntosh-BC Hydro

Plan Update Prepared by:

D. Webster – Eco-Web Ecological Consulting Ltd.
and
Brent Matsuda - BC Hydro

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1.0 INTRODUCTION

In January 2014, BC Hydro acquired a 637 hectare (ha) = 1574 acre (ac) property known as Marl Fen (the Property) consisting of three parcels about two kilometres (km) west of Hudson's Hope, just north of the Hudson's Hope Airport (**Figure 1**). The legal descriptions of the parcels comprising the Property are:

- PID: 013-335-553 Legal: Parcel A (T41614) of District Lot 1200 Peace River District
- PID: 014-789-736 Legal: District Lot 1211 Peace River District, Except the West 80 Feet
- PID: 024-828-203 Legal: Block A District Lot 1210 Peace River District

The Property lies within the Provincial Agricultural Land Reserve (ALR) and was purchased for the purposes of wetland and wildlife mitigation for the Site C Clean Energy Project ("the Project"). It contains 104 ha (256 ac) of wetland (**Figure 1)** surrounded by 422 ha (1042 ac) of hay fields and pasture of which 386 ha (849 ac) are cultivated and 112 ha (276 ac) are forest. Vegetation and wildlife surveys conducted in 2012 prior to the purchase of the Property confirmed habitats on the Property were being used by a range of wildlife including species at risk and bird species of conservation concern for Bird Conservation Region 6 (Environment Canada 2013) that were identified as potentially being adversely affected by Project construction and operations (BC Hydro 2013).

The current values of the Property as wildlife habitats are a reflection of past management practices. An understanding of this past use is summarized below and was used to develop the long-term management plan in 2015 (Christie *et al.* 2015). With the filling of the reservoir in late 2024, this plan was reviewed to ensure that objectives were being met and that the terms and requirements are compatible with agricultural operations at the Property.

1.1 Plan objectives

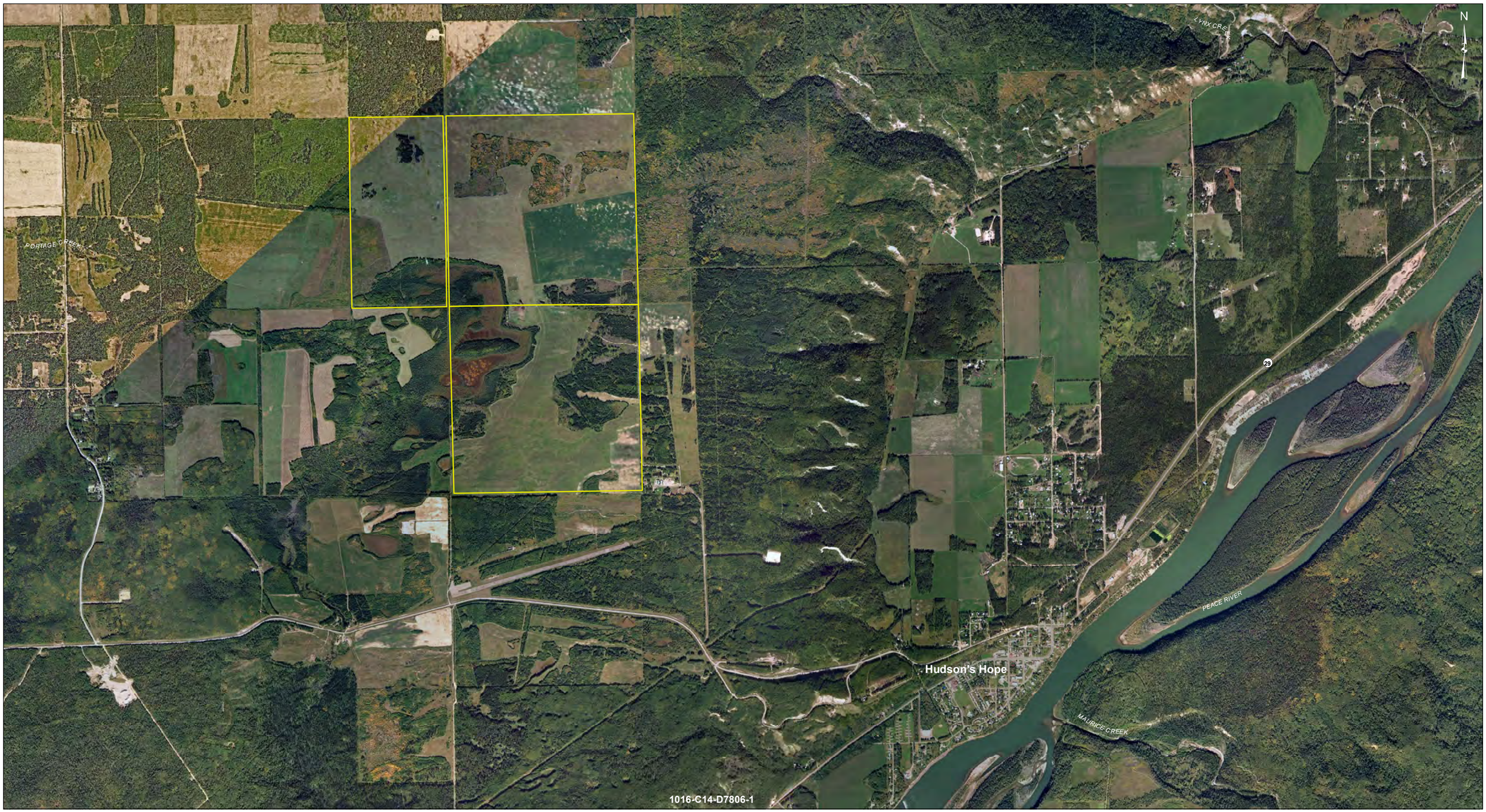
This document outlines how the Property will be managed to protect the wetland, maintain and enhance wildlife habitat values and maintain agricultural production.

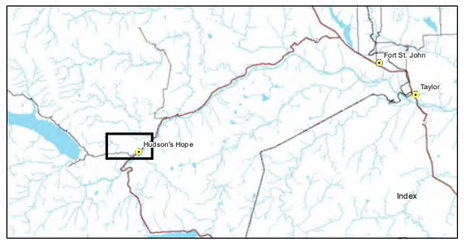
Management of these lands will assist BC Hydro in fulfilling the following conditions of the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC):

- **FDS Condition 10**: Mitigation of non-wetland migratory bird habitat
- **FDS Condition 11**: Mitigation for wetland habitat use by migratory birds and species at risk and compensation to address the loss of wetland area and functions supporting migratory birds and species at risk
- **FDS Condition 16**: Address and monitor effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants.
- **EAC Condition 12:** The EAC Holder must develop a Wetland Mitigation and Compensation Plan.
- **EAC Condition 16:** Implement various mitigation and compensation measures and described in the Vegetation and Wildlife Mitigation and Monitoring Plan.

- **EAC Condition 21:** The EAC Holder must ensure that measures implemented to manage harmful Project effects on wildlife resources are effective by implementing monitoring measures detailed in a Vegetation and Wildlife Mitigation and Monitoring Plan.

This management plan is a living document which will be amended as needed based on Property monitoring, further studies, and refinement of management objectives.





Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
4. Orthophotos created from 1:40,000 photos taken Sept. 10th 2007, DataBC WMS.
5. Property boundary locations are best available but should be considered approximate. Property information is a combination of surveyed data representing BC Hydro's current ownership records and ICIS data.

Legend

Marl Fen Wetland Mitigation Properties

1:15,000

0 150 300 600 Meters

Figure 1. Location of Marl Fen Property

BC hydro

SITE C CLEAN ENERGY PROJECT

Marl Fen Wetland Mitigation Properties Overview

DATE	January 12, 2015	DWG NO	1016-C14-D7806-1	R 0

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Construction of the Site C Clean Energy Project is subject to required regulatory approvals including environmental certification

X:\Arc\GIS\Projects\Mapping\northeast\MarlFen_MitigationPlan_1016_C14_D7806-1.mxd

1.2 Original Condition of the Property (2014)

In 2014 the Property was visited in June and September by BC Hydro and their consultant (P. Christie-Talisman Resource Consultants). The objective of the June visit was to discuss previous use of the Property with individuals who had recently farmed it and collect information to inform development of this plan. During the site visit notes were taken regarding the conditions of fields, wetlands, and fencing, their locations, and status of on-site infrastructure. A second site visit was conducted at the end of September to tour the property with the leaseholder and discuss the condition of the cattle water sources and identify improvements that could be made to these sources.

The June site visit confirmed the fields and fencing were generally in good condition, although several fields required renovation and some fencing and gate repairs were needed. The wetland showed little sign of cattle use and fencing the perimeter of the wetland to exclude cattle was not required for the 2014 grazing season if stocking levels remained aligned with historic levels.

In the first week of August, 2014, 225 head of cattle were brought to the site. At the end of August, the leaseholder informed BC Hydro that the dugouts were drying up due to drought. The site visit at the end of September also assessed the condition of the dugouts to identify measures to enhance them and water sources along the edge of the wetland.

During the September visit it was evident that the cattle were using three locations at the edge of the wetland as their primary water source and were entering the wetland to access water and forage. Consequently the edge of the wetland around the watering sites was heavily impacted by cattle. It was also noted that the grazing of the fields was uneven with higher grazing intensity near the wetland water sources and decreasing as distance from water increased.

The following recommendations were developed as a result of the September 2014 site visit:

- The wetland should be fenced off to exclude cattle
- Extracting water from the wetland is required to provide cattle with water, particularly in dry years
- Infrastructure improvements should be made at the water channel at the edge of the wetland
- A second water source should be developed at the edge of the wetland
- Dugouts in the fields should be refurbished through removal of accumulated organic matter
- All but one of the dugouts should be fenced to prevent direct access by cattle
- External troughs should be used to provide water to cattle at dugouts
- Cattle should access water at the largest dugout via a fenced ramp running into the dugout
- Additional water sources in the fields may need to be developed in the future to support cattle grazing.

1.3 Current Condition of the Property (2024)

BC Hydro has visited the Property annually over the intervening years, with the last visits and discussion with the leaseholders in 2022 and 2023 to discuss the long-term lease agreement. In

2024 the Property was visited in September to assess the current status of both agricultural use and wetland conditions. Leah and Mike Mant on behalf of the Gundersons are ranging ~230 cattle on the Property. Cattle are rotated through Fields 3, 4, 5 and 6 and Fields 1, 2 and 7 based on discussions with the leaseholder. Water is sourced strictly from the water well sources.

Table 1 below provides a breakdown of the actions taken based on the recommendations in Section 1.2, along with current recommendations based on the 2024 site visit.

Table 1 – Original recommendations, actions taken and current recommendations

Original Recommendation (2015)	Action Taken	Current Recommendations (2024)
The wetland should be fenced to exclude cattle.	2015-2016 - Wetlands fenced off and cattle excluded.	Maintain fencing around wetlands and inspect yearly.
Provide cattle with water extracted from the wetland, particularly in dry years.	Four dugouts were rehabilitated, and two wetland water source sites were remediated. None of the dugouts provided sufficient water so were not used.	Two wells were drilled to provide on-site water for cattle but must be run once a day. Construct dugouts at the wells to capture rain/snow to fill up the wells which will eliminate wetland water use.
Infrastructure improvements should be made at the water channel at the edge of the wetland	Wetland Well (WW) #1 - Dry well was removed and area dried up so not a viable water source; leaseholder did not use this.	Do not use wetland well for cattle watering as current drilled water well system is far less intrusive and set back from the wetland.
A second water source should be developed at the edge of the wetland.	WW #3 – Enhancements were not done as the area dried up.	Do not use for cattle watering as water well system outside the wetland is less intrusive to the wetland area.
Dugouts in the fields should be refurbished through removal of accumulated organic matter.	Dugouts 4,5,6,8 were refurbished in 2015.	Due to severe drought since 2020, dugouts do not retain water beyond spring and are no longer used. Future use during wetter years is feasible.
All but one of the dugouts should be fenced to prevent direct access by cattle.	Dugouts 4,5,6,8 had direct water access.	These dugouts are outside of the main wetland area and cattle access should be maintained for use in wetter years.
External troughs should be used to provide water to cattle at dugouts.	This recommendation was rejected based on practicality and cost.	The leaseholder uses a mobile trough setup with the water wells. This could be improved by constructing dugouts near the wells with troughs that overflow into the dugout.
Cattle should access water at the largest dugout via a fenced ramp running into the dugout.	Ramps were improperly installed, and wildlife ripped out part of the fencing. Leaseholder repaired fence.	Maintain fence as cattle will be able to access this water source in wetter years. Review ramp construction and remediate to a stable surface.
Additional water sources in the fields may need to be developed in the future to support cattle grazing.	Two wells were drilled and were the primary water source providing cows access to Fields 2, 4, or 5.	Construct dugouts at wells with ramps, fencing, and troughs to allow well water to overflow into the dugouts.

Discussions with the leaseholder indicate old Fields 5 and 6 are included in the overall grazing rotation on a yearly basis due to the last four years of drought conditions limiting forage availability

across the Property (M. Mant, Gunderson Ranch, Personal Communication, 2024). Cows have access to the old fields and the intensively managed Fields 3 and 4 which has reduced the impact of grazing. The leaseholder is open to grazing the old fields only in the later season (August to October), allowing them to establish better and rejuvenate each year.

Fields 1, 2 and 7 are intensively managed and cattle rotated through them in the early and late season. Rehabilitation efforts in Field 4 were met with poor growth results due to early season drought conditions which have bene ongoing for the past 4 years. Given the drought conditions, any fields that are worked up/ planted should be rested for the entire season to allow plants to establish. In general, it would be best to keep cows off the rejuvenated areas as long as possible, ideally resting it for a whole season, unless the vegetation growth is sufficient. If the fields are rejuvenated in sections, temporary fencing should be utilized to keep cattle off the worked-up areas. Consider re-harrowing and seeding in the spring or a late fall seeding (under the snow) and resting the area for the season depending on moisture conditions and grass growth. Moisture retention in rejuvenated fields should be improved through snow retention (bale grazing in the spring) and increasing organic content in the soils (manure composting/spreading). More drought-tolerant pasture mixes/species, with legumes such as: alfalfa (*Medicago sativa*), birdsfoot trefoil (*Lotus corniculatus*), cicer milk vetch (*Astragalus cicer*), and grass species such as northern wheatgrass (*Agropyron dasystachyum*), crested wheatgrass (*Agropyron cristatum)*, meadow bromegrass (*Bromus commutatus*) and tall fescue (*Lolium arundinaceum)* should be considered.

Wetland water sources have not been used and are fenced off. Given the drought conditions, this is for the best as keeping cattle out of the wetlands is preferred. Water dugouts 4,5,6,8 were all dry and did not hold any useable water all season. In wetter years or years with a normal snowpack, it is estimated that the use of these dugouts will be feasible but fencing and ramps need to be maintained. The water wells are the most reliable water sources however the current setup requires turning them on daily to water the cattle. Construction of clay-lined dugouts with adequate ramps and a trough system at the well to capture and trickle water through overflow into the dugouts would be the most efficient.

The wetland areas (western wetland complex, eastern wetland complex, northern wetland complex) were dry but naturalizing to a normal ecological function without cattle access into these areas. The northern wetland complex was not specifically investigated and based on the cattle rotation, is anticipated to have cattle impacts. The western wetland complex was grown up to a later seral stage with black spruce (*Picea mariana*) and tamarack (*Larix laricina*) in most areas and sedges and grasses in the former wet areas. Upon restoration of a normal precipitation and snowpack it is assumed that these areas will restore complete ecological function.

The leaseholders are looking to open some areas to provide more shade for their cattle. The forest south of Field 7 was suggested but this is part of the eastern wetland complex and so cattle must be excluded from this area. The western mesic forest at the west end of Field 4 may be suitable if the western fence is intact and maintained. The leaseholder will need to ensure the fence is intact before setting cattle into this area.

2.0 CONSULTATION

Consultation with agencies and the leaseholder regarding the development and implementation of this plan is outlined below:

- July 30, 2015: Draft Management Plan sent to Environment Canada
- September 10, 2015: Draft Management Plan sent to provincial Ministry of Forests, Lands, and Natural Resources Operations (MFLNRO)
- September 21, 2015: Tour of property and review of management plan with Environment Canada (Canadian Wildlife Service) and MFLNRO
- October 28, 2015: Management plan comments from MFLNRO
- November 30, 2015: Inspection noted fencing deficiencies at dugout #6 and issues with the gate on the west side of the road right of way.
- December 23, 2015: Letter sent to the Gundersons regarding scope of work and pricing for installation of two miles of perimeter fencing at the Marl Fen property.
- February 29, 2016: Meeting with the Gundersons to review the Draft Management Plan . Reviewed fencing, water dugouts, proposed 2016 work and livestock use, installation of water wells and field renovation.
- 2017: No records received from leaseholder.
- 2018: Gundersons provided monthly summaries of grazing use and activities.
- 2019: Gundersons provided monthly summaries of grazing use and activities.
- 2022: Gundersons provided monthly summaries of grazing use and activities.
- June 29, 2022: Meeting between BC Hydro and Gundersons to address long term lease and outstanding issues at the property.
- October 12, 2022: Gunderson's submitted proposed five year grazing management plan to address field rejuvenation and cattle grazing.
- 2023: Gundersons provided monthly summaries of grazing use and activities.
- 2023: Site visit with regulators, BC Hydro and the Gundersons.
- 2024: Gundersons provided monthly summaries of grazing use and activities.
- September 10, 2024: Site visit with Gundersons and BC Hydro consultant (Dan Webster, Eco-Web) to review management plan and discuss potential amendments to update the plan.

3.0 BASELINE AGRICULTURAL CONDITIONS

The Marl Fen Property is within the provincial Agricultural Land Reserve (ALR) and has historically been used for hay production and cattle pasture. The ALR was established in 1973 and under the *Agricultural Land Commission Act* (ALCA) is land designated to protect BC's farmland for food production (ALC 2022). The Agricultural Land Commission (ALC) oversees this protection, as the ALR is based upon a land's potential for agricultural use and activity on it must maintain that agricultural potential (ALC 1979). In preparation of this management plan on ALR lands to protect the overlapping wetland values of the Marl Fen, the agricultural use of the site must be maintained. This section provides the baseline conditions of the agricultural values of the Property.

3.1 Soils

The gently sloping upland fields at elevations 680 – 700 m[1] are dominantly (70%) Beryl (BY) map unit soils classified as Brunisolic Gray Luvisols on a thin layer of sandy to loamy alluvium that generally overlies calcareous clay tills (BC Soil Survey 1986). The texture of the generally thin (10 to 20 cm) upper horizon ranges from fine sand to silt, which limits its use for crops and restricts the agricultural use to primarily hay production and cattle grazing.

Beryl soils are moderately well-drained, slowly pervious, and have a humid water regime. The typical soil profile has topsoil layers consisting of a thin upper (Ae) horizon, a yellowish brown, loamy (Bm) horizon, and a second Ae horizon that overlies the upper subsoil and is a more finely textured (Bt) horizon. The parent material[2] (C horizon) is generally fine textured (clayey) and moderately calcareous.

The 30% remaining upland area is mapped as Lynx (LY) map unit soils, also classified as Brunisolic Gray Luvisols developed on fine sandy to loamy, strongly calcareous glaciofluvial deposits. These soils occur intermittently at elevations below 750 m along the upper terraces adjacent to the Peace River Valley and its main tributaries. The macro-topography is level to gently sloping overall, with intermittent ridges of cross-bedded fine sandy surface sediments that have characteristics consistent with soils reworked by wind action (aeolian materials).

Lynx soils are well drained, moderately pervious, and have a humid water regime. The typical soil profile has a topsoil layer of brown sandy loam Bm and Ae horizons, and a thin loamy upper subsoil Bt horizon, overlying a calcareous parent material (Ck horizon[3]) at about 30 cm depth.

The BC Soil Survey (1986) states that Beryl soils are often associated with Eaglesham map unit soils that are organic soils occurring in poorly drained, shallow depressions interspersed throughout the upland areas adjacent to the Peace River Valley. These fen soils are classified as poorly-drained Terric Mesisols developed on sedge peats. A brief field reconnaissance suggests that shallow organic soils, with dominantly sedge cover, occur in the depressional channels interspersed throughout the fields, particularly in the northeast portion of the site. Field tests

[1] LiDAR data. Acquired 2006
[2] Parent material is the base soil or rock that the soil profile is built from, in this case clay.
[3] The C horizon is modified by the subclassification "k" to denote the calcareous nature of the horizon.

confirmed that the shallow relief ridges along some of the channels exhibit soil textures typical of Aeolian deposits.

The wetland, covering the depressional southwesterly portion of the property, is mapped as Kenzie (KZ) map unit organic soils classified as Terric Mesisols developed from sphagnum moss peats (BC Soil Survey 1986). The strongly acid peat is generally between 1 to 2 m deep and is saturated most of the year by acidic water. The surface horizons (Of) are fibric and the lower horizons are partially (mesic) decomposed (Om). The peats overlie mineral sub-soils. Field observations along the excavated wetland reservoir at Dugout Site #1 indicate the sub-soils at the edge of the wetland are fine sandy loams, with low silt and clay content.

The Beryl and Lynx map units cover the currently developed agricultural land, while the Eaglesham and Kenzie map units overlap the wetland habitat. These organic soils are not considered agricultural soils and often are restricted to grazing. This historical practice on the Property had impacted the wetland function and this management plan seeks to balance the agricultural potential of the upland fields and protect the ecological diversity of the lowland wetland habitat. Focusing agricultural activities on these areas maintains the food production values mandated by the ALC, while allowing the natural diversity of the wetlands to flourish.

3.2 Climate Capability for Agriculture

The capability of land for agricultural production depends on both climate and soils. The climate capability for agriculture therefore only looks at the restrictions that climate has on agricultural capability (BC Ministry of Environment, 1981). The subject lands, including the large wetland and upland fields, are mapped within climate capability for agriculture Class 3G, with the major limitation of insufficient heat units during the growing season (G). Growing degree-days (GDD[4]) range from 1030 to 1169, May to September precipitation is about 250 mm, and the freeze-free period (FFP) is 60-74 days (BC Ministry of Environment, 1983). The climatic moisture deficit is about 148 mm/year (based on the 40-year mean).

3.3 Land Capability for Agriculture

The available land capability for agriculture mapping (BCLI, 1979) pre-dates the 1983 soil mapping, and does not reflect the most current soils information (BC Ministry of Environment and Ministry of Agriculture and Food 1983). The forage fields in the upland areas are mapped as 70% Class 4TM[5] with topography (T) and low moisture (M) holding capacity limitations, and 30% Class 5 W[6] with wetness (W) limitations. The Class 5 areas could potentially be improved to Class 4 with onsite drainage works. This class is assigned without consideration of the economic

[4]GDD: the accumulated difference between the mean daily temperature and the standard base temperature of 5˚C on days when the mean daily temperature is above 5˚C.

[5]Land in Class 4 has limitations that require special management practices or severely restrict the range of crops, or both. Subclass T indicates topographic constraints such as steepness. Subclass M indicates a low moisture holding capacity, caused by adverse inherent soil characteristics and limits crop growth.

[6]Land in Class 5 has limitations that restrict its capability to produce perennial forage crops or other specially adapted crops. Subclass W indicates there is an excess of free water, other than from flooding, that limits agricultural use and may be due to poor drainage, high water table, seepage, and/or runoff from surrounding areas.

feasibility of these improvements. Class 3X[7] soils are present along the western boundary of the Property. The more recent soils mapping shows the upland fields as 30% Lynx (mineral) soils, which are not organic, and would likely be rated as Class 3 (the base climate capability rating) as they are finer textured than the Beryl soils so do not have the low moisture holding capacity limitation and are depressional to gently sloping. Based on limited field observations to date, the shallow, depressional channels interspersed throughout the upland fields are poorly drained, shallow sedge peat soils that would be Class 5 in their unimproved (not drained) state.

The wetland, mapped as Kenzie soils, is rated as unimproved Class 4 improving to Class 3 with local drainage works. This class is assigned without consideration of the economic feasibility of these improvements. The more recent soils mapping indicates that the depressional areas in which Kenzie soils occur are subject to local frost-pooling and have little potential for agriculture use (BC Ministry of Environment and Ministry of Agriculture and Food 1983).

3.4 Crop Suitability

The upland field areas are suitable for most hay and grain crops grown in the Peace Region, with the Class 3 climate severely limiting the range of other crops, such as vegetables, that could be grown commercially. The Class 4 and 5 land capability would severely restrict crops to perennial forage crops and grazing potential. The climatic moisture deficit (~148 mm) and the lack of suitable irrigation water sources further limit the amount of forage that could be produced; cut hay would be limited to one crop per year, with a limited amount of after-math grazing potential.

4.0 PAST USE CONDITIONS AND RECENT USE

The total cultivated area within the property is 386ha. Table 2 outlines the cultivated area by field (see **Figure 3** below for field numbers).

Table 2. Cultivated areas within fields

Field Number	Cultivated area (ha)
1	97
2	30
3	44
4	30
5	50
6	73
7	62
Total cultivated area	**386**

[7]Land in Class 3 has limitations that require moderately intensive management practices or moderately restrict the range of crops, or both. Subclass X refers to multiple restrictions that affect soil production.

The subject lands have historically been used for forage production including cut hay and pasture and have provided seasonal grazing for 300 to 400 head of cattle. Horses have also been pastured on the site in the past. The fields have been grazed on a seasonal rotation, with light after-math grazing of cut hayfields.

Former operators have stated that an annual, single cut of hay was harvested from most fields. Actual harvested hay yields are unknown but based on production estimates for Class 3-4 lands in a Class 3 climate area, yields are estimated to be in the 2 tonnes (t)/ha (=0.8 t/ac) range. Since 2007 fields have been used as pasture, primarily for cattle, although there appears to have been limited horse (e.g., <10 head) grazing. Traditionally, cattle have been placed onsite between May 24 and June 10, and removed between mid-August and mid-November, depending on moisture and grass conditions. The wetter the year, the better the vegetation growth and the longer the fields can support cattle.

Based on field observations and interviews with past operators, the fields were periodically replanted. The primary grass species that have been planted include mixes of Timothy (*Phleum pratense*), creeping red fescue (*Festuca rubra*), orchard grass (*Dactylis glomerata*), meadow bromegrass (*Bromus commutatus*) and alfalfa.

With the exception of the recently renovated fields (**Figure 3**), most fields appear to be over-mature in terms of forage yields and would benefit from cultivation and reseeding (renovating). The fields along the northerly Property boundary appear to be the oldest in terms of cultivation and seeding history and have reverted to “old field habitat”.

4.1 Weed issues

4.1.1 2014 Inventory and Control

A weed inventory of the Property was completed June 6-9, 2014. Canada thistle (*Cirsium arvense)*, perennial sow thistle (*Sonchus arvensis)* and yellow hawkweed (*Hieracium pratense*) were documented. The only significant infestation identified was in the recently cultivated northeast field. **Figure 2** outlines the location of the infestations within the property.

4.1.2 2014 Treatment

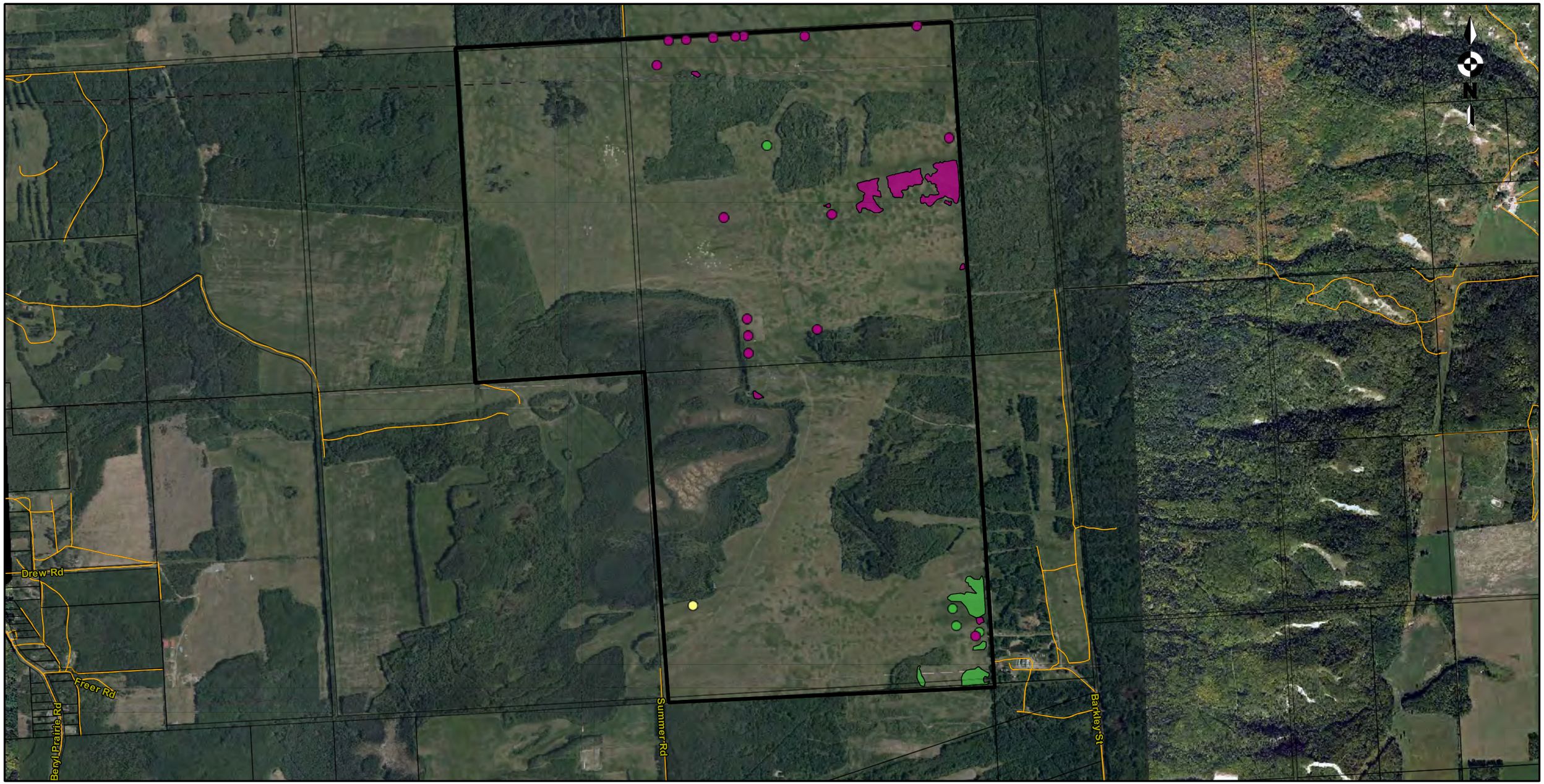
The infestations were treated four times in 2014 with aminopyralid, 2,4-D amine (**Table 3**). On October 3rd a post-treatment audit was conducted. During the audit, all noxious weed infestations treated were surveyed to assess the efficacy of the treatments. The audit confirmed that the chemicals had effectively treated the plants: no live Canada thistle (all were dead or dying) and no perennial sow thistle were observed during the final audit.

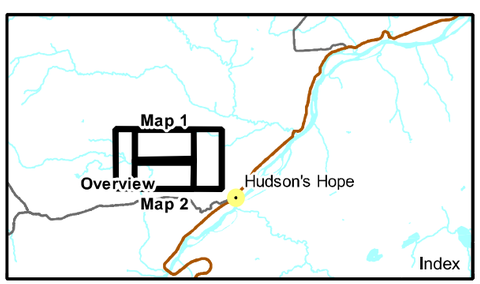
Table 3. Summary of 2015 noxious weed treatments

Baseline Survey / Walkthrough	Herbicide Application	Post treatment Inspection	Final Weed Audit
June 4 - 9	-	N/A	N/A
-	July 26 aminopyralid – 0.5 L/ha, 7.0 ha	Aug. 8	N/A
-	July 27 aminopyralid – 0.5 L/ha, 2.0 ha	Aug. 10	N/A
-	Aug. 8 2,4-D Amine 600 – 1.48 L/ha, 0.135 ha	Aug. 25	N/A
-	Aug. 10 2,4-D Amine 600 – 1.5 L/ha, 0.70 ha	Aug. 25	N/A
Sep. 5	None	Sept 5	N/A
Oct 3	None		Oct. 3

4.1.3 2024 Observations

Ongoing weed inspections have been undertaken by the leaseholder on the Property. During the September 10, 2024 site visit, Creeping Thistle (*Cirsium arvense*) was noted at the north gate entrance to the Property and was mowed by the Gunderson's to control it. The leaseholder indicated that spot occurrences of invasives were noted at very low levels but no infestations of weeds were noted or reported on the Property indicating that ongoing management was effective. This site visit does not represent a thorough weed inspection and was cursory in nature only.





Map Notes:
1. Datum: NAD83
2. Projection: BC Albers
3. Base Data: Province of B.C.
4. Orthophotos: created from 1:15,000 photos taken 2014.

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Legend

Weed Location - Points
- Canada Thistle
- Perennial Sow Thistle
- Yellow Hawkweed

Weed Location - Polygons
- Canada Thistle
- Perennial Sow Thistle

Roads-TRIM Data

Cadastral Parcel Boundaries

Marl Fen Parcel Boundary

1:18000 0 200 400 600 800 m

Figure 2. Location of noxious weed infestations.
Source: Pathfinder Endeavours 2015

CONFIDENTIAL DOCUMENT FOR PLANNING PURPOSES

BC hydro | PATHFINDER ENDEAVOURS LTD.

SITE C CLEAN ENERGY PROJECT

Site C Leased Lands
Marl Fen
2014 Weed Location Overview

Date	Jan 13, 2015	DWG NO	1016-C14-B7803-23	R0

Construction of the Site C Clean Energy Project is subject to required regulatory approvals including environmental certification.

5.0 INFRASTRUCTURE ON SITE

5.1 Access

The Property is located just north of the Hudson's Hope Airport, and can be accessed from either the north or west. Access from the north is via Beryl Prairie, Wegen, Boring and Stove Roads. Access from the south is via Canyon Drive and the gravel road at the west end of the airport. A relatively well graded bare soil track runs between the wetland and upland forage fields, to the vicinity of the old corrals in the mid-Property. Poorly graded internal tracks are used to access the fields, including the north fields and northerly Property boundary.

5.2 Buildings

There are no residences on the property. There is one small, dilapidated shed (**Appendix 1: Photo 1**) on the Property, near the three steel silos used for grain and seed storage (**Appendix 1: Photo 2**). These are located near the southwest entrance to the site. Apparently, orchard grass seed is stored in at least one of the silos. As of 2024 the shed has been removed and the silos are empty and not currently in use.

5.3 Water

A shallow reservoir has been excavated along the mid-western boundary of the wetland, Dugout #1 (**Appendix 1: Photo 3, Figure 3**). The reservoir was constructed several years ago[8] to provide water for cattle. Water is extracted from this channel via a seasonal (portable) pump system into troughs located along the edge of the field.

Additional livestock water is provided at six shallow dugouts located throughout the Property, including two more along the westerly margin of the wetland, as shown on **Figure 3**. As of 2024, due to drought conditions the leaseholder has not used any of the water dugouts as they do not contain sufficient water. Two water wells were drilled on the property and are currently being run on a daily basis to provide water while cattle are in the pasture.

[8]The date of construction was not provided by the previous property owner.

N

5

6

4

3

7

2

1

Legend

- # Field Number
- Water Source (Dugout)
- Water Well
- Existing Gate
- Proposed Gate
- Proposed Fencing
- Existing Fencing
- Marl Fen Wetland Mitigation Properties

Figure 3. Location of cattle watering sites 1:10,000

0 0.2 0.4 km

Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
4. Orthophotos created from 1:40,000 photos taken Sept. 10th 2007, DataBC WMS.
5. Property boundary locations are best available but should be considered approximate. Property information is a combination of surveyed data representing BC Hydro's current ownership records and ICIS data.

BC hydro

SITE C CLEAN ENERGY PROJECT

Marl Fen Wetland Mitigation Properties

Date	January 16, 2015	DWG NO	1016-C14-B7806-3	R 0

© BC Hydro 2015 - all rights reserved. This map is for information purposes only and accuracy is not guaranteed.

Construction of the Site C Clean Energy Project is subject to required regulatory approvals including environmental certification

Path: X:\ArcGIS\Projects\Mitigation\Wetland\MarlFen_MitigationPlan_1016_C14_B7806-3.mxd

5.4 Fencing and Corrals

The entire periphery of the Property is fenced along the property lines and internal field fencing is also in place, as shown on **Figure 3**. Fencing is primarily 4 strand barb wire, generally in good repair (**Appendix 1: Photo 4**), with sections that are either down from wear and tear or trespass vandalism (**Appendix 1: Photo 5**). In 2024 it was noted that fencing generally remains in good condition except for the perimeter fence in the SE corner (Field 1) which is rotting and has many loose posts. Existing gate locations are also shown on **Figure 3**. The main access gates are metal and field gates are barbed slip wire. Some gates have been damaged or removed (**Appendix 1: Photo 6**).

Old timber plank corrals, a loading ramp, and a high-page wire fenced hay storage site, generally in disrepair, are located in the vicinity of dugout #1 (**Appendix 1: Photo 7**). The hay storage site and corrals are not used due to the state of disrepair.

6.0 BASELINE VEGETATION RESOURCES ON THE PROPERTY

Vegetation data presented in this management plan were collected during surveys of the property in 2012 and 2014. Detailed descriptions of the methods and results are in Simpson *et al.* (2014) which is appended to this management plan. No updated vegetation data other than grazing details and field activities has been collected during the annual reviews.

6.1.1 Ecosystems present

Terrestrial Ecosystem Mapping was completed for the Property in 2014. Eighteen ecosystems (habitats) were mapped (**Figure 4 and Figure 5**). **Table 4** summarizes the amount of each ecosystem mapped within the Property.

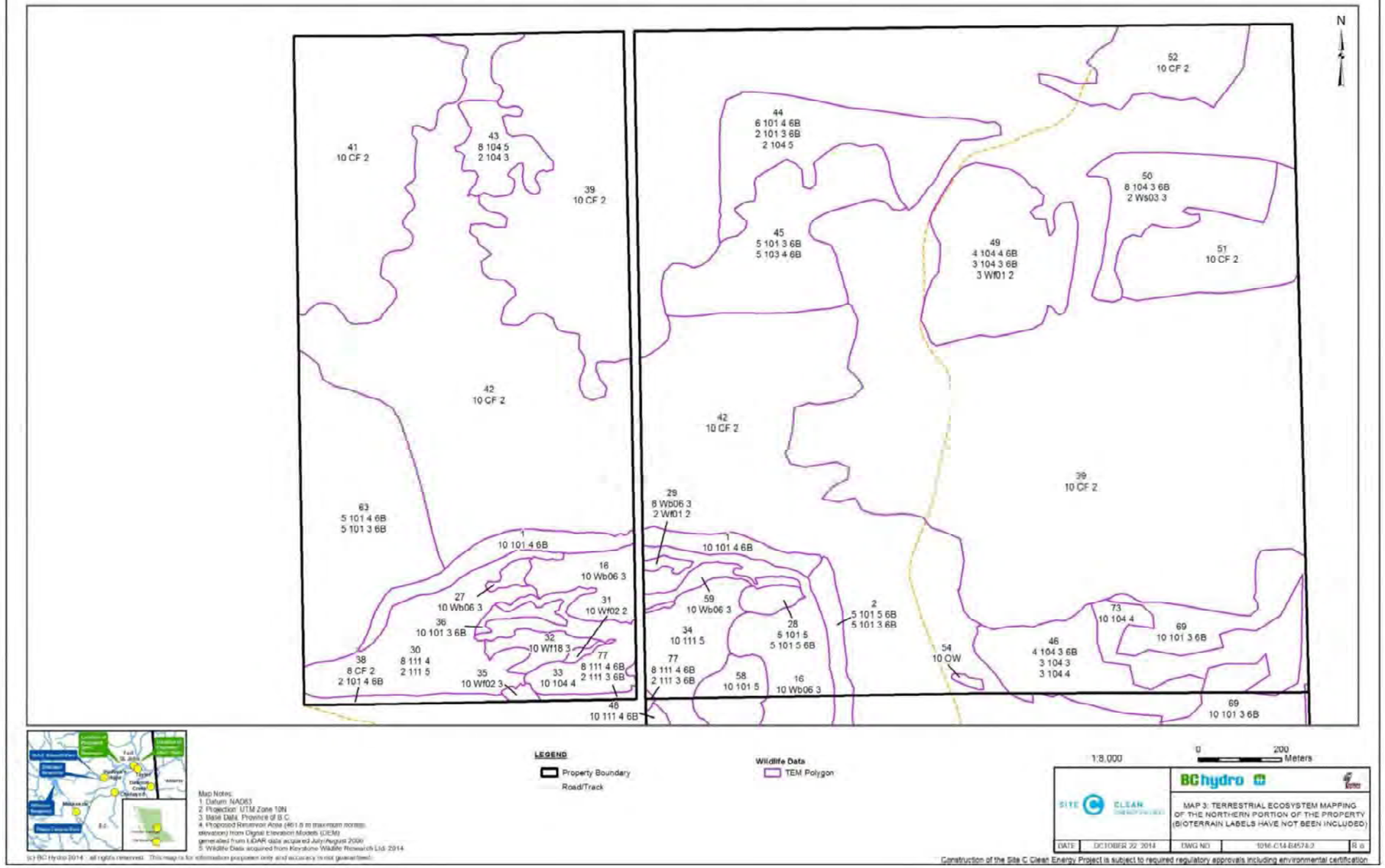

Figure 4. Terrestrial Ecosystem Map of Marl Fen Property: North

Source Simpson et al. (2014)

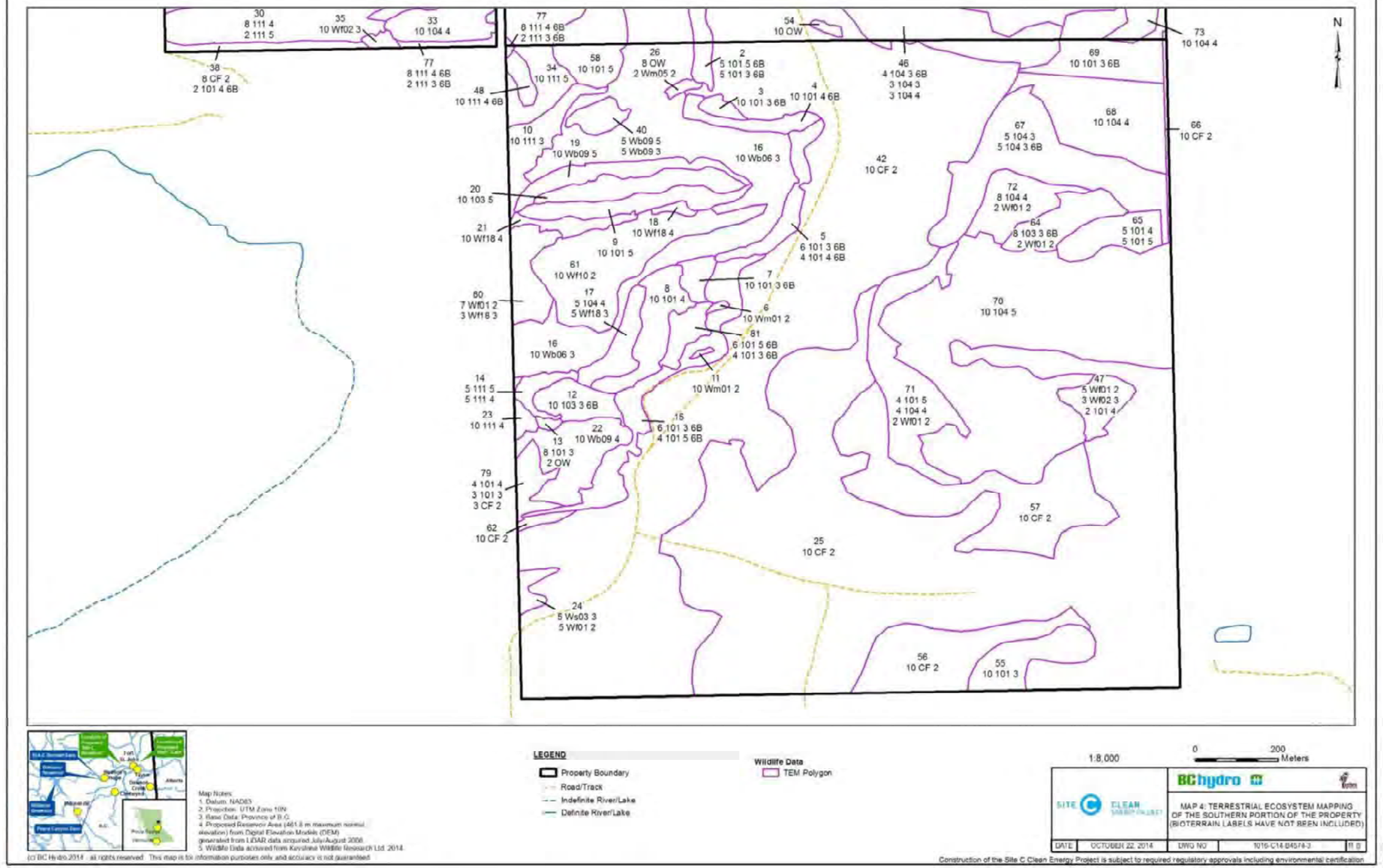

Figure 5. Terrestrial Ecosystem Map of Marl Fen Property: South

Source: Simpson et al. (2014)

Table 4. Ecosystems and area mapped

Map Code	Ecosystem Name	Ha mapped
Forested Ecosystems: Coniferous		
101	Sw-Trailing raspberry-Step moss	16.5
103	SwPl-Soopolallie-Fuzzy-spiked wildrye	2.2
104	Sb-Labrador tea-Step moss	59.6
Forested Ecosystems: Seral		
101B	At-Rose-Creamy peavine	65.6
103B	At-Rose-Fuzzy-spiked wildrye	9.3
104B	At-Labrador tea-Lingonberry	21.1
111B	At-Cow-parsnip-Meadowrue	1.2
Wetland Ecosystems		
111	Sw-Currant-Horsetail	15.5
Wb06	Tamarack-Water sedge-Fen moss	26.4
Wb09	Black spruce – Common horsetail-Sphagnum	6.1
Wf01	Water sedge-Beaked sedge	8.4
Wf02	Scrub birch-Water sedge	1.1
Wf10	Hudson Bay clubrush-Red hook-moss	6.5
Wf18	Tamarack-Scrub birch-Buckbean	3.9
Wm01	Beaked sedge-Water sedge	0.2
Wm05	Cattail Marsh	0
Ws03	Bebb's willow-Bluejoint	1.8
OW	Open Water	0.4
Anthropogenic		
CF	Cultivated Field	428.6
TOTAL		674.3

For the purposes of discussing rare plant occurrence, wildlife use and future management the property has been divided into 8 sub-areas based on ecosystems mapped within the property (**Table 5, Figure 5:** Simpson *et al*. 2014). These areas are:

- Northern cultivated field
- Northern mesic forest
- Northern wetland complex
- Eastern wetland complex
- Southern cultivated field
- Southern mesic forest
- Western wetland complex
- Western mesic forest

Table 5. Habitats found within each sub-area within the Property.

Area	Habitat
Northern cultivated field	Fields 3-7
Northern mesic forest	101, 103, 104, 101B
Northern wetland complex	104B, Wf01, Ws03
Eastern wetland complex	101, 104, 101B, 103B, 104B, Wf01, Wf02
Southern cultivated field	Fields 1 and 2
Southern mesic forest	101
Western wetland complex	101, 104, 103, 101B, 103B, 111BWf02, Wf18, Wb06, Wb09, Wf10, Wm01, Wm05, Ws03
Western mesic forest	101

6.1.2 Rare plants

Rare plant surveys were conducted on the Property in 2012 and 2014. A detailed description of the surveys and results can be found in Simpson *et al.* (2014). Seven vascular rare plants were documented within the property (**Table 6, Figure 7**: Simpson et al. 2014). Two species are on the BCCDC's Red list, the remaining five are on the Blue list. None are SARA or COSEWIC listed. All vascular rare plants were documented in wetland or forested areas. No rare plants were documented in cultivated fields.

Table 6. Rare vascular plants occurring within the Property.

Common Name	Scientific Name	BC List	Occurrences	Location(s)
Tawny Paintbrush	*Castilleja miniata* var. *fulva*	Red	4	Eastern Wetland Complex Western Wetland Complex Northern Mesic Forest Western Mesic Forest
Slender-leaf Sundew	*Drosera linearis*	Blue	1	Western Wetland Complex
Northern Bog Bedstraw	*Galium labradoricum*	Blue	1	Western Wetland Complex
Bog Rush	*Juncus stygius* ssp. *americanus*	Blue	1	Western Wetland Complex
Small-flowered Lousewort	*Pedicularis parviflora* ssp. *parviflora*	Blue	1	Western Wetland Complex
Autumn Willow	*Salix serissima*	Blue	2	Western Wetland Complex Southern Mesic Forest
Purple-stemmed Aster	*Symphyotrichum puniceum* var. *puniceum*	Blue	3	Northern Wetland Complex Western Wetland Complex Northern Mesic Forest

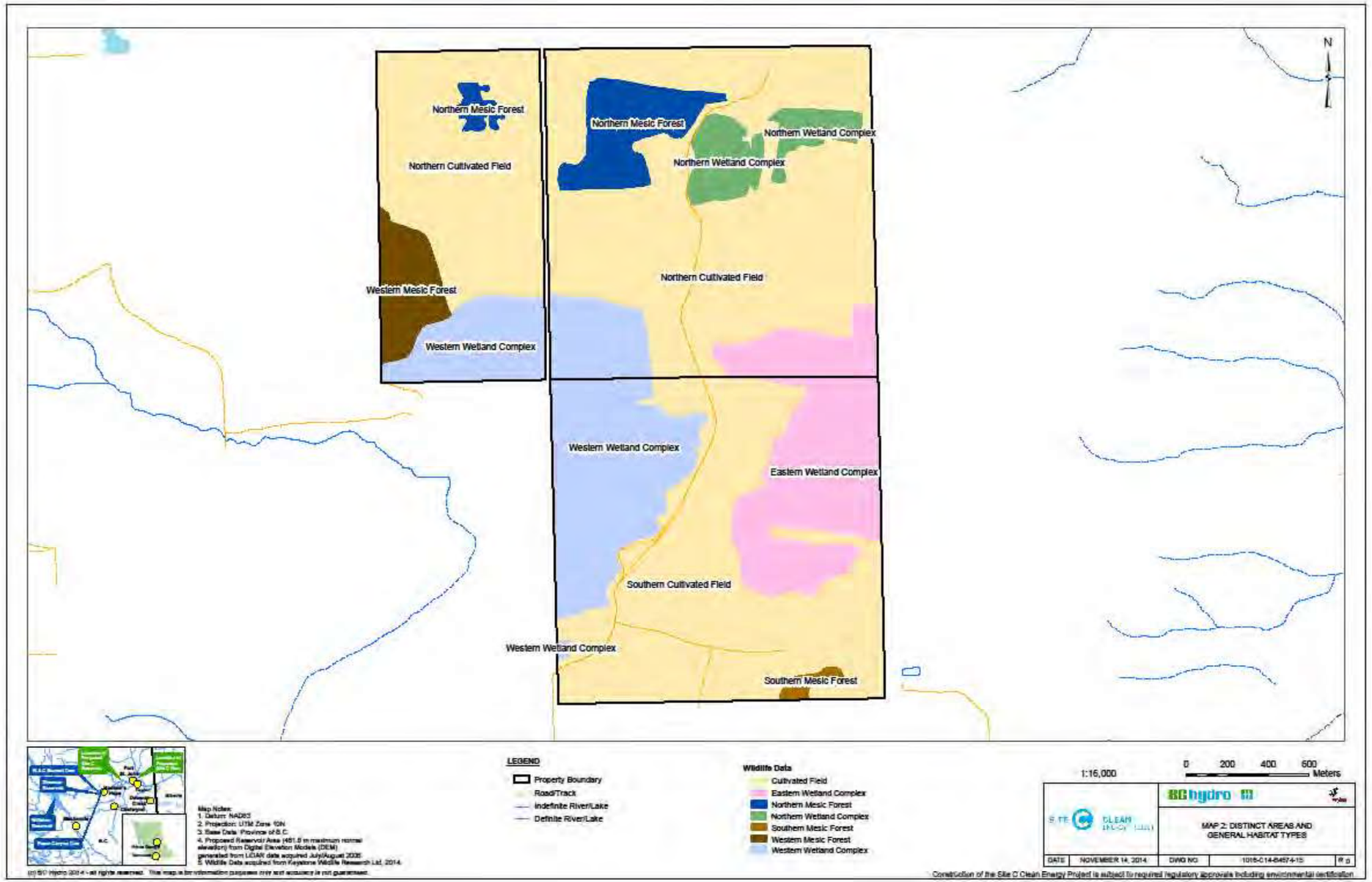

Figure 6. Sub-areas within the Property

Source: Simpson et al. (2014).

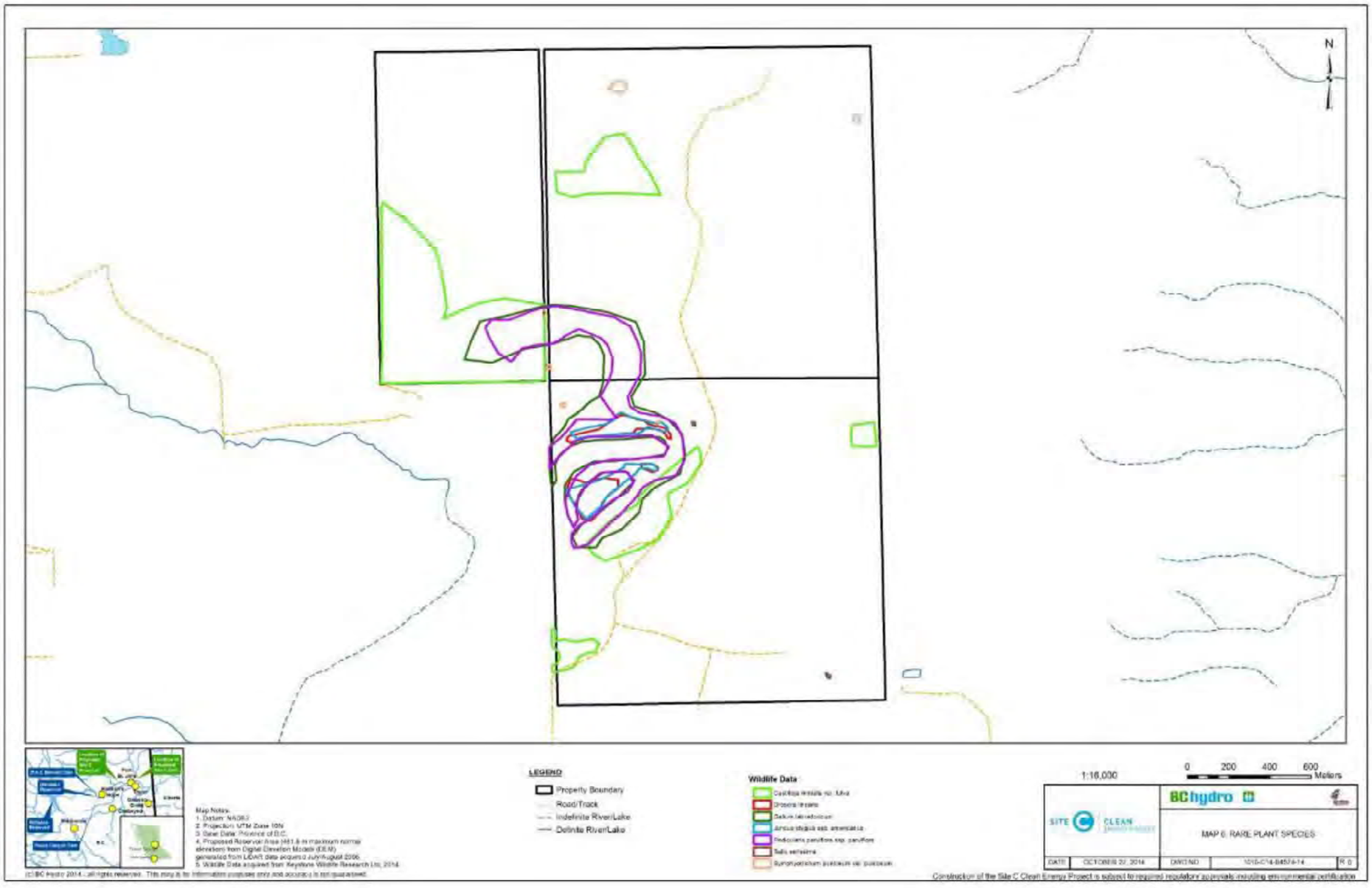

Figure 7. Rare vascular plant occurrences within Property

Source: Simpson et al. (2014).

7.0 BASELINE WILDLIFE PRESENCE AND USE OF THE PROPERTY

Wildlife data presented in this management plan were collected during surveys of the property in 2012 and 2014. Detailed descriptions of the methods and results can be found in Simpson *et al.* 2014 which is appended to this management plan (See **Appendix 2**). Wildlife management will focus on managing habitat for Key Indicator Species used to assess the potential effects of the Site C Clean Energy Project on Wildlife Resources (BC Hydro 2013) including invertebrates, amphibians, birds and mammals.

7.1 Invertebrates

Nine species of dragonflies have been documented on the property: sedge darner (*Aeshna juncea*), zigzag darner (*Aeshna sitchensis*), boreal whiteface (*Leucorrhinia borealis*), crimson-ringed whiteface (*Leucorrhinia glacialis*), four-spotted skimmer (*Libellula quadrimaculata*), whitehouse's emerald (*Somatochlora whitehousei*), black meadowhawk (*Sympetrum danae*), white-faced meadowhawk (*Sympetrum obtrusum*). None are classified as species at risk (BC Conservation Data Centre 2025).

Six species of damselflies have been documented on the property: American emerald (*Cordulia shurtleffii*), taiga bluet (*Coenagrion resolutum*), northern bluet (*Enallagma cyathigerum*), boreal bluet (*Enallagma boreale*), spotted spreadwing (*Lestes tridens*), northern spreadwing (*Lestes disjunctus*), emerald spreadwing (*Lestes dryas*). None are classified as species at risk (BC Conservation Data Centre 2025).

One blue-listed butterfly, the bronze copper (*Lycaena hyllus*), has been documented on the Property.

7.2 Amphibians and Reptiles

Three species of amphibian were documented on the property: boreal chorus frog (*Pseudacris maculata*), wood frog (*Lithobates sylvaticus*) and western toad (*Anaxyrus boreas*). Boreal chorus frog and wood frog are yellow listed provincially and not listed federally. The western toad is blue-listed provincially and is on Schedule 1 of the *Species at Risk Act.* (BC Conservation Data Centre 2025).
While not documented on the property, two species of gartersnakes occur in the area and have the potential to occur: Common Gartersnake (*Thamnophis sirtalis*) and Western Gartersnake (*T. elegans*). Both species are yellow listed provincially and not listed federally.

7.3 Birds

Eighty bird species were documented on the property. Four species are classified as species at risk:

- The Rusty Blackbird (*Euphagus carolinus*) and Barn Swallow (*Hirundo rustica*) are blue-listed provincially and on Schedule 1 of the *Species at Risk Act*.
- The Upland Sandpiper (*Bartramia longicauda*) is red-listed provincially.
- The LeConte's Sparrow (*Ammodramus leconteii*) is blue-listed provincially.

There were 62 species of non-wetland migratory birds, 17 of which were species of conservation concern for Bird Conservation Region 6 (Environment Canada 2013). Eighteen were wetland migratory birds, 13 of which are species of conservation concern in Bird Conservation Region 6 (Environment Canada 2013). **Table 7** below summarizes this and indicates the habitats that each species is expected to use for breeding and migration. While the property provides habitat for non-wetland migratory birds, it does not provide breeding habitat for Canada Warbler (*Cardellina canadensis*), Cape May Warbler (*Setophaga tigrine*) or Bay-breasted Warbler (*Setophaga castanea*).

Table 7. Bird species observed on the Marl Fen Property and habitat preferences

Species	Scientific Name	Non-Wetland Migratory Birds	Wetland Migratory Bird	Species of Conservation Concern BCR 6	Breeding habitat Site Series	Migration habitat
Alder Flycatcher	*Empidonax alnorum*	X		X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	
American Crow	*Corvus brachyrhynchos*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	01, 103, 104, 111, 101B, 103B, 104B, 111B
American Kestrel	*Falco sparverius*	X		X	CF	CF
American Pipit	*Anthus rubescens*	X			n/a	CF
American Redstart	*Setophaga ruticilla*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	01, 103, 104, 111, 101B, 103B, 104B, 111B
American Robin	*Turdus migratorius*	X			101, 103, 104, 111, Wb06, Wb09, Wf02, Wf18	101, 103, 104, 111, Wb06, Wb09, Wf02, Wf18
American Three-toed Woodpecker	*Picoides dorsalis*	X		X	101, 104, 111,	
Barn Swallow*	*Hirundo rustica*	X		X		Wb06, Wf01, Wf02, Wf10, Wm01, OW, PD
Black-and-white Warbler	*Mniotilta varia*	X			101B, 103B, 104B, 111B	101B, 103B, 104B, 111B
Black-billed Magpie	*Pica hudsonia*	X		X	CF	

Species	Scientific Name	Non-Wetland Migratory Birds	Wetland Migratory Bird	Species of Conservation Concern BCR 6	Breeding habitat Site Series	Migration habitat
Black-capped Chickadee	*Poecile atricapillus*	X		X	101, 104, 111, Wb06	101, 104, 111, Wb03/05, Wb06
Brown-headed Cowbird	*Molothrus ater*	X			101B, 103B, 104B, 111B, CF	101B, 103B, 104B, 111B, CF
Blue-headed Vireo	*Vireo solitarius*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Blackpoll Warbler	*Setophaga striata*	X		X	101, 104, 111, Wb06	
Bank Swallow	*Riparia riparia*	X			NA	CF, Wb06, Wf01, Wf02, Wf10, Wm01, Wm05, Ws03
Blue Jay	*Cyanocitta cristata*	X			101B, 103B, 104B, 111B	101B, 103B, 104B, 111B
Boreal Chickadee	*Poecile hudsonicus*	X		X	BT, Wb06, 101, 104, 111	BT, Wb06, 101, 104, 111
Bufflehead	*Bucephala albeola*		X	X	PD	PD
Blue-winged Teal	*Spatula discors*		X	X	Wf01, Wf02, Wf10, Wm01, OW, PD, Ws03	Wf01, Wf02, Wf10, Wm01, OW, PD, Ws03
Canada Goose	*Branta canadensis*		X		101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wb09, Wff02, Wf18	CF
Clay-colored Sparrow	*Spizella pallida*	X		X	CF	CF
Chipping Sparrow	*Spizella passerina*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Common Raven	*Corvus corax*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	NA
Common Yellowthroat	*Geothlypis trichas*	X		X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Dark-eyed Junco	*Junco hyemalis*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09
Downy Woodpecker	*Dryobates pubescens*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wf18, Wb09	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wf18, Wb09
Fox Sparrow	*Passerella iliaca*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Golden-crowned Kinglet	*Regulus satrapa*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09
Canada (Gray) Jay	*Perisoreus canadensis*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09

Species	Scientific Name	Non-Wetland Migratory Birds	Wetland Migratory Bird	Species of Conservation Concern BCR 6	Breeding habitat Site Series	Migration habitat
Greater Yellowlegs	*Tringa melanoleuca*		X	X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	OW, Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Hairy Woodpecker	*Dryobates villosus*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09, Wb06, Wf18	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb09, Wb06, Wf18
Hermit Thrush	*Catharus guttatus*	X			101, 103, 104, 111	101, 103, 104, 111
Killdeer	*Charadrius vociferus*	X		X	CF, Wf01, Wf02, Wf10, Wm01, Ws03	CF, Wf01, Wf02, Wf10, Wm01, Ws03
Lapland Longspur	*Calcarius lapponicus*	X			N/A	CF
Long-billed Dowitcher	*Limnodromus scolopaceus*		X		N/A	CF, Wf01, Wf02, Wf10, Wm01, Wm05
Le Conte's Sparrow*	*Ammospiza leconteii*	X		X	Wf01, Wf02, Wf10, Wm01, Wb06, CF, Ws03	CF
Least Flycatcher	*Empidonax minimus*	X		X	101, 104, 111,Wb03, Wb06, 101B, 104B, 111B	101, 104, 111,Wb03, Wb06, 101B, 104B, 111B
Lesser Yellowlegs	*Tringa flavipes*		X	X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	OW, Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Lincoln's Sparrow	*Melospiza lincolnii*	X			Wb06, Wf01, Wf02, Wb09	Wf10, Wm01, Ws03, Wf18, Wm05
Mallard	*Anas platyrhynchos*		X	X	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD, CF
Mountain Chickadee	*Poecile gambeli*	X			101, 103, 104, 111	101, 103, 104, 111
Northern Flicker	*Colaptes auratus*	X		X	101, 102, 104, 111, 101B 111B	101, 102, 104, 111, 101B 111B
Northern Harrier	*Circus hudsonius*	X		X	CF, Wf01, Wf02, Wf10, Wm01, Wb06	CF
Northern Pintail	*Anas acuta*		X	X	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD, CF
Northern Shoveler	*Spatula clypeata*		X	X	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD	Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD
Northern Waterthrush	*Parkesia noveboracensis*		X		Wb06, Wb09, Wf18, 104, 111	Wb06, Wb09, Wf18, 104, 111
Orange-crowned Warbler	*Leiothlypis celata*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Pectoral Sandpiper	*Calidris melanotos*		X		NA	CF, PD

Species	Scientific Name	Non-Wetland Migratory Birds	Wetland Migratory Bird	Species of Conservation Concern BCR 6	Breeding habitat Site Series	Migration habitat
Pine Siskin	*Spinus pinus*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B, CF
Pacific-slope Flycatcher	*Empidonax difficilis*	X			101, 104, 111, Wb06, Wb09, Wf18	101, 104, 111, Wb06, Wb09, Wf18
Purple Finch	*Haemorhous purpureus*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wb09, Wf18	101, 103, 104, 111, 101B, 103B, 104B, 111B Wb06, Wb09, Wf18
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B Wb06, Wb09, Wf18	101, 103, 104, 111, 101B, 103B, 104B, 111B Wb06, Wb09, Wf18
Red-breasted Nuthatch	*Sitta canadensis*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Ruby-crowned Kinglet	*Corthylio calendula*	X			101, 103, 104, 111	101, 103, 104, 111, 101B, 103B, 104B, 111B, CF
Red-eyed Vireo	*Vireo olivaceus*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Red-tailed Hawk	*Buteo jamaicensis*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wb09, Wf18	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wb06, Wb09, Wf18
Rusty Blackbird*	*Euphagus carolinus*		X	X	Wb06, Ws03	CF, Wb09, Wf18, Ws03
Ruffed Grouse	*Bonasa umbellus*	X			101, 103, 104, 111	N/A
Red-winged Blackbird	*Agelaius phoeniceus*		X		CF, Wb06, Wf01, Wf02, Wf10, Wf01, Wm05, Ws03	CF, Wb06, Wf01, Wf02, Wf10, Wf01, Wm05, Ws03
Sandhill Crane	*Antigone canadensis*		X	X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03, OW, PD	Wb06, Wf01, Wf02, Wf10, Wm01, OW, PD, CF
Savannah Sparrow	*Passerculus sandwichensis*	X			N/A	CF
Sora	*Porzana carolina*		X	X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Solitary Sandpiper	*Tringa solitaria*		X	X	Wb06, Ws03	OW, Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Song Sparrow	*Melospiza melodia*	X			Wb06, Wf01, Wf02, Wf10, Wf18, Wm01, Wm05, Ws03	Wb06, Wf01, Wf02, Wf10, Wf18, Wm01, Wm05, Ws03

Species	Scientific Name	Non-Wetland Migratory Birds	Wetland Migratory Bird	Species of Conservation Concern BCR 6	Breeding habitat Site Series	Migration habitat
Swainson's Thrush	*Catharus ustulatus*	X			101, 103, 104, 111	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wf20, Wf18, Ws03
Tennessee Warbler	*Leiothlypis peregrina*	X			Wb06, Wb09, Wf18	101, 103, 104, 111, 101B, 103B, 104B, 111B
Townsend's Solitaire	*Myadestes townsendi*	X			101, 103, 104, 111	101, 103, 104, 111
Tree Swallow	*Tachycineta bicolor*	X			101, 103, 104, 111, Wb06, Wb09, Wf18	101, 103, 104, 111, Wb06, Wb09, Wf18
Upland Sandpiper**	*Bartramia longicauda*		X	X	CF	CF
Varied Thrush	*Ixoreus naevius*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Vesper Sparrow	*Pooecetes gramineus*	X			CF	CF
Warbling Vireo	*Vireo gilvus*	X			101B, 103B, 104B, 111B	101B, 103B, 104B, 111B, Wf02, Wf18, Ws03
White-crowned Sparrow	*Zonotrichia leucophrys*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
Wilson's Snipe	*Gallinago delicata*		X	X	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03	Wb06, Wf01, Wf02, Wf10, Wm01, Ws03
Wilson's Warbler	*Cardellina pusilla*	X			101, 104, 111, 101B, 104B, 111B,Wb06, Wb09, Wf18	101, 104, 111, 101B, 104B, 111B,Wb06, Wb09, Wf18
White-throated Sparrow	*Zonotrichia albicollis*	X		X	101, 103, 104, 111, CF, Wb06	101, 103, 104, 111, 101B, 103B, 104B, 111B, Wm05
Yellow-bellied Flycatcher	*Empidonax flaviventris*	X			101, 103, 104, 111, Wb06, Wb09, Ws03	101, 103, 104, 111, Wb06, Wb09, Ws03
Yellow-bellied Sapsucker	*Sphyrapicus varius*	X		X	101, 111, 101B, 104B, 111B	101, 111, 101B, 104B, 111B
Yellow Warbler	*Setophaga petechia*	X			101, 103, 104, 111, Ws03, Wb06, Wb09, Wf18	101, 103, 104, 111, Ws03, Wb06, Wb09, Wf18
Yellow-rumped Warbler	*Setophaga coronata*	X			101, 103, 104, 111, 101B, 103B, 104B, 111B	101, 103, 104, 111, 101B, 103B, 104B, 111B
	* blue-listed provincially **red-listed provincially					

7.4 Mammals

Ten mammal species were documented on the property: long-eared Myotis (*Myotis evotis*), little brown Myotis (*Myotis lucifugus*), northern Myotis (*Myotis septentrionalis*), silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Aeorestes cinereus*), moose (*Alces alces*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*), black bear (*Ursus americanus*) and coyote (*Canis latrans*). All of these are yellow listed, except for the northern Myotis which is blue-listed (BC Conservation Data Centre 2025). Both the northern Myotis and little brown Myotis have been added as Endangered to Schedule 1 of the *Species at Risk Act*. This is due to the high levels of mortality associated with White-nose Syndrome. White-nose Syndrome has been documented in the Grand Forks area of BC in 2023 and has been moving westward across Canada (BC Government 2023). Surveys at the Portage Mountain quarry site ~10 kms to the northwest have identified all these bat species in this area.

8.0 MANAGEMENT OBJECTIVES

8.1 Vegetation

Management of the Property will aid in fulfilling the following conditions attached to the Project's environmental certification:

- **FDS Condition 16:** The Proponent shall ensure that potential effects of the Designated Project on species at risk, at-risk and sensitive ecological communities and rare plants are addressed and monitored
- **FDS Condition 16.2:** The Proponent shall develop, in consultation with Environment Canada, a plan setting out measures to address potential effects of the Designated Project on species at risk, at-risk and sensitive ecological communities and rare plants.
    - 16.3.3: The plan shall include measures to mitigate environmental effects on species at-risk and sensitive ecological communities and rare plants
- **FDS Condition 11:** The Proponent shall mitigate the potential effects of the Designated Project on wetland habitat use by migratory birds, species at risk and for current use of lands and resources for traditional purposes by Aboriginal Groups
    - 11.2: The Proponent shall develop, in consultation with Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups, a plan that addressed potential effects of the Designated Project on wetland habitat use by migratory birds, species at risk and for current use of lands and resources for traditional purposes.
    - 11.4.4: compensation measures to address the unavoidable loss of wetland areas and functions supporting migratory birds, species at risk, and the current use of lands and resources by Aboriginal people in support of the objective of full replacement of wetlands in terms of area and function

- **EAC Condition 12:** The EAC Holder must develop a Wetland Mitigation and Compensation Plan. The Wetland Mitigation and Compensation Plan must include an assessment of wetland function lost as a result of the Project that is important to migratory birds and species at risk (wildlife and plants). The Wetland Mitigation and Compensation Plan must be developed by a QEP with experience in wetland enhancement, maintenance and development. The Wetland Mitigation and Compensation Plan must include at least the following:
    - Maintain or improve hydrology where avoidance is not feasible;
    - Replace like for like where wetlands will be lost, in terms of functions and compensation in terms of area
    - Improve the function of existing wetland habitats

8.1.2 Target species

Management of the Property will focus on protecting and managing the large wetland complex in perpetuity to retain both its function and area and maintaining the seven rare vascular plants documented on the Property (**Table 6**) from the surveys in 2013 (Simpson et al 2014).

This will be achieved through:

- fencing of the wetland to exclude cattle and prohibit future disturbance by cattle
- prohibiting use of the wetland by the leaseholder
- management of the cultivated fields (see Section 9 below)

8.2 Wildlife

Management of the Property will aid in fulfilling the following conditions attached to the Project's environmental certification:

- **FDS Condition 10.1:** The Proponent shall mitigate the potential effects of the Designated Project on non-wetland migratory bird habitat
- **FDS Condition 10.2:** The Proponent shall develop, in consultation with Environment Canada, a plan that addresses potential effects of the Designated Project on non-wetland migratory bird habitat
    - 10.3.4 compensation measures to address the unavoidable loss of non-wetland migratory bird habitat
    - 10.3.5 an approach to monitor and evaluate the effectiveness of the mitigation or compensation measures to be implemented and to verify the accuracy of the predictions made during the environmental assessment on non-wetland migratory bird habitat, including migratory bird use of that habitat.
- **FDS Condition 16.1:** The Proponent shall ensure that potential effects of the Designated Project on species at risk, at-risk and sensitive ecological communities and rare plants are addressed and monitored
- **FDS Condition 16.2:** The Proponent shall develop, in consultation with Environment Canada, a plan setting out measures to address potential

effects of the Designated Project on species at risk, at-risk and sensitive ecological communities and rare plants.
    - 16.3.3: The plan shall include measures to mitigate environmental effects on species at-risk and sensitive ecological communities and rare plants
    - 16.3.6 an approach to monitor and evaluate the effectiveness of mitigation measures and to verify the accuracy of the predictions made during the environmental assessment on species at risk, at-risk and sensitive communities and rare plants
- **EAC Condition 16:** If loss of sensitive wildlife habitat or important wildlife areas cannot be avoided through Project design or otherwise mitigated, the EAC Holder must implement the following measures, which must be described in the Vegetation and Wildlife Mitigation and Monitoring Plan. The Vegetation and Wildlife Mitigation and Monitoring Plan must include the following compensation measures:
    - Compensation options for wetlands must include fish-free areas to manage the effects of fish predation on invertebrate and amphibian eggs and larvae and young birds.
    - Establishment of nest boxes for cavity-nesting waterfowl developed as part of wetland mitigation and compensation plan, and established within riparian vegetation zones established along the reservoir on BC Hydro-owned properties.
- **EAC Condition 21:** The EAC Holder must ensure that measures implemented to manage harmful Project effects on wildlife resources are effective by implementing monitoring measures detailed in a Vegetation and Wildlife Mitigation and Monitoring Plan. The Vegetation and Wildlife Mitigation and Monitoring Plan must be developed by a QEP. The Vegetation and Wildlife Mitigation and Monitoring Plan must include at least the following:
    - Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features.

8.2.1 Target species

Management of the Property will focus on managing habitat (breeding, feeding and migration) for species known to use the Property and Key Indicator Species that could use the property if suitable habitats are created (e.g., Short-eared Owl (*Asio flammeus*), Northern Harrier (*Circus hudsonius*)). Should additional species at risk or of conservation concern for Bird Conservation Region 6 be documented on the property the management plan will be revised as required to ensure their habitat is maintained on the Property. Target species include:

- Invertebrates
- Western toad
- Bird species listed in Table 5.
- Bats
- Fisher (*Pekania pennanti*)

Management will be achieved through protecting wetland and forested habitats within the Property and managing cultivated fields to provide a balance between agricultural production and breeding, feeding and migration habitat for invertebrates, amphibians, birds and mammals. **Table 7** summarizes which bird species documented on the property use each sub area and will thus benefit from management outlined in Section 9 of this document.

Table 8 Species use by Property sub area

		Project sub area										Project sub area							
Species	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest	**Species**	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest
Sedge darner	*Aeshna juncea*		X	X	X		X	X		**Barn Swallow***	*Hirundo rustica*			X	X			X	
Zigzag darner	*Aeshna sitchensis*		X	X	X		X	X		Black-and-white Warbler	*Mniotilta varia*			X					
Boreal whiteface	*Leucorrhinia borealis*		X	X	X		X	X		Black-billed Magpie	*Pica hudsonia*	X		X		X			
Crimson-ringed whiteface	*Leucorrhinia glacialis*		X	X	X		X	X		Black-capped Chickadee	*Poecile atricapillus*		X				X		X
Four-spotted skimmer	*Libellula quadrimaculata*		X	X	X		X	X		Brown-headed Cowbird	*Molothrus ater*	X		X		X			
Whitehouse's emerald	*Somatochlora whitehousei*		X	X	X		X	X		Blackpoll Warbler	*Setophaga striata*		X				X		X
Black meadowhawk	*Sympetrum danae*		X	X	X		X	X		Blue-headed Vireo	*Vireo solitarius*		X		X		X	X	X
White-faced meadowhawk	*Sympetrum obtrusum*		X	X	X		X	X		Bank Swallow	*Riparia riparia*	X		X	X	X		X	
Bronze Copper	*Lycaena Hyllus*		X	X	X		X	X		Blue Jay	*Cyanocitta cristata*			X					
Boreal chorus frog	*Pseudacris maculata*		X	X	X	X		X		Blue-winged Teal	*Spatula discors*			X	X			X	
Wood Frog	*Lithobates sylvaticus*		X	X	X	X		X		Boreal Chickadee	*Poecile hudsonicus*		X		X		X	X	X
Western toad	*Anaxyrus boreas*		X	X	X	X		X		Bufflehead	*Bucephala albeola*	X				X		X	
Alder Flycatcher	*Empidonax alnorum*			X	X			X		Canada Goose	*Branta canadensis*		X	X	X		X	X	X
American Crow	*Corvus brachyrhynchos*		X	X			X		X	Clay-colored Sparrow	*Spizella pallida*	X		X		X			
American Kestrel	*Falco sparverius*	X		X		X				Chipping Sparrow	*Spizella passerina*		X	X	X		X	X	X
American Pipit	*Anthus rubescens*	X		X		X				Common Raven	*Corvus corax*		X	X	X		X	X	X
American Redstart	*Setophaga ruticilla*		X	X			X		X	Common Yellowthroat	*Geothlypis trichas*			X	X			X	
American Robin	*Turdus migratorius*		X				X		X	Dark-eyed Junco	*Junco hyemalis*		X	X	X		X	X	X

		Project sub area										Project sub area							
Species	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest	**Species**	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest
American Three-toed Woodpecker	*Picoides dorsalis*		X				X		X	Downy Woodpecker	*Dryobates pubescens*		X	X	X		X	X	X
Fox Sparrow	*Passerella iliaca*		X	X	X		X	X	X	Northern Shoveler	*Spatula clypeata*			X	X			X	
Golden-crowned Kinglet	*Regulus satrapa*		X	X	X		X	X	X	Northern Waterthrush	*Parkesia noveboracensis*		X				X	X	X
Gray Jay	*Perisoreus canadensis*		X	X	X		X	X	X	Orange-crowned Warbler	*Leiothlypis celata*		X	X	X		X	X	X
Greater Yellowlegs	*Tringa melanoleuca*			X	X			X		Pectoral Sandpiper	*Calidris melanotos*	X		X		X			
Hairy Woodpecker	*Dryobates villosus*		X	X	X		X	X	X	Pine Siskin	*Spinus pinus*		X	X	X		X	X	X
Hermit Thrush	*Catharus guttatus*		X		X		X	X	X	Red-eyed Vireo	*Vireo olivaceus*		X	X	X		X	X	X
Killdeer	*Charadrius vociferus*	X		X	X	X		X		Pacific-slope Flycatcher	*Empidonax difficilis*		X		X		X	X	X
Lapland Longspur	*Calcarius lapponicus*	X				X				Purple Finch	*Haemorhous purpureus*		X	X	X		X	X	X
Le Conte's Sparrow*	*Euphagus carolinus*	X		X	X	X		X		Red-breasted Nuthatch	*Sitta canadensis*		X	X	X		X	X	X
Least Flycatcher	*Empidonax minimus*		X		X		X	X	X	Red-tailed Hawk	*Buteo jamaicensis*		X	X	X		X	X	X
Lesser Yellowlegs	*Tringa flavipes*			X	X			X		Red-winged Blackbird	*Agelaius phoeniceus*	X		X		X			
Lincoln's Sparrow	*Melospiza lincolnii*			X	X			X		Rose-beaked Grosbeak	*Pheucticus ludovicianus*		X	X	X		X	X	X
Long-billed Dowitcher	*Limnodromus scolopaceus*	X		X	X	X		X		Ruby-crowned Kinglet	*Corthylio calendula*	X	X		X	X	X	X	X
Mallard	*Anas platyrhynchos*	X		X		X				Ruffed Grouse	*Bonasa umbellus*		X		X		X	X	X
Mountain Chickadee	*Poecile gambeli*		X		X		X	X	X	**Rusty Blackbird***	*Euphagus carolinus*	X				X			
Northern Flicker	*Colaptes auratus*		X		X		X	X	X	Sandhill Crane	*Antigone canadensis*	X		X		X			
Northern Harrier	*Circus hudsonius*	X		X		X				Savannah Sparrow	*Passerculus sandwichensis*	X		X		X			

		Project sub area										Project sub area							
Species	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest	**Species**	**Scientific Names**	Northern cultivated field	Northern mesic forest	Northern wetland complex	Eastern wetland complex	Southern cultivated field	Southern mesic forest	Western wetland complex	Western mesic forest
Northern Pintail	*Anas acuta*	X		X	X	X		X		Sora	*Porzana carolina*			X	X			X	
Solitary Sandpiper	*Tringa solitaria*			X	X			X		Wilson's Warbler	*Cardellina pusilla*		X	X	X		X	X	X
Song Sparrow	*Melospiza melodia*			X	X			X		Yellow-bellied Flycatcher	*Empidonax flaviventris*		X	X	X		X	X	X
Swainson's Thrush	*Catharus ustulatus*		X		X		X	X	X	Yellow-bellied Sapsucker	*Sphyrapicus varius*		X	X	X		X	X	X
Tennessee Warbler	*Leiothlypis peregrina*		X	X	X		X	X	X	Yellow Warbler	*Setophaga petechia*		X	X	X		X	X	X
Townsend's Solitaire	*Myadestes townsendi*		X		X		X	X	X	Yellow-rumped Warbler	*Setophaga coronata*		X	X	X		X	X	X
Tree Swallow	*Tachycineta bicolor*		X		X		X	X	X	Long-eared Myotis	*Myotis evotis*	X	X	X	X	X	X	X	X
Upland Sandpiper**	*Bartramia longicauda*	X		X		X				Little brown Myotis	*Myotis lucifugus*	X	X	X	X	X	X	X	X
Varied Thrush	*Ixoreus naevius*		X	X	X		X	X	X	Northern Myotis	*Myotis septentrionalis*	X	X	X	X	X	X	X	X
Vesper Sparrow	*Pooecetes gramineus*	X		X		X				Silver-haired bat	*Lasionycteris noctivagans*	X	X	X	X	X	X	X	X
Warbling Vireo	*Vireo gilvus*		X	X	X		X	X	X	Hoary bat, moose	*Aeorestes cinereus*	X	X	X	X	X	X	X	X
White-crowned Sparrow	*Zonotrichia leucophrys*		X	X	X		X	X	X	Elk	*Cervus elaphus*	X	X	X	X	X	X	X	X
White-throated Sparrow	*Zonotrichia albicollis*		X	X	X		X	X	X	Mule deer	*Odocoileus hemionus*	X	X	X	X	X	X	X	X
Wilson's Snipe	*Gallinago delicata*			X	X			X		Black bear	*Ursus americanus*	X	X	X	X	X	X	X	X

Installation of cattle exclusion fencing around cattle water sources will provide/protect additional breeding habitat for wildlife adjacent to water. Invertebrates, amphibians and birds are expected to use habitats within the fence line.

8.3 Agriculture

8.3.1 Management Objectives

The primary objective of forage field management is to maintain and enhance historic forage production levels, both for cattle and wildlife, while also protecting wildlife habitats within the property. This will be achieved through a program of field management that will include:

- Fencing of the wetland to exclude cattle;
- Repair of existing fences and field accesses;
- Installation of cross-fencing to enhance field management;
- Renovation and replanting of existing fields to hay/pasture mixes (grasses/legumes);

The site-specific proposed improvements are presented in Section 9 below.

8.3.2 *Grazing Management*

In terms of domestic animals, only cattle grazing will be allowed, in keeping with historic site use and to protect the quality of the fields. No over-wintering of cattle will be permitted under this management plan.

Although cut hay crops have been harvested from at least some parts of the Property in the past, and might be considered in future years, at this time forage fields will be managed through cattle grazing rotations only.

8.3.2.1 Grazing Season and Carrying Capacity

Historically, the Property has been grazed between mid-to late May and mid-to late October, with the actual period of grazing in a given year dependant on weather and field/grass conditions. According to the former operators, in most years, 400-450 cow/calf pairs were grazed on the Property for 4-5 months, depending on field conditions. Under the proposed grazing management regime, in some years, the grazing period could be extended at either end but pushing the season could result in soil and crop damage, which in turn could lead to reduced wildlife values. Accordingly, extension of the grazing period will generally not be permitted under this Plan, unless extenuating circumstances warrant it.

There are 422 ha (928 ac) of hayfields and pastures (which include treed areas) within the Property, of which 386 ha are cultivated (Table 9). Under optimal pasture management, the intensively cultivated fields (Fields 1, 2, 3, 4 and 7) should support about two tonne/ha (1,800 lbs/ac) annually, or about 6 AUMs/ha (animal unit months – the amount of forage required to support a cow/calf pair for a month).

To optimize the habitat values as outlined in the Plan, some fields (Fields 5 and 6) will be managed as “old field” habitat under a less intensive grazing regime. These less intensively managed pastures should support about one tonne/ha. As shown in Table 9, this translates to an assigned

carrying capacity for all pastures of approximately 1,377 AUMs, or 344 animals (cow/calf pairs, and/or yearlings or mature animals) for 4 months. The actual numbers of animals and the timing and extent of the grazing period will vary from year to year, depending on existing field/grass conditions and management decisions regarding the grazing rotation plan in a given year. The current leaseholder is grazing fewer cattle (~260) on the land due to the recent drought years and had no plans of increasing this number. Adapting to site conditions by the leaseholder is important in maintaining the objectives of this plan.

The assigned carrying capacity of individual fields and the proposed number of animals is discussed more detail in section 9.4.2.

Table 9. Assigned carrying capacities for pastures on the Marl Fen Property

Field	Cult Area (ha)	T/ha	Total T	Total AUMs	Assigned AUMS	Designated Use
1	97	2	194	569	455	Intensive Pasture
2	30	2	60	176	141	Intensive Pasture
3	44	2	88	258	207	Intensive Pasture
4	30	2	60	176	141	Intensive Pasture
5	50	1	50	147	117	Old Field Pasture
6	73	1	73	214	171	Old Field Pasture
7	62	1	62	182	145	Intensive Pasture
Totals	**386**		**587**	**1722**	**1377**	

8.3.2.2 Grazing Rotation

Continuous grazing (over the grazing season) can lead to overgrazing resulting in increased weed growth and soil damage, while controlled (or rotational) grazing, helps to maintain the quality and longevity of the forage stand. Rotational grazing entails more intensive field management whereby a pasture is rested for several weeks or months, following a period of grazing for several days or weeks. The optimal number of livestock is placed in the pasture and distributed evenly throughout the field by salting and water placement to ensure even grazing pressure over the entire field. The management decision on when to start grazing, end grazing, and then re-graze a pasture, is based on several factors, including the density and height of the grass/legume cover and ground (soil) conditions.

Rotational grazing is used to manage both native (natural) forested and grassland ranges and improved pastures and pasture/hayfields such as occur within the Property. For native ranges, the period of use is generally rotated annually between the earlier and later grazing season in order to achieve optimal forage health and production levels. Early spring grazing by cattle increases the palatability of the forage for ungulates, while the later fall grazing helps to rejuvenate the forage yield the following year. For intensively managed pastures, forage stands are generally grazed for several days, then rested for several weeks to allow the grass to regrow to a desired height. Once the grass reaches the desired height, the pasture can be re-grazed with the cattle then removed for the season once the grass is grazed to a set height.

Two general rotation patterns are proposed for management of cultivated fields within the Property:

Old Field: For "old field habitats" a simple rotation of predominantly light, later season grazing (August to mid-October – 2.5 months) in one year, will be followed by earlier, light spring (mid-May to end of June – 1.5 months) grazing the following year if growing conditions are conducive to this. In years with limited spring growth, grazing would be held off to late season grazing. The interval (e.g., every second or third year) with which the fields would be grazed in the spring would be based on actual field conditions. The objective will be to allow about 50% of the grasses to go to seed each year for late grazing and 100% of the field to go to seed in each year for early grazing. The determination of both the intensity of grazing and the frequency of spring grazing will be based on maintaining "old field habitat" as opposed to the optimal pasture objective of the more intensively managed fields.

Because of proposed lighter use, the "old field habitats" have been assigned a grazing intensity of about half their carrying capacity, or 1 t/ha, or 3 AUMs/ha (0.5 t/ac; 1.3 AUMs/ac).

Intensively managed fields: A grazing rotation during the five month period of mid-May through to mid-October will be followed for the intensively managed fields/pastures. This will generally entail a period of short-term intensive grazing, followed by several weeks of rest, followed by an additional short grazing period as described above. The timing of the start of the first grazing period will be dependent on adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder. The grass stand will be grazed to a height of ~10-15 cm during early grazing. Grazing grass shorter than this requires longer rest periods which would need to be worked into the rotation. The second grazing period would only occur if it could be accomplished without major damage to the grass and soil. This will require monitoring by the leaseholder to ensure that the grass stand has achieved the desired density and height and that soil moisture conditions are optimal, before placing cattle back on the field. The leaseholder may need to consider further breaking these fields down into smaller segments with temporary electric fencing if pasture grasses are not seen to be recovering.

The exact rotation schedule will be based on seasonal monitoring. Individual field specific rotations will be determined in consultation with the Property leaseholder on an annual basis. Implementation of this rotational system will require intensive management during the grazing season, including regular field maintenance (e.g., rejuvenation) and timely movement of cattle between fields, by the leaseholder.

The strategic placement of salt blocks and use of a mobile watering system will help to distribute cattle more evenly throughout the fields. These methods, as well as periodic active movement of cattle to more desirable areas, will be the responsibility of the leaseholder.

Mob grazing, which uses high numbers of cattle (20 animals/acre) on site for a short time (7-10 days) to graze grass to 6-8 inches could also be used if desired by the leaseholder. In order to initiate a mob grazing management regime, the fields would need to be subdivided into smaller

pastures by the lessee. The most efficient way to achieve this is with electric fences (mob grazing will be discussed further with the lessee, when/if the opportunity arises). This method could also allow for protection of rejuvenating fields by exclusion fencing (i.e. electric fencing).

8.3.2.3 Field Rejuvenation

The current grasses and legumes observed within the fields are described as having been planted in the past by former operators. These include meadow bromegrass and smooth bromegrass (*Bromus inermis*) (both of which need early grazing), creeping red fescue (which is good for over-winter survival and available in early spring, but not good for grazing before mid-July), tall fescue, alfalfa and Timothy. Native sedges and reed canary grass (*Phalaris arundinacea*) occur in the poorly drained depressions or channels, particularly in the northerly fields. Reed canary grass is an invasive tall perennial bunchgrass that is non-native (not listed in Peace River Regional District, but regulated under the *Community Charter, Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation* (BC Laws 2025) and can be extremely aggressive in aquatic habitats (BC Invasives 2023). These wetland or riparian species are generally self-seeding and do not require replanting under normal field renovation conditions.

Typically, Peace River upland hayfields and pastures require renovation (tilling, seeding and fertilizing) every 5-8 years to maintain optimal forage production levels. Some of the existing fields have not been renovated in more than a decade. Fields to be intensively managed for forage (described in detail in later sections) are being renovated annually. It should be noted that a longer series of drought years from 2021 to 2024 has made forage yields low and resulted in low renovation success. Renovated fields will be planted to a hardy Peace River pasture grass mix containing brome grass (meadow or smooth), tall fescue, creeping red fescue, orchard grass, alfalfa and timothy, or equivalent agronomic species and fertilized at the time of seeding. All seed should be Canada No. 1 certified and free of weed species. The exact seeding (and fertilizing) specifications will be worked out for each field area in liaison with the leaseholder and local seed and fertilizer suppliers.

9.0 DETAILED MANAGEMENT PLANS

9.1 Site Cleanup

Overall, the Property is in a clean state with only minor debris and abandoned materials noted. A cleanup was conducted to remove:

- Dilapidated shed near metal silos (**Appendix 1: Photo 1**);
- Any stored seeds/grains in the storage bins (**Appendix 1: Photo 2**);
- Old lumber cattle loading ramp and corrals (**Appendix 1: Photo 7**);
- Large number of plastic bale bags (**Appendix 1: Photo 8**);
- Several large propane tanks near dugout #1 (**Appendix 1: Photo 9**);
- Dry well at dugout #1 (**Appendix 1: Photo 10**);
- Timber crib bases used to support watering troughs near dugout #1.

Grain silos were emptied of seed and retained to provide nesting habitat for Barn Swallow in 2015-2016 and have since been maintained.

9.2 Fencing

Fencing off the wetland and repair of the existing fences and installation of additional gates was conducted in 2015-2016 prior to cattle placement on the Property. The leaseholder has been maintaining the fence in terms of repair, gates, etc. and is in discussion with BC Hydro on the long term management of the fence. Fencing works completed are summarized below.

9.2.1 Original Proposed Works: Fencing

The following works were proposed in the original Management Plan Version 2 and have been updated in Version 3 of the plan as described below.

9.2.1.1 Original Scope of Work

Installation of fencing and gates at four dugouts (**Figure 8: sites 4, 5, 6 and 8**) located in cultivated fields within the property.

Installation of a fence and gates around the perimeter of the large wetland area along the southwest part of the property.

Task 1. Installation of Perimeter fencing around dugouts # 4, 5, 6 and 8

- Fencing installation will be guided by the staking BC Hydro has established around dugouts 4, 5 and 8 to completely exclude cattle from the dugouts.
- Fencing installation will be guided by the staking BC Hydro has established around dugout 6 to allow cattle access to wetted portions of the dugout at two access ramps that are 16 feet wide. Fencing will enter the wetland such that cattle will have access to the dugout in dry, low-water-years.
- Fencing is to be installed as per the BC Agricultural Fencing Handbook (BC Ministry of Agriculture Food and Fisheries 2002). Additional considerations include:
    - Fencing to be installed by pile-driving in fence posts, not auguring out post holes;
    - Line posts to be 7’ 4-5” diameter pressure treated posts;
    - Brace posts to be 8’ 4-5” diameter pressure treated posts;
    - Brace rails to be 10’ long;
    - Line posts to be spaced 15’ apart;
    - Wire spacing is 8” apart, beginning 18” above the ground with a top wire height of 42”;
    - Top and bottom wires to be 12½ gauge high-tensile smooth wire. Middle wires to be 12½ gauge double-strand barbed wire.
    - One 12’ access gate to be installed at each dugout;
        - The gate will be located to be easily accessible from the cultivated field.

Results (2016 to 2024)

Dugouts were fenced, but ramp construction did not result in stable ramps. In the intervening years the dugouts have not been used due to drought conditions. The installation of water wells is currently meeting the cattle watering needs. As normal precipitation levels increase, the dugouts can be used, and the status of the ramps will need to be reviewed between BC Hydro and the leaseholder.

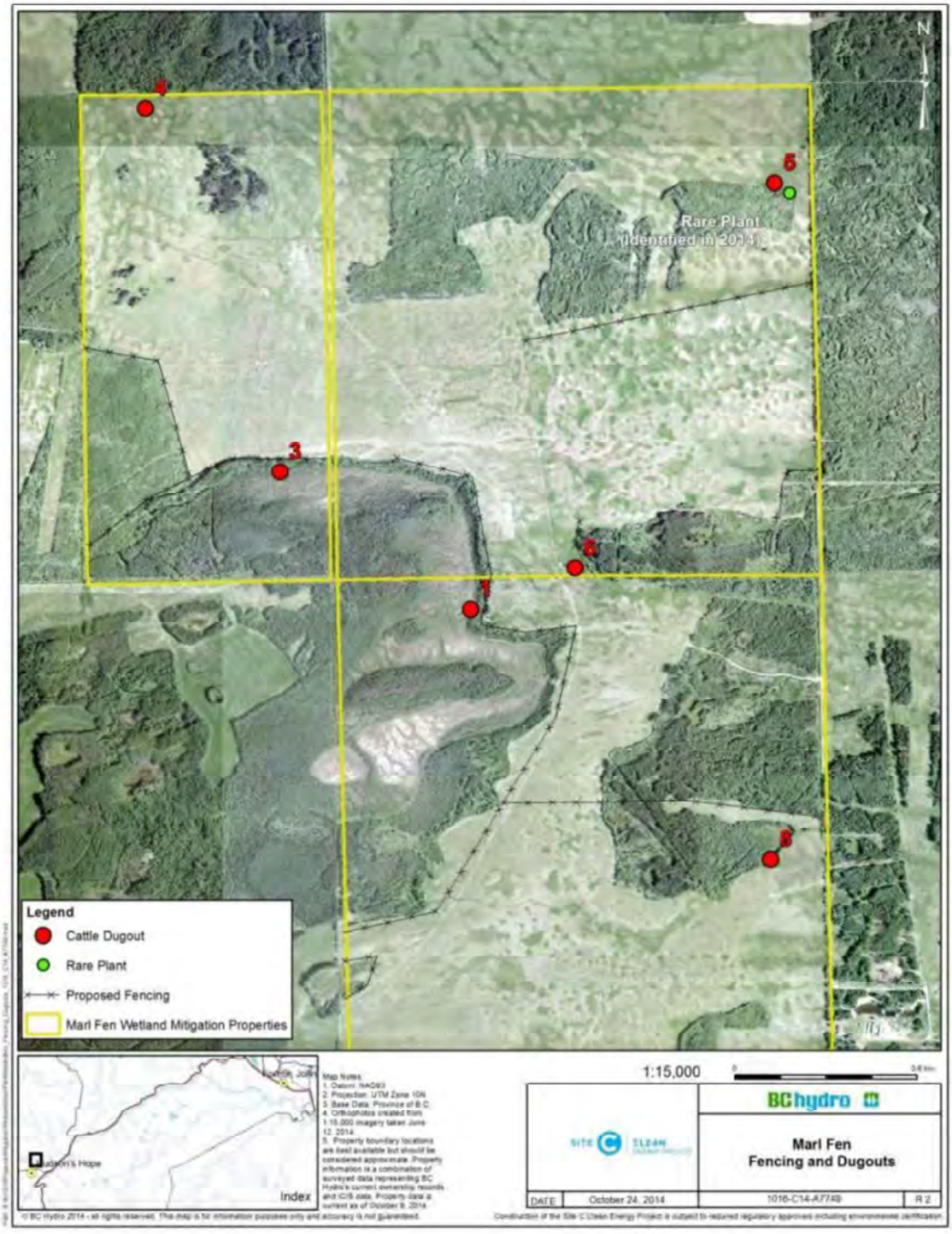

Figure 8. Location of worksites within the Marl Fen Property

Task 2. Wetland Exclusion Fence

Install fencing to isolate wetland from the adjacent cultivated fields as delineated by BC Hydro staking. The fence line has been located so sections are straight resulting in the fence being offset from the edge of the wetland. Edges of the existing cultivated field will be located on the inside of the fence along the edge of the wetland.

- Fencing to be installed as per the BC Agricultural Fencing Handbook (Ministry of Agriculture Food and Fisheries 2002). Additional considerations include:
    - Fencing to be installed by driving in fence posts, not auguring out post holes;
    - Line posts to be 7' 4-5" diameter pressure treated posts;
    - Brace posts to be 8' 4-5" diameter pressure treated posts;
    - Brace rails to be 10' long;
    - Line posts to be spaced 15' apart;
    - Wire spacing is 8" apart, beginning 18" above the ground with a top wire height of 42";
    - Top and bottom wires to be 12½ gauge hi-tensile smooth wire. Middle wires to be 12½ gauge double strand barbed wire.
    - Two 12' gates will be installed in the fencing at corners in the fencing (locations TBD).
- Two 12' gates will be installed at corners of the fence along the wetland (location TBD).
- One 12' access gate to be installed at each of the two water sources at the edge of the wetland (**Figure 8: sites 1 and 3**).
    - The gate should be located to be easily accessible from the cultivated field.

Results

Wetland exclusion fencing has kept cattle out of the wetland areas with maintenance conducted as needed. When the leaseholder stopped using the dugouts within the wetlands and moved to the well watering system, cows were unable to access the wetland area which resulted in the fence being maintained in good condition. When dugout use resumes based on water levels and site conditions, the fence should be monitored to ensure it continues to exclude cattle from the wetland area.

9.3 Cattle Watering

The existing cattle watering dugouts were improved to maximize capacity, protect and maintain water quality and assist in optimizing field grazing use by increasing options for both temporal (seasonal) and spatial distribution of cattle grazing. A detailed review of existing cattle watering facilities and plans for improving the current dugout and cattle watering systems are summarized below.

9.3.1 Proposed Works: Dugouts

9.3.1.1 Original Scope of Work

Rehabilitation of four dugouts (**Figure 8: sites 4, 5, 6 and** 8) located in cultivated fields within the property.

Creation of a water channel at the edge of the wetland at a current cattle access site (**Figure 8: site 3**)

Installation of cattle watering infrastructure at two sites adjacent to the wetland (**Figure 8: sites 1 and 3**). Infrastructure to be provided includes: two water troughs, a support structure for a seasonal above-ground pumping system and support structures for two above-ground water storage tanks.

BC Hydro will establish access routes to worksites within the property. The Contractor will enter and move all vehicles and equipment around the property on rubber-tired vehicles along established access routes.

The contractor will only access the site when the fields are dry or frozen. No access will be permitted when the fields are wet and vulnerable to rutting damage.

Dugouts # 4, 5, 6 and 8

Task 1. Remove existing organics from bottom of dugouts.

- Remove organic stained surface soils (e.g., cow footprints); approximately 12" of organics to be cautiously removed to prevent disturbance to any seal at the bottom of the basin.
    - Areas of removal have been staked;
- Excavated organics are to be placed on top of the existing spoil pile;
    - At dugout 8 organics will not encroach on the wetland area adjacent to the dugout;
- Spoil pile with new organics to be shaped with moderate slopes and then seeded.
- Seed will be certified and a seed certificate of analysis to be provided to BC Hydro. Seed mix to be used includes: slender wheat grass (25%), meadowbrome (25%), creeping red fescue (25%), and alfalfa (25%), percentages by seed count. By weight the mix is approximately: slender wheat grass (27%), meadowbrome (45%), creeping red fescue (10%), and alfalfa (18%).

Task 1 Results

The organics were removed and recontoured as per the Task 1 plan. The low water levels in these dugouts resulted in further accumulation of organics, although not to the extent originally noted. This will need to be monitored by BC Hydro and the leaseholder.

Task 2. Prepare two access ramps for cattle at dugout 6.

- The access ramps will be at least 16' wide, have a maximum slope of 16:1 and follow the design outlined in Quality Farm Dugouts (Alberta Agricultural and Irrigation 2023).
- The access ramp will extend down into the center of the dugout to allow cattle access during dry, low water years.
- Geofabric, or some other material to prevent sediments from entering the gravel base, will be placed along the access ramp prior to laying down gravel. The material will extend beyond the width of the ramp such that fencing can be put through the material to provide additional anchoring.

Task 2 Results

The leaseholder has indicated that the ramps and fencing around Water Dugouts 4, 5, 6 & 8 are problematic for cattle access and use. Elk and moose have ripped out part of the fencing around Dugouts 4 and 6 which BC Hydro had the leaseholder repair. Dugout 6 was noted in 2017 that the ponded area (at high water) was flooded and greatly exceeded the fenced area around the dugout. Cattle and wildlife have created a deeply rutted wallow across the entire front of the dugout. The gravel ramp/apron that the original installation stated does not appear to have been properly installed. During a 2022 inspection there were only scattered stones across the access opening which created more of a problem than a benefit. During the 2024 inspection, there was not time to re-inspect this dugout which is not currently in use due to the drought conditions. It is assumed that the ramp will require repair prior to using this dugout for cattle watering.

Task 3. Prepare level location for portable pumping trailer system to be located approximately 20-50' outside the exclusion fencing at dugouts # 4, 5 and 8.

- Location will have the following dimensions: 10' wide by 20' long.
- Area to be seeded with the same seed mix previously mentioned.

Task 3 Results

The dugouts were rehabilitated but the water trough system was not installed as BC Hydro determined that the expense was better applied to drilling the water wells. The dugouts did not provide adequate water given the site conditions and the ramps quickly became inaccessible for cattle due to excessive rutting from cattle and wildlife tracks. BC Hydro changed the plan to drill two water wells on the property and the leaseholder utilized a mobile watering system to water cows during the drought years. In subsequent years, with adequate precipitation, the use of the dugouts will be re-evaluated by the leaseholder and discussed with BC Hydro.

BC Hydro had two successful water wells installed in 2016 and standpipes with an electrical hookup at each well. BC Hydro provided the leaseholder with a portable gas pump to pull water from these wells. Well 1, in the southwest corner of Field 2, yields ~10 gal/min and Well 2, in the southeast corner of Field 5, yields ~30 gal/min. The leaseholders have set up a portable cattle watering system on a truck and have been successfully using this to provide daily water to the cattle on-site. This system appears to be working well and given the recent drought years has allowed for adequate cattle watering.

Use of the dugouts, when conditions allow, will require installation of a portable pumping trailer so cattle are kept out of the dugouts and watered on stable ground. This will be discussed with the leaseholder and BC Hydro and a detailed plan created on how to effectively accomplish this. Ongoing updates will be part of the yearly discussions between BC Hydro and the leaseholder.

Wetland Water Source# 1

Task 1. Install permanent platform to support pump and fuel storage

- The platform will be 4-8';
- Construct the platform roughly like a dock;
- The platform will be located on the inside slope of the spoil along the edge of the channel but above high water level;
- A diagram of the proposed layout will be provided;
    - BC Hydro will review and approve the layout prior to the contractor initiating installation.

Task 2. Decommission and make safe the dry well

- Remove and safely dispose of the lumber;
- Backfill the hole with material from the spoil pile.

Task 1 and 2 Results

Wetland water source #1 is not used currently used as it does not provide consistent water. The leaseholder is okay to use the water wells since they are functioning better and more reliably than this water source. This will be re-evaluated yearly in discussions between BC Hydro and the leaseholder.

Wetland Water Source # 3

Task 1. Remove organics from existing non-vegetated area to create a channel.

Task 2. Install permanent platform to support pump and fuel storage

- The platform will be 4-8 feet;
- Construct the platform similar to a dock configuration;
- The platform will be located on the inside slope of the spoil along the edge of the channel but above high-water level.

Task 1 and 2 Results

The platform was not constructed, and the gate is kept closed as there has not been water in this water source for the past four years. Subsequently, as with the other wetland water sources, the leaseholder has been obtaining sufficient water from the water wells. If at a future point in time the leaseholder deems use of this water source to be necessary, the measures outlined above will need to be established prior to watering cattle at this water source. This will be discussed with BC Hydro and the leaseholder annually.

9.4 Field Improvements

9.4.1 Field Layout

To achieve greater flexibility and control of cattle grazing and ensure a more even distribution of grazing pressure on the fields, the five existing fields were further subdivided into a total of seven fields, by constructing cross-fences as shown on **Figure 3**. Fencing was four-strand barbed wire on treated, driven poles, as described in the BC Agricultural Fencing Handbook (BC Ministry of Agriculture Food and Fisheries 2002).

The existing property access gates, as well as existing field gates and at least three additional internal field gates, as shown in **Figure 3**.

The wetland is fenced along the perimeter on the upland side to exclude cattle (**Figure 3)**. The fencing consists of 4-strand, driven, treated poles, with top and bottom wire smooth, bottom wire 18” above ground level, with the middle two wires barbed (per BC MAF&F Fencing Handbook specifications). Four gates were installed to: (a) allow access to the wetland for monitoring, and (b) provide a means of removing cattle (calves) out of the wetland should they get through the fence. Additional electric fences may be installed by the leaseholder to further subdivide fields, as required.

9.4.2 Proposed Field Management

9.4.2.1 Fields 1 and 2

The cultivated area of Field 1 is 97 ha and the cultivated area of Field 2 is 30 ha. These fields are used for intensive pasture. These southerly fields are mostly located on well-drained, fine sandy soils and primarily support agronomic grasses, including bromegrass, tall fescue, and alfalfa. Field 2 has numerous depressional channels that are seasonally inundated and support native sedges and reed canary grass. The forested stands along the easterly field boundaries have not been and will not be fenced off. These stands provide limited forested grazing and cover for livestock. No harvesting of live or dead trees will be permitted.

The alfalfa planted in Field 1 should be closely monitored and scarified (harrowed) and re-seeded by the lessee every two years and should not be grazed in the establishment year.

Fields 1 and 2 should be renovated on a rotational basis by the leaseholder and re-planted to the Peace River pasture grass mix or equivalent. The fields will also need to be fertilized at the time of seeding to ensure proper take and nutrient re-establishment. These fields will be grazed annually on a seasonal rotation (see section 8.3.2.2 above). Renovation will be required every 5-8 years to maintain productivity (newly seeded areas should not be grazed in the establishment year). If partial renovation of a field is conducted temporary fencing (i.e., electric fencing may be required to keep cattle out of the newly seeded areas).

Under the proposed management regime, the carrying capacity of Field 1 is about 455 AUMs. The carrying capacity of Field 2 is about 141 AUMs. The number of head to be placed on the fields and duration of grazing will be worked out with the leaseholder annually.

Cattle watering dugouts were improved within both field areas at Site #1 and Site #8 (**Figure 3**). These improvements under normal precipitation conditions should enhance the ability to distribute cattle and achieve even grazing throughout the entire field area. Under drought conditions, water well 2 installed in Field 1 by BC Hydro provided a reasonable backup system that is capable of provisioning cattle within the AUMs. Additional portable watering facilities at the dugouts may also be required to distribute cattle and prevent damage to the ramps, fences and dugout areas. This would be the responsibility of the leaseholder.

Future hay crops can be produced on these fields. Production of hay on other fields will not be permitted based on the current Plan.

9.4.2.2 Fields 3 and 4

The cultivated area in Field 3 is 44 ha and the cultivated area of Field 4 is 30 ha. These fields will continue to be used for intensive pasture. Fields 3 and 4 are located along the north side of the wetland and are similar to Fields 1 and 2, although Field 3 may have somewhat coarser textured (sandier) soils (based on conversations with former operators). These fields should be renovated following completion of Fields 1 and 2 and every 5-8 years after.

The existing cattle watering dugout (site #3), along the north margin of the wetland within Field 4, was not improved due to drought conditions. Once the enhancement measures are completed, water from this dugout will be provided to cattle via a pumping system (to be provided by leaseholder) to prevent cattle from disturbing the slope above the wetland.

Water for cattle using field 3 will be provided via a portable system that is filled with water from either site 1 or 3 (to be provided by leaseholder). Water well 1 in the southeast corner of Field 5, on the boundary of Field 4 provides water for cattle use in this field under drought conditions.

Under the proposed management regime, the carrying capacity of Field 3 is about 207 AUMs. The carrying capacity of Field 4 is about 141 AUMs.

9.4.2.3 Field 5

Field 5 is located in the northwest corner of the Property and has a cultivated area of 50 ha. It appears to have a greater extent of poorly-drained, channeled soils dominated by native sedges, as well as scattered tree stands. This field will be allowed to continue to mature to "old field habitat" to enhance wildlife values. cattle grazing will rotate from mid- to late-summer (e.g., August-September), with cattle removed when about 50% of the mature grass cover has been grazed to ~4-6 inches in height. Depending on field conditions, this would be followed by an early rotation from mid-May to June 30, field condition dependant, with cattle removed when grass height is ~4-6" over about 50% of the field. The early spring rotation would be followed by mid- to late-summer grazing (August-September) the following year. No later grazing season use (October-November) will be permitted. The actual timing and intensity of cattle grazing will be based on annual monitoring of field conditions by the leaseholder. It is expected that early spring grazing will occur every 2 to 3 years alternated with mid- to late-summer grazing in between years.

Grass values would be increased for limited cattle grazing by light scarification (e.g., using a harrow) and over-seeding on the ridges with a Peace River pasture mix, combined with limited fertilizer application. Poorly drained channels and depressions will not be cultivated and will be re-seeded. This improvement work will be carried out over the next three years by the leaseholder in consultation with BC Hydro.

The dugout at site #4, along the north field boundary, was improved with water from the dugout provided to cattle via an external water trough or pump system (provided by leaseholder). Water well 1 in the southeast corner of Field 5, provided water for cattle during drought conditions.

Under the proposed management regime, the assigned grazing rate of Field 5 will be about 117 AUMs.

9.4.2.4 Field 6

Field 6, located in the northeast corner of the Property, is approximately 50% open field and 50% interspersed tree stands with a cultivated area of 73 ha.

The open fields have largely reverted to "old field habitat" and are a complex mix of well-drained, sandy ridges and poorly-drained, sedge and reed canary grass-dominated swales. It is proposed that this area be managed to retain and enhance the old field habitat. Grazing in this field would be limited to mid-to-late summer and would be of very low intensity. This will maintain old field habitat and protect any sharp tailed grouse (*Tympanuchus phasianellus*) lek(s).

Dugout at site #5, near the east field boundary was improved. Water from this dugout will be provided to cattle via an external water trough (to be provided by leaseholder). Water well 1 in the southeast corner of Field 5, on the boundary of Field 6 provides water for cattle use in this field under drought conditions.

Under the proposed management regime, the assigned grazing rate of Field 6 will be about 171 AUMs.

9.4.2.5 Field 7

Field 7, located along the mid-east Property boundary, has a cultivated area of 62 ha.

Field 7 was renovated and reseeded with a "Peace River pasture/hay mix", which contained Timothy and alfalfa and likely also contained brome grass and other agronomic species. The westerly and southerly portions of the field are in good condition but the northeast quarter is weedy and sparsely revegetated. Light scarification (e.g., harrow) and re-seeding of this area should be completed within the next 5 years. Continued treatment of the noxious weeds in this area will be required (see Section 9 below).

The existing cattle watering dugout at site #6, in the southwest corner of the field, was improved, however the ramp was installed incorrectly and is not sufficient. In the intervening years, drought conditions have limited the amount of water in this dugout and its use has been limited. BC Hydro and the lessee should work towards improving this ramp to provide cattle access to water in this dugout. Alternatively, a pump and water trough system could be used to access the water in this dugout for cattle use.

Under the proposed management regime, the carrying capacity of Field 7 is about 141 AUMs.

10.0 WEED TREATMENT

The leaseholder will be responsible for continued control of noxious weeds on the Property. BC Hydro's noxious weed specialist conducted a weed inventory of the entire Property in early June 2015 once plants had grown enough to be identified to determine the status of the known infestations. No weed inventories have been completed since this initial review. The results of the 2015 inventory were provided to the leaseholder. The BC Hydro noxious weed specialist assisted the leaseholder in development of a treatment program for 2015-16. BC Hydro will work with the leaseholder on developing an Integrated Pest Management Plan as per the BC *Weed Control Act*.

The Integrated Pest Management Plan will incorporate weed inventories with treatment methods (mechanical and chemical). Post-treatment inspections, by the BC Hydro noxious weed specialist or their designate, would be carried out on all chemically treated areas within 10-14 days of herbicide application or as directed by the label to assess the efficacy of the treatment.

One of the dangers of applying the same chemicals to an infestation is the development of chemical resistance. To ensure weeds do not develop herbicide resistance, chemical groups will be rotated over the years and efficacy will be assessed during the post-treatment inspection. If signs of resistance are observed (e.g., plants not being killed) then the herbicide group will be changed.

A final weed audit will be conducted at the end of the growing season (September-October) to assess the efficacy of the treatments and to aid in the development of future treatment and management recommendations for the site.

11.0 ADDITIONAL REQUIREMENTS AND/OR RECOMMENDATIONS

- No polypropylene twine or wire is to be used for any hay brought on site. Only degradable twine is to be permitted.
- The leaseholder should carrying out soil tests for soil fertility management and the application of fertilizer in field renovation activities.
- Placement of bee hives on the Property should be considered.
- Install piping at each dugout to allow the leaseholder to pump water up into their mobile pump truck/trough system for cattle watering.
- Use the water wells to refill Dugouts 4, 5, 6, 8.
- Construct clay-lined dugouts adjacent to Water Well 1 in Field 1 and adjacent to Water Well 2 in Field 4.

12.0 MONITORING AND FOLLOW-UP TO MANAGEMENT OF PROPERTY

12.1 Leaseholder record-keeping requirements

The leaseholder will keep records of the following (see example monthly record form in Appendix 3):

- Date cattle enter property;
- Number of cattle on site;
- Rotation of cattle through fields (dates on and off each field);
- Grass length at time cattle enter and leave fields (average based on measurements from 5 sites within the field);
- Weather conditions (dry year, wet year);
- Number of times cattle access the wetland (i.e., access location, duration of stay, distance moved into wetland);
- Wildlife observations, including any wildlife issues;
- Data cattle removed from Property.
- Where/when fencing repairs required
- Wildlife carcasses (ungulates, predators): where, when, sex and age (adult, juvenile, young of year)
- Active raptor nests
- Predator dens
- Any other notable wildlife observations or features

12.2 Monitoring by BCH

Surveys and monitoring to date conduced on the Property include:

- Breeding bird surveys (see Sections 7.1.1.2-A and 7.2.7 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*) including Sharp-tailed Grouse lek surveys (e.g., May-June);
- Waterfowl and shorebird follow-up monitoring (see Section 7.1.1.2-C of the *Vegetation and Wildlife Mitigation and Monitoring Plan*);

- Monitoring of water extraction infrastructure (when cattle on site - frequency TBD);
- Monitoring of field conditions (when cattle on site);
- Monitoring of general property conditions (TBD).

12.3 Annual meetings to discuss/update management plans

To be determined in consultation with leaseholder. BC Hydro suggests having these annual meetings in April each year, with potential follow up meetings in October if required.

13.0 REFERENCES

Alberta Agriculture and Irrigation. 2023. Quality Farm Dugouts. Fourth Edition. Accessed online Feb 7, 2025 at: https://open.alberta.ca/publications/quality-farm-dugouts-fourth-edition

Agricultural Land Commission (ALC). 1979. Protecting B.C.'s Farmland. Available at: https://www.alc.gov.bc.ca/assets/alc/assets/library/archived-publications/alr-history/protecting_bc_farmland_booklet.pdf (Accessed 04 Feb 2025).

Agricultural Land Commission (ALC). 2022. *ALR History*. Available at: https://www.alc.gov.bc.ca/role-of-the-alc/alr-history/ (Accessed 04 Feb 2025).

B.C. Conservation Data Centre. 2025. BC Species and Ecosystems Explorer. B.C. Ministry of Environ. Victoria, B.C. Available: https://a100.gov.bc.ca/pub/eswp/ (accessed Feb 7, 2025).

BC Government. 2023. Bat fungus that causes white nose syndrome detected in B.C. Accessed online Feb 7, 2025 at: https://news.gov.bc.ca/releases/2023FOR0019-000426

BC Hydro. 2013. Environmental Impact Statement for Site C Clean Energy Project - Volume 2. Available at: http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_371_35290.html.

Invasive Species Council of BC. 2023. Factsheet December 2023 – Reed Canary Grass. Accessed online Feb 7 2025 at: https://bcinvasives.ca/wp-content/uploads/2024/02/Reed-canary-grass-Dec-2023post-for-public-input.pdf

BC Laws. 2025. BC Reg 144/2004 - Community Charter, Spheres of Concurrent Jurisdiction – Environment and Wildlife Regulation. Accessed online at: https://www.bclaws.gov.bc.ca/civix/document/ id/complete/statreg/144_2004

BC Land Inventory (BCLI), 1979. Land Capability for Agriculture, 1:50,000 Mapsheet 94A/4 (Hudson Hope).

BC Soil Survey, 1986. Agriculture Canada - Soils of the fort St. John-Dawson Creek area, British Columbia, Report No. 42.

BC Ministry of Agriculture Food and Fisheries. 2002. BC Agricultural Fencing Handbook. Accessed online Feb 7 2025 at: https://peaceforage.bc.ca/wp-content/uploads/2021/07/BC_Agriculture_Fencing_Handbook.pdf

BC Ministry of Environment, 1981. Climatology Unit, Climatic Capability Classification for Agriculture in British Columbia. Climatology Unit, Air Studies Branch, Victoria, BC.

BC Ministry of Environment, 1983. Climatology Unit, Climate Capability for Agriculture, 1:100,000 NTS Sheet 94A/SW. August.

BC Ministry of Environment and Ministry of Agriculture and Food, MOE. 1983.Manual 1, RAB Technical Paper #1, Land Capability Classification for Agriculture in BC. April.

Christie, P., Kroeker, D., K.A. McIntosh. 2015. Site C Clean Energy Project, Marl Fen Wetland Property Management Plan, prepared for BC Hydro.

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 6: Boreal Taiga Plains.

Personal Communication, Mike and Leah Mant (Gunderson Ranch), September 10, 2024

Pathfinder Endeavours. 2014. 2014 Year End Summary Site C Clean Energy Project Peace River Valley Noxious Weed Control Program.

Simpson, L., C. Churchland, T. Jones and T.K. Simpson. 2014. Site C Clean Energy Project: Wildlife, Vegetation and Mapping Inventory for the Marl Fen Property. Keystone Wildlife Research.

Appendix 1. Photos

2016 Photos

Photo 1. Dilapidated shed

Photo 2. Steel silos

Photo 3. Reservoir in wetland

Photo 4. Existing fencing in good condition

Photo 5. Existing fencing needing repair

Photo 6. Damaged gate

Photo 7. Cattle-handling infrastructure needing repair

Photo 8. Plastic bale bags

Photo 9. Old propane tanks

Photo 10. Dry well at dugout #1

2024 Photos

Photo 1: Creeping thistle near gate entrance

Photo 2: Looking east at Field 6

Photo 3: looking south at Water Well 1 in the SE corner of Field 5

Photo 4: rejuvenation in Field 4 with poor take

Photo 5: Southwest corner of Field 6

Photo 6: Red-tailed hawk in Field 7

Photo 7: Looking from Field 3 into wetland, fence intact

Photo 8: Field 3 conditions, grazed low due to drought conditions

Photo 9: Wetland recovery is good despite drought conditions

Photo 10: Field 4 conditions, some rejuvenation done, but generally poor growth

Photo 11: Water Source #3 regrowth once use of this water source was stopped

Photo 12: Wildlife proof fence for hay storage in Field 3

Photo 13: cattle in Field 2, soon to be moved back home due to low grazing availability

Photo 14: Water Well 2 in use in Field 2

Photo 15: Field 1 conditions, still being grazed

Photo 16: Unused Dugout 6 due to no water

Photo 17: South gate locked and in good condition

Photo 18: Fence at south boundary of Field 1 in poor condition

Appendix 2. Marl Fen baseline vegetation and wildlife report

SITE C CLEAN ENERGY PROJECT

WILDLIFE, VEGETATION AND MAPPING INVENTORY

FOR THE MARL FEN PROPERTY

FINAL

Prepared for:

BC Hydro
Suite 600, Four Bentall Centre
1055 Dunsmuir Street
PO Box 49260
Vancouver BC V7X 1V5

Prepared by:

L. Simpson, C. Churchland, T. Jones and T.K. Simpson
Keystone Wildlife Research Ltd.
112-9547 152 St
Vancouver BC V3R 5Y5

December 2014

DISCLAIMER

This report was prepared exclusively for BC Hydro by Keystone Wildlife Research Ltd. The quality of information, conclusions, and estimates contained herein is consistent with the level of effort expended and is based on:

i) Information available at the time of preparation;

ii) Data collected by Keystone Wildlife Research Ltd. and/or supplied by outside sources; and

iii) The assumptions, conditions, and qualifications set forth in this report.

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LIST OF ACRONYMS

BC.....BRITISH COLUMBIA

BCCDC..... BRITISH COLUMBIA CONSERVATION DATA CENTRE

BEC.....BIOGEOCLIMATIC ECOSYSTEM CLASSIFICATION

COSEWIC..... COMMITTEE ON THE STATUS OF ENDANGERED WILDLIFE IN CANADA

GPS .....GLOBAL POSITIONING SYSTEM

PROJECT ..... SITE C CLEAN ENERGY PROJECT

RISC.....RESOURCE INVENTORY STANDARDS COMMITTEE

SARA .....SPECIES AT RISK ACT

SD.....SECURE DIGITAL

1.0 INTRODUCTION

Through its passive acquisition program BC Hydro purchased a 1574 acre property consisting of three (3) parcels (termed the "Property" for this report) for the purposes of wetland and wildlife mitigation, on January 7th, 2014. The legal descriptions of the Property are:

- Pcl 395.6: PID: 013-335-553 Legal: Parcel A (T41614) of District Lot 1200 Peace River District;
- Pcl 395.7: PID: 014-789-736 Legal: District Lot 1211 Peace River District, Except the West 80 Feet; and,
- Pcl 395.8: PID: 024-828-203 Legal: Block A District Lot 1210 Peace River District[1].

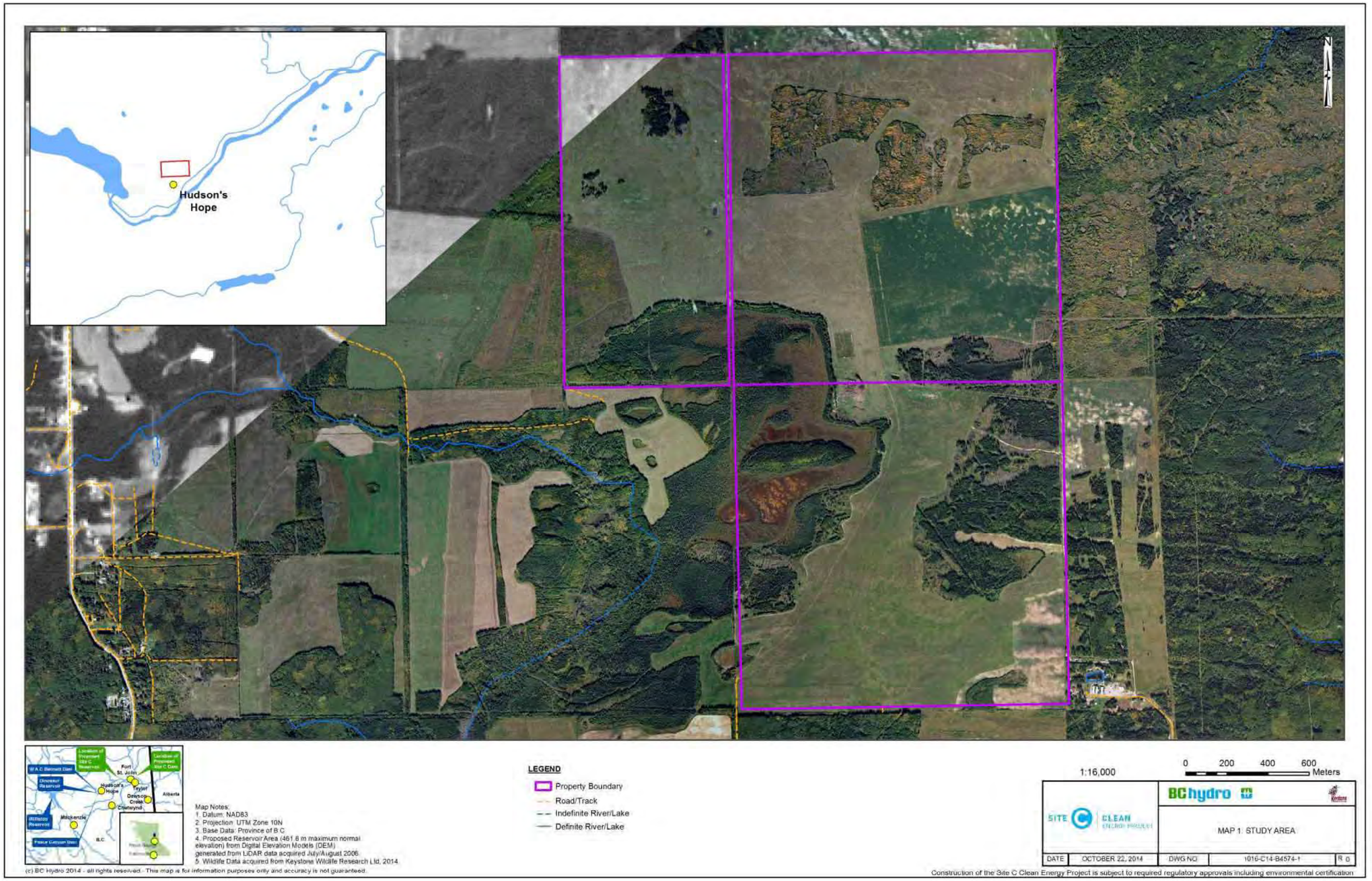
BC Hydro acquired the Property as it contains wetland habitat (**Map 1**) surrounded by cultivated field. As part of the pre-purchase work in 2012, baseline vegetation and wildlife surveys were conducted on the Property. These reconnaissance level surveys included surveys for the presence of rare plant species, dragonflies and damselflies, amphibians, breeding songbirds, Common Nighthawk, Short-eared Owl and Sharp-tailed Grouse (Keystone Wildlife Research Limited 2013). The presence of rare plants and wildlife species at risk was confirmed.

In support of development of a comprehensive Management Plan for the Property, additional mapping and inventory work was completed in 2014. This included detailed 1:5,000 scale Terrestrial Ecosystem Mapping (TEM) and additional surveys to provide further information on the presence and distribution of wildlife and rare plant species.

1.1 Study area

The Property is located approximately five kilometers northwest of Hudson's Hope (**Map 1**). The property contains 104 ha (256 acres) of wetland surrounded by 422 ha (1042 acres) of cultivated fields and 112 ha (276 acres) of forest. The Property is within the Peace Lowland Ecosection and the Boreal White and Black Spruce subzone variant (BWBSmw) (DeLong et al. 1990).

[1] This parcel was not surveyed in 2012 as it was added after field studies had commenced.



Map 1 Study Area

2.0 METHODS

A variety of field survey methods were utilized to complete vegetation and wildlife inventories on the Property. Surveys were completed in 2012 and 2014.

2.1 Terrestrial Ecosystem Mapping

Previous broad habitat mapping at a 1:20,000 scale had been completed for the general area of the Property in support of the Site C Project's Environmental Impact Statement. This mapping does not provide the fine resolution required for delineation of subtle differences in vegetation communities.

The TEM was produced at 1:5,000 scale following methodology described in *Terrain Classification System for British Columbia* (Howes and Kenk 1997), *Guidelines and Standards for Terrain Mapping in British Columbia* (Resources Inventory Committee (RIC) 1996), and *Standard for Terrestrial Ecosystem Mapping in British Columbia* (Resources Inventory Committee (RIC) 1998d) (**Appendix A**). Polygons were delineated based on vegetation, togographic and terrain features. The TEM for the Property was completed using the latest site series descriptions for the BWBSmw variant (DeLong et al. 2010). Outlined in **Appendix B** are the new TEM codes that correspond to old TEM codes used for previous mapping associated with the Site C Project.

Surveys targeted a level 1 sampling intensity (76-100% of polygons visited), following the methodology described in *A Field Guide to Ecosystem Identification for the Boreal White and Black Spruce Zone of British Columbia* (DeLong et al. 2010). Ground Inspection Forms and visual plots were completed (BC Ministry of Environment, Lands and Parks and BC Ministry of Forests 1998).

Field data were entered into a VENUS database. After initial quality assurance reviews, the bioterrain and ecosystem information in the map database and map linework were edited based on field data collected. Final map linework includes ecosection, variant, bioterrain and ecosystem unit.

2.2 Sensitive and At Risk Ecosystems

Sensitive ecological communities are those that may not be provincially listed but are ecologically fragile. Sensitive communities in the Peace Region have been defined as old-growth forests, tufa seeps, marl fens, grasslands, wetlands, and communities ranked

1 or 2 for the Goal 2 of the Conservation Framework (Hilton et al. 2013a). Goal 2 emphasizes the prevention of species and ecosystems from becoming at risk in order to protect species and communities that are neither secure nor at risk (BC Ministry of Environment 2009).

An ecological community can be defined as a natural plant community and its associated environmental site characteristics including soil, landform, nutrient, and moisture regimes. Ecological communities at risk (ECAR) are defined and ranked by the BC CDC and placed on the provincial Red- or Blue-list according to the degree of threat, trend in the area, number of protected and managed occurrences, intrinsic vulnerability, specificity of habitat requirement, as well as other considerations (BC Conservation Data Centre 2004). The BC CDC has identified thirteen ECAR that could potentially occur in BWBSmw in the Peace Forest Region (**Table 2.1**) (BC Conservation Data Centre 2014a). These include nine wetland communities, four forested communities and one floodplain community.

Table 2.1 ECAR associated with BWBSmw

Scientific Name	Common Name	Site Series Association	BC List
Picea mariana / *Vaccinium vitis-idaea* / *Sphagnum spp.*	black spruce / lingonberry / peat-mosses	Wb03	Blue
Larix laricina / Carex aquatilis / Tomentypnum nitens	tamarack / water sedge / golden fuzzy fen moss	Wb06	Blue
Picea mariana / Equisetum arvense / Sphagnum spp.	black spruce / common horsetail / peat-mosses	Wb09	Blue
Betula nana / Carex aquatilis	scrub birch / water sedge	Wf02	Blue
Larix laricina / Menyanthes trifoliata - Carex limosa	tamarack / buckbean - shore sedge	Wf18	Blue
Typha latifolia Marsh	common cattail Marsh	Wm05	Blue
Picea glauca - Picea mariana / Rhododendron groenlandicum / Aulacomnium palustre	white spruce - black spruce / Labrador-tea / glow moss	Ws15	Blue
Juncus arcticus - Puccinellia nuttalliana - Suaeda calceoliformis	arctic rush - Nuttall's alkaligrass - seablite	00*	Red
Muhlenbergia richardsonis - Juncus arcticus - Poa secunda ssp. *juncifolia*	mat muhly - arctic rush - Nevada bluegrass	00*	Red
Picea glauca / *Gymnocarpium dryopteris - Aralia nudicaulis*	white spruce / oak fern - wild sarsaparilla	110	Blue
Picea glauca / Ribes triste / Equisetum spp.	white spruce / red swamp currant / horsetails	111	Blue
Populus balsamifera - Picea glauca / *Alnus incana - Cornus stolonifera*	balsam poplar - white spruce / mountain alder -	112	Blue

Scientific Name	Common Name	Site Series Association	BC List
	red-osier dogwood		
Salix exigua Shrubland	narrow-leaf willow Shrubland	Fl06	Red

*Site unit not associated with Ministry of Forest site series classification.

ECAR are usually associated with one or more specific site series that have the potential to support the community in question (**Table 2.1**). Initially, ECAR were identified on the Property using the TEM mapping. During field truthing an ECAR was determined to be present if the characteristic vegetation and physiognomic structure was present at a site. The high sampling intensity allowed many rare and sensitive ecosystems to be identified on the ground. Field data was extrapolated to sites that were not visited, but were classified in the TEM as a site series associated with an ECAR. For these sites the range of natural variation associated with each ecosystem and how natural and anthropogenic disturbance might affect the function of the ecosystem was considered to determine if an ECAR was likely present. Both the BEC field guide and field observations were considered to make this determination (DeLong et al. 2010).

2.3 Rare Plant Inventory

Rare plant field surveys were conducted on the Property in 2012 and 2014. For the purposes of these investigations, “rare plants” were defined to include the following vascular plants, mosses, and lichens:

- species listed on Schedule 1 of the Canadian Species at Risk Act (SARA) as amended (Government of Canada 2002);
- species assigned a status of Extinct, Extirpated, Endangered, Threatened, or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2014); and
- species on the BC Conservation Data Centre’s (BC CDC) provincial Red- or Blue-lists (BC Conservation Data Centre 2014a).

No formal provincial standards exist for conducting rare plant inventories in BC other than for the collection of voucher specimens (Resources Inventory Committee (RIC) 1999b). Guidelines for conducting rare plant inventories have been developed by a number of organizations in North America; the methods used for the rare plant work on the Property are based on a synthesis of several of these guidelines (Bizecki-Robson

1998; Whiteaker et al. 1998; Alberta Native Plant Council 2000; Alberta Native Plant Council 2012; California Native Plant Society 2001; Henderson 2009; Penny and Klinkenberg 2012) and are consistent with previous baseline data collection methods.

In 2012 and 2014 the rare plant investigations began with an office-based pre-field review designed to guide the methods, survey coverage, and timing for the work on the Property. The first step was to prepare a list of the rare plants either already known to occur in the Peace Region, or with a global range that is likely to include the Property. The following sources were consulted:

- BCCDC records of known rare plant occurrences in the vicinity of the Property (BC Conservation Data Centre 2014c; BC Conservation Data Centre 2014d);
- element occurrence data collected during the multi-year rare plant surveys that were conducted during the preparation of the Site C Project EIS;
- species distribution maps on the Electronic Atlas of the Flora of British Columbia website (Klinkenberg 2014);
- published floras (Hitchcock et al. 1955; Lawton 1971; Flora of North America Editorial Committee 1993; Goward 1994; Cody 1996; Douglas et al. 1998; Goward 1999); and
- online databases (BC Conservation Data Centre 2014a; NatureServe 2014).

These data were compiled to produce a list of the target rare plant species with potential for occurrence on the Property. It should be noted that the target list is used as a working guideline and is not intended to be an exhaustive list of all potential rare plants. For this reason, the surveyors considered all described plant taxa while conducting surveys. The completed field plans specified the target plant species and their likely habitats, the areas to be surveyed, and the timing window for those surveys.

The surveys were performed by two botanists from Eagle Cap Consulting Ltd. with extensive experience working with the rare plant and vegetation resources of the boreal region in general and the Site C Regional Assessment Area in particular.

The surveyors used the intuitive-controlled search protocol (Whiteaker et al. 1998) for all rare plant work conducted on the Property. The intuitive-controlled search pattern is designed to locate the majority of rare plant occurrences within a limited geographic area.

When using the intuitive-controlled search pattern:

- surveyors walk variable-width transects that are spaced relatively close together (typically so that the edge of the transect just surveyed is still visible to the surveyor or their partner—this distance varies based on the habitat surveyed and the detectability of the target species);
- surveyors attempt to locate all rare plant occurrences or high-suitability rare plant habitat within a defined unit in a systematic way (e.g., by walking in a zig-zag pattern along linear features, or in a contour pattern in a polygon feature); and
- surveyors attempt to traverse a representative cross-section of all low-suitability rare plant habitat within the unit.

The intuitive-controlled survey technique is habitat-directed and preferentially covers high-suitability ecosystems over the more common low-suitability habitats (MacDougall and Loo 2002). The survey method is also floristic in nature and all plant taxa encountered are recorded and identified to a level necessary to determine their rarity (Alberta Native Plant Council 2012). Furthermore, the intuitive-controlled search pattern is of variable-intensity, and when rare plant occurrence or high-suitability rare plant habitat is located, the surveyors increase the intensity of their survey by narrowing the spacing of the transect pattern. Depending on the kind of habitat being surveyed and the detectability of the target rare species, this can require very close, hands-and-knees survey work in certain areas.

During the field work, the surveyors monitored all areas traversed for changes in habitat and plant association as well as for previously unrecorded plant species (common and rare). Lists were kept of all plants and plant communities observed. Unknown species were collected for later identification in the lab. A global positioning system (GPS) unit was used to mark location points as appropriate in addition to notes and photographs taken to record plants of interest, landforms and unique features, habitat quality and disturbance, and areas requiring further survey.

When target rare plants were found during the field work, element occurrence data were recorded on a BCCDC rare plant survey form (BC Conservation Data Centre 2012a). The CDC defines a single rare plant occurrence as any population or populations found within 1 km of each other. An occurrence can contain several sub-occurrences or sub-populations (NatureServe Explorer 2004). Occurrence data were later transcribed into

digital format to facilitate analysis of the sites. Digital photographs were taken of both the individual plants and of the surrounding habitat. Consistent with both the RISC guidelines and the rare plant survey guidelines on the BC E−Flora website (Resources Inventory Committee (RIC) 1999b; Penny and Klinkenberg 2012), a voucher specimen was collected when doing so would not compromise the viability of the population. At each site, GPS units were used to record the boundary of each occurrence (and sub-occurrence where applicable).

2.4 Amphibians

Amphibian surveys in both 2012 and 2014 were based on protocols outlined in *Inventory Methods for Pond-breeding Amphibians and Painted Turtles* (Resources Inventory Committee 1998c). Systematic searches for egg masses were conducted to document use of wetland habitat for breeding (Resources Inventory Committee 1998c). The shoreline and shallow sections potentially suitable for amphibian breeding were searched during the day. Habitat attributes collected at each site included location (UTM NAD 83), size of water body, percent open water, percent solar exposure, duration of habitat, water condition (turbidity), air and water temperature and percentage of the habitat surveyed. Surveyors attempted to completely survey each area. Habitat types were associated with TEM polygons after field work was completed[2].

All egg masses, tadpoles and metamorphosed amphibians detected during surveys were recorded. Attributes recorded for observations included species, development stage, count, aggregate (egg mass) size, length (tadpoles and adults), distance from shore to observation, and average water depth.

General survey conditions were recorded at the start and end of all surveys, including cloud cover, ambient air temperature, precipitation and wind speed. Information was recorded on RISC standard data forms modified for this project.

[2] TEM polygons were not delineated when amphibian field work commenced so surveyed wetlands could only be associated with specific TEM polygons once the TEM was finalized.

2.5 Avian Surveys

2.5.1 Breeding Bird Surveys

Surveys in 2014 focused on habitats, particularly wetlands, not inventoried in 2012. Habitats expected to support use by rare birds were targeted.

Surveys followed the methodology in *Inventory Methods for Forest and Grassland Songbirds* (Resources Inventory Committee (RIC) 1999a).

Point counts were completed by a crew of two surveyors, beginning at sunrise and continuing for up to four hours. Point count stations were placed a minimum of 200 m apart so records at each station were independent of each other. Surveyors remained at each station for 5-minutes, during which time all bird species observed or heard were recorded.

Surveys targeting marsh birds started 30 minutes before sunrise at point count stations immediately adjacent to suitable marsh bird habitat.

All bird species seen or heard at point count stations during both breeding bird and marsh bird surveys were recorded; any observations made between stations were recorded as incidentals. Information was recorded on RISC standard data forms modified for this project. UTM coordinates (NAD 83), start and stop time and weather conditions (wind, cloud cover, precipitation, and temperature) were recorded for each point count station. For each detection, sex, age class, and call type were recorded whenever possible. Distance and direction to the initial detection location were estimated.

2.5.2 Sharp-tailed Grouse

The focus for 2014 survey efforts was to determine if a Sharp-tailed Grouse lek was present on the Property. Survey methods were based on *Inventory Methods for Upland Gamebirds* (Resources Inventory Committee (RIC) 1997).

Transects and associated survey stations were completed in early spring to maximize the opportunity for detecting and observing birds. Point count stations were located at 800 m intervals; surveyors also intuitively wandered the area surrounding the transect to search for lek sites. Surveys were initiated from 30 minutes before sunrise until 2 hours after sunrise. Two surveyors listened for sounds of displaying males for 3 minutes at

each station. All Sharp-tailed Grouse observed were recorded and any congregation of Sharp-tailed Grouse observed was recorded as a lek.

Information was recorded on RISC data forms modified for this project. UTM coordinates (NAD 83), start and stop time and weather conditions (wind, cloud cover, precipitation, and temperature) were recorded for each station. If a grouse was observed, the species, sex and age class were recorded, whenever possible. The distance and direction to the initial detection location was estimated.

2.5.3 Common Nighthawk

Call-playback surveys for Common Nighthawks followed methods outlined in *Inventory Methods for Nighthawk and Poorwill* (Resources Inventory Committee (RIC) 1998b). Surveys were completed during the evening crepuscular period and transects were located in habitat suitable for Common Nighthawk. Stations were separated by 400 m.

At each station, a recording of a male nighthawk was broadcast to elicit a response from territorial males in the area. Five to six calls were broadcast in a series, followed by at least 30 seconds of silence, during which surveyors listened for a response. This sequence was repeated to achieve a total station survey time of five minutes. Surveys were not completed in inclement weather (wind >2, heavy rain, temp <7^{o}C).

Information was recorded on RISC data forms modified for this project. UTM coordinates (NAD 83), start and stop time and weather conditions (wind, cloud cover, precipitation, and temperature) were recorded for each station.

2.5.4 Short-eared Owl

Short-eared Owl surveys were conducted in accordance with the methods outlined in *Inventory Methods for Raptors* (Resources Inventory Committee 2001). Vehicle encounter transects were completed. Two observers drove at a low speed (not exceeding 40 km/hr) while scanning the surrounding suitable habitat for owls. Surveys were not completed in inclement weather conditions (wind speed >20km/hr, steady rain).

Information was recorded on RISC data forms modified for this project. UTM coordinates (NAD 83), start and stop time and weather conditions (wind, cloud cover, precipitation, and temperature) were recorded for each transect.

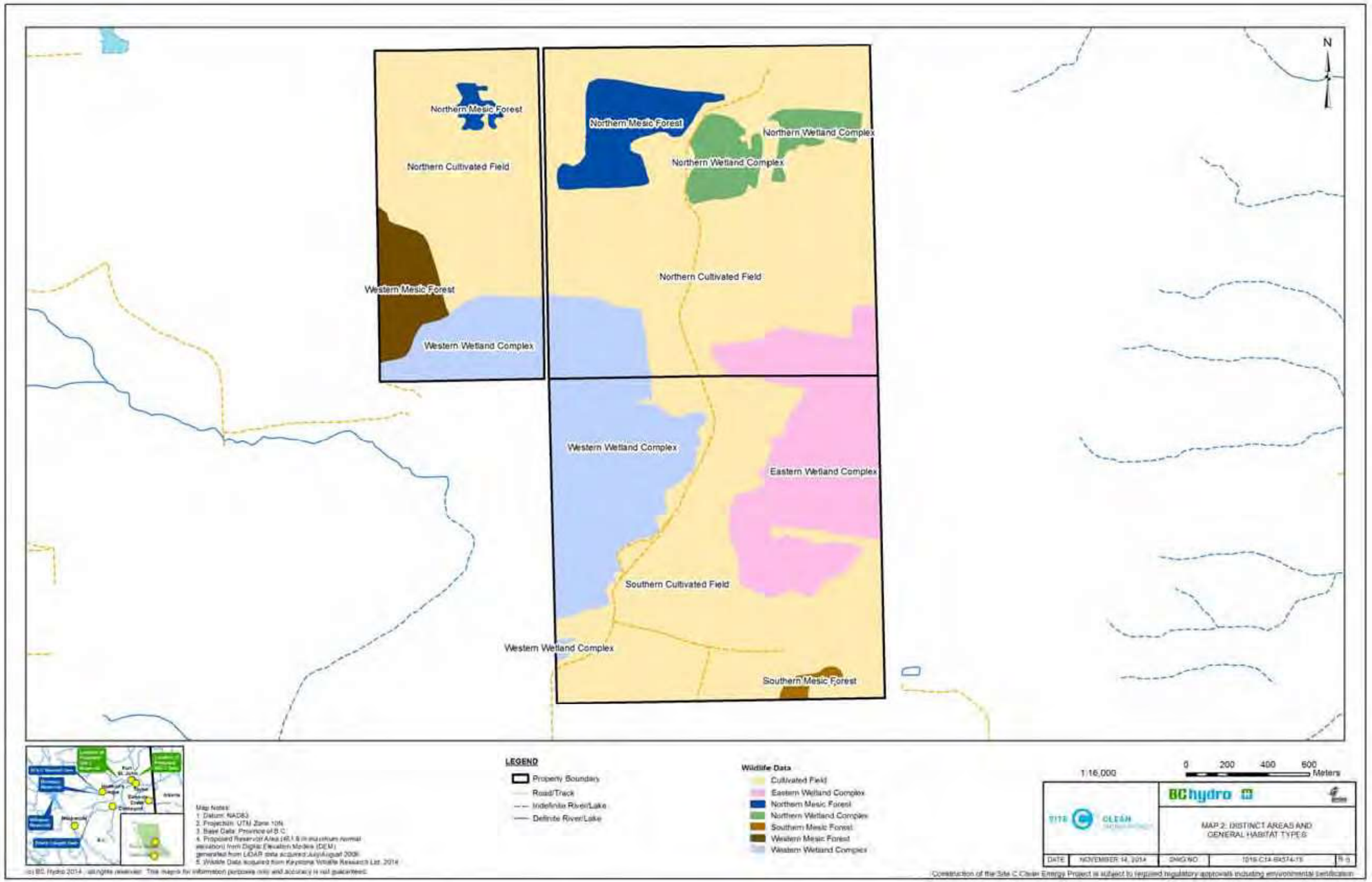
2.6 Bats

Survey work was completed in 2014 to determine bat species presence and general activity. Two SM-2 bat acoustic detectors (Wildlife Acoustics Ltd.) were installed near potentially suitable habitat. Inventory methods generally followed the *Inventory Methods for Bats* - taking into consideration advances in acoustic detection technology in the last 16 years (Resources Inventory Committee (RIC) 1998a). One detector was programmed to begin recording 30 minutes before sunset and stop recording 30 minutes after sunrise, allowing sampling to occur all night. The other detector was programmed to begin recording 30 minutes before sunset and stop recording 4 hours after sunset, the period of greatest bat activity. Limiting the sampling time to 4.5 hours increases the battery life of the detector, reducing the number of days potentially "missed" between visits. Data were stored as .wac files on SD cards that were downloaded approximately every 10 to 14 days. The downloaded files were converted to zero-crossing files using Wildlife Acoustics' Kaleidoscope conversion software. The zero-crossing files were filtered and labelled by species group using Analook software, filters, and the professional judgement of an experienced bat biologist, and tabulated for analysis.

3.0 RESULTS

The data summaries presented below include results for the 2014 field program, as well as all relevant results from 2012.

The TEM polygons were grouped into 7 distinct areas with similar ecosystem attributes (**Map 2**). Three general habitat types were identified: wetlands, mesic forests, and cultivated fields. Rare plants and wildlife associated with each general habitat type and distinct area are summarized in the results. A summary of TEM polygons within each distinct area can be found in **Appendix D**.



Map 2 Distinct Areas and General Habitat Types.

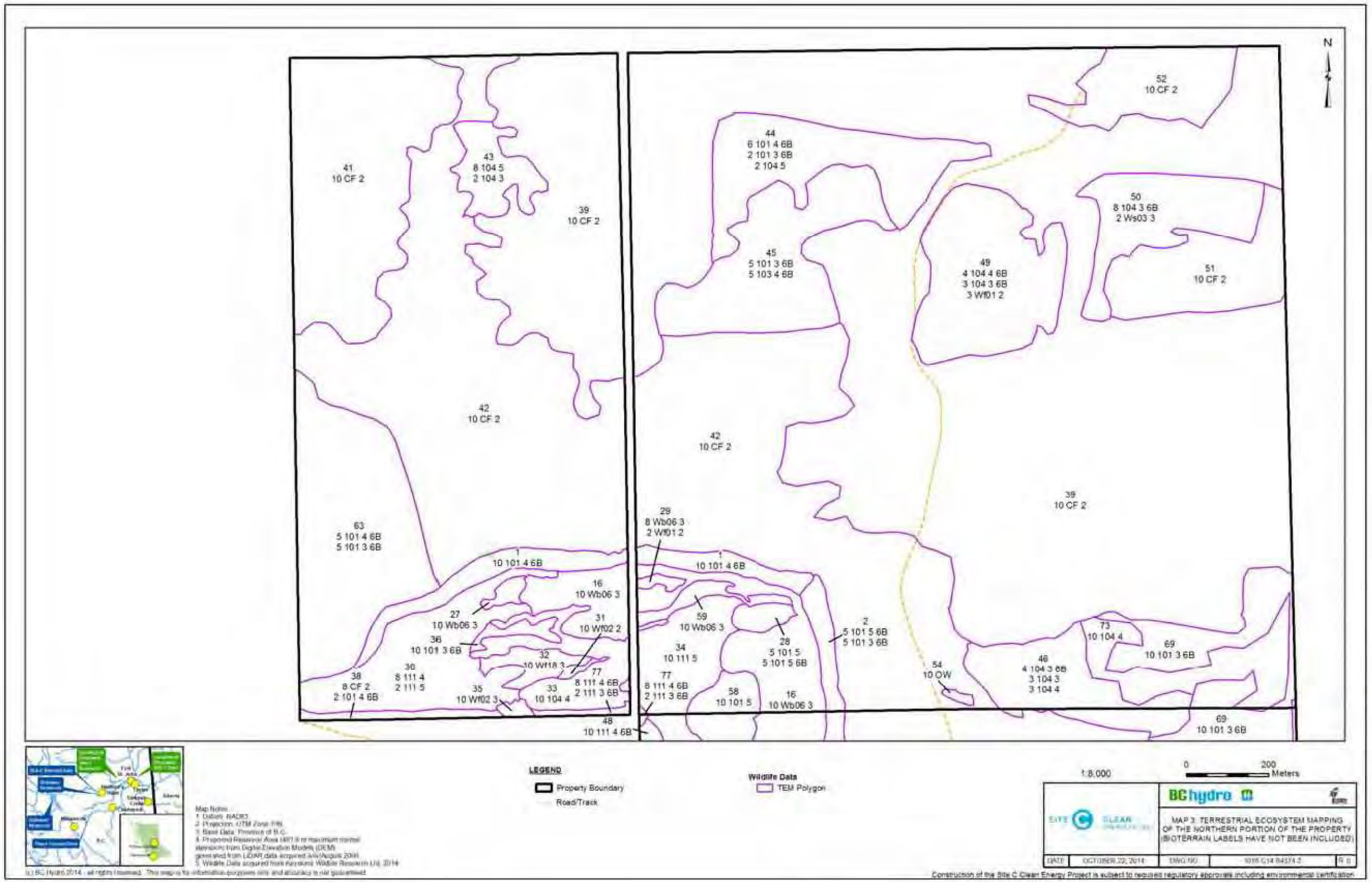
3.1 Terrestrial Ecosystem Mapping

Seventy-five ecosystem polygons were delineated based on bioterrain and ecosystem attributes as per RIC standards (1998d) (**Map 3, Map 4**). Field truthing took place from August 24 to 27, 2014. A total of 9 Ground Inspection Forms and 64 visual plots were completed, resulting in 97% visitation of mapped polygons. This meets the target survey intensity of 76-100% for level 1 sampling (Resources Inventory Committee (RIC) 1998d), although no full plots were completed. The TEM for the Property was completed using the latest site series descriptions for the BWBSmw variant (DeLong et al. 2010). **Appendix B** correlates old and new TEM site series descriptions.

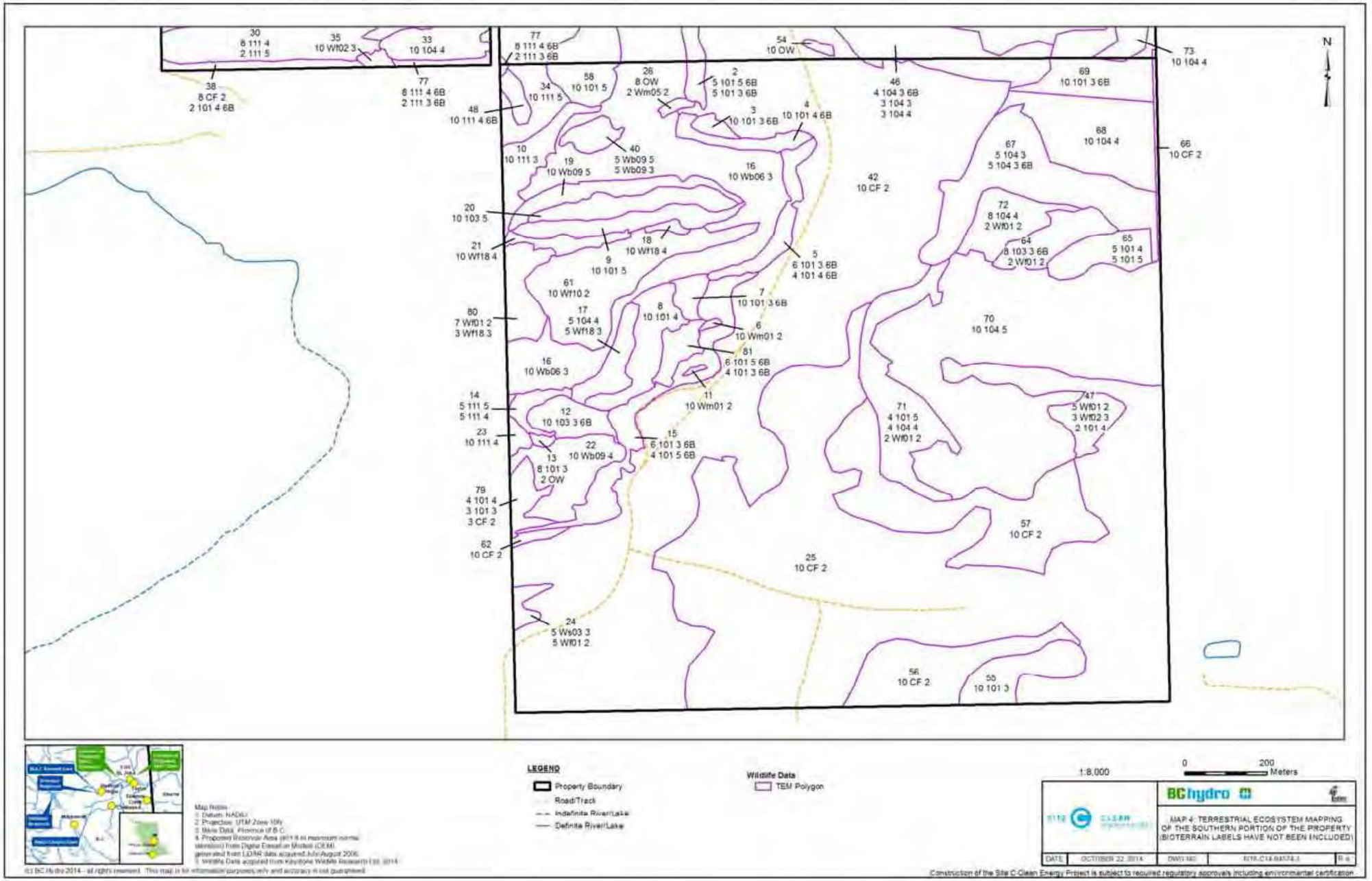
The Property is within the BWBSmw ecosystem. The majority (400 ha or 63%) of the Property is cultivated field (**Table 3.1**). A detailed summary of ecosystems on the Property by structural stage and site modifier is provided in **Appendix C**.

Table 3.1 Mapped Ecosystem Areas within the Property

Ecosystem Unit	Map Code	Seral Stage	Total Area (ha)	Comments
00	CF		399.5	
00	OW		0.5	
101			15.7	non-seral
101		6B	62.1	seral
103			2.2	non-seral
103		6B	9.3	seral
104			58.7	non-seral
104		6B	21.1	seral
111			14.3	non-seral
111		6B	1.0	seral
Wb06			25.9	
Wb09			5.9	
Wb09			2.7	
Wf01			8.0	
Wf02			0.9	
Wf10			6.5	
Wf18			3.8	
Wm01			0.2	
Wm05			<0.1	
Ws03			1.8	
TOTAL			**637.3**	



Map 3 Terrestrial Ecosystem Mapping of the Northern Portion of the Property (bioterrain labels have not been included)



Map 4 Terrestrial Ecosystem Mapping of the Southern Portion of the Property (bioterrain labels have not been included)

3.2 Rare and Sensitive Ecosystems

Sensitive ecological communities that occur on the property include marl fens, grasslands and wetlands. No old growth forest, tufa seeps or communities ranked 1 or 2 for the Goal 2 of the Conservation Framework were documented on the Property.

Marl fens are a special class of calcareous fens that are not typically associated with any site series, with one exception being the Hudson's Bay clubrush/rusty hook moss (Wf10) which is often underlain by calcareous marl (MacKenzie and Moran 2004). Instead they are associated with a substrate of non-acidic peat and dependent on a constant supply of calcium rich and oxygen poor ground water (Minnesota Department of Natural Resources 2011). Areas of heavily concentrated Marl precipitate were documented in the western wetland complex. These calcareous fens exist within the larger fen complex and are present due to local conditions that allow the marl to accumulate.

In the BWBSmw, grasslands are infrequent, except on the Peace River breaks where they are locally common and associated with steep, warm aspect slopes (DeLong et al. 2010). Although the cultivated field is providing habitat to grassland dependant species it is not considered a sensitive ecosystem since it does not have the physical characteristics of the native grasslands in the region.

Three wetland complexes were documented on the Property. Wetlands are vulnerable to changes in hydrological regime, pollutants, siltation, compaction by livestock and vehicles, and the effects of exotic vegetation species. Seven of the nine wetland types occurring on the Property are also provincially listed. The other two site associations, Water sedge/ Beaked sedge (Wf01) and Beaked sedge / Water sedge (Wm01), are the most common and widespread in the province (MacKenzie and Moran 2004). The western wetland complex was the largest, most diverse wetland on the Property. There appeared to be minimal disturbance to this wetland complex, except along the periphery. The northern and eastern wetland complexes were more common wetland types and were in poor condition, due primarily to cattle grazing. Several smaller, unmapped wetlands were also present on the Property. These wetlands are not represented in the mapping, either because they were too small to be delineated or because they are so heavily disturbed that they were not evident during air photo interpretation.

Of the thirteen ECAR expected to occur in the BWBSmw, six occur on the Property (**Table 3.2)**. Two additional ECAR were found on the Property that are listed but are not

expected to occur in the BWBSmw biogeoclimatic zone. This can occur if the ecological community occurs in areas that have not been sampled or if the CDC does not have data on the occurrence of this community in the Biogeoclimatic zone. These ecosystems were mapped in consultation with the regional ecologist.

Table 3.2 ECARs on the Property

Common Name	Site Series Assoc.	BC List	ha	# Field Plot	Location
Tamarack / water sedge/Fen Moss	Wb06	Blue	25.9	5	Western Wetland Complex
Black spruce / common horsetail / Sphagnum	Wb09	Blue	5.9	3	Western Wetland Complex
Scrub birch / water sedge	Wf02	Blue	0.9	3	Eastern and Western Wetland Complex
Hudson Bay clubrush-Rusty hook-moss	Wf10	Red*	6.5	1	Western Wetland Complex
Tamarack/ buckbean-shore sedge	Wf18	Blue	3.8	5	Western Wetland Complex
Common cattail marsh	Wm05	Blue	0.04	0	Western Wetland Complex
Bebb's Willow – Bluejoint	Ws03	Blue*	1.8	1	Northern Wetland Complex
White Spruce / red swamp currant / horsetails	111	Blue	15.3	7	Western Wetland Complex

*CDC does not list association in the BWBSmw

All ECAR were documented in wetland complexes, with most occurring in the western wetland complex. Twenty-eight field plots were completed, sampling all rare ecosystems except the Wm05 which was mapped in one small polygon in the western wetland complex. Field plots confirmed the occurrence of the rare ecosystem in 88% of the plots sampled.

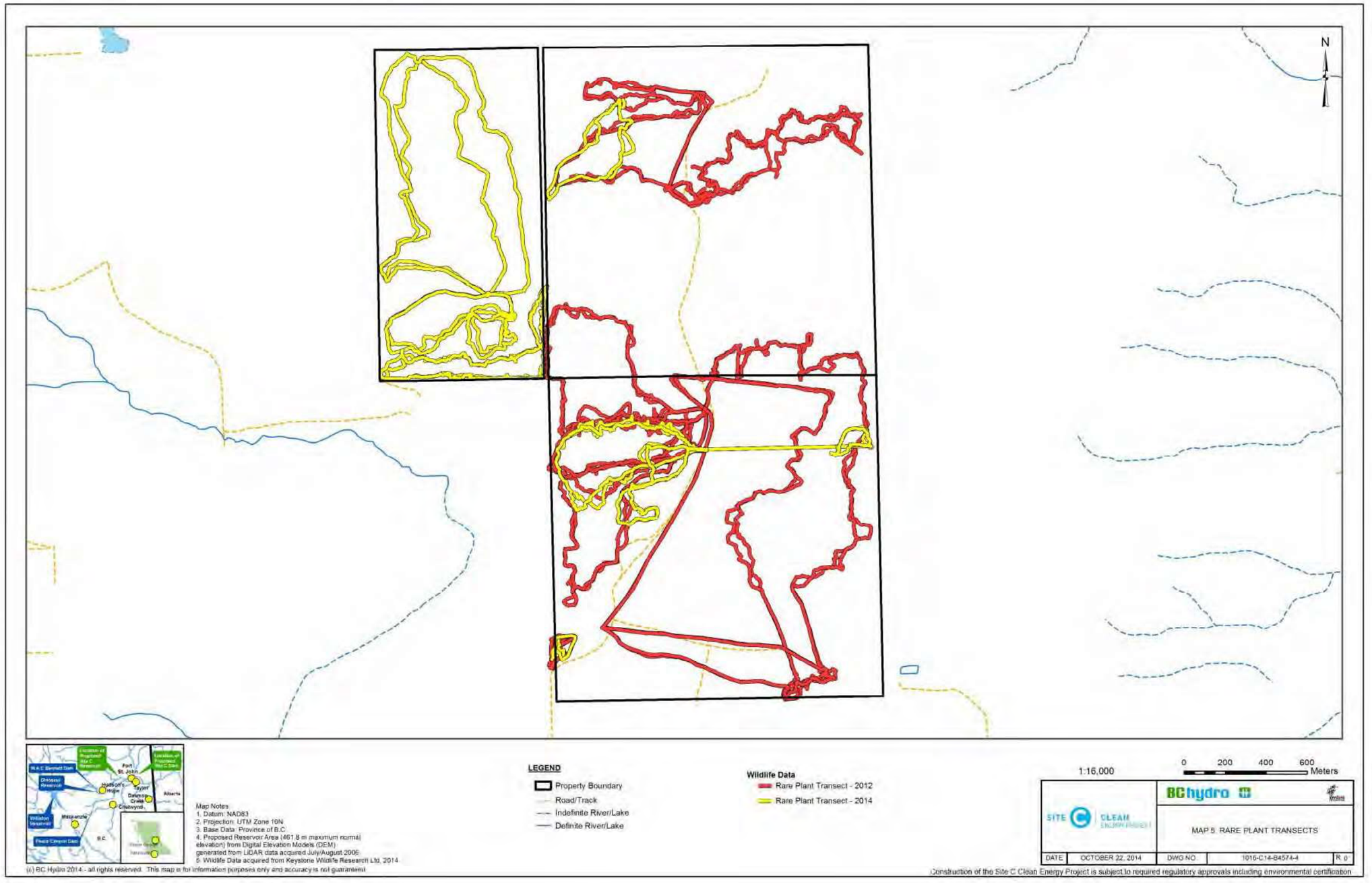
3.3 Rare Plant Inventory

The field surveys were conducted during the following periods:

- July 17 through 20, 2012

- August 15, 2012
- July 26 through 28, 2014

A total of 28 intuitive-controlled survey transects were walked, covering a cumulative distance of 94.7 kilometres (**Map 5**).



Map 5 Rare Plant Encounter Transects

3.3.1 Pre-field Review

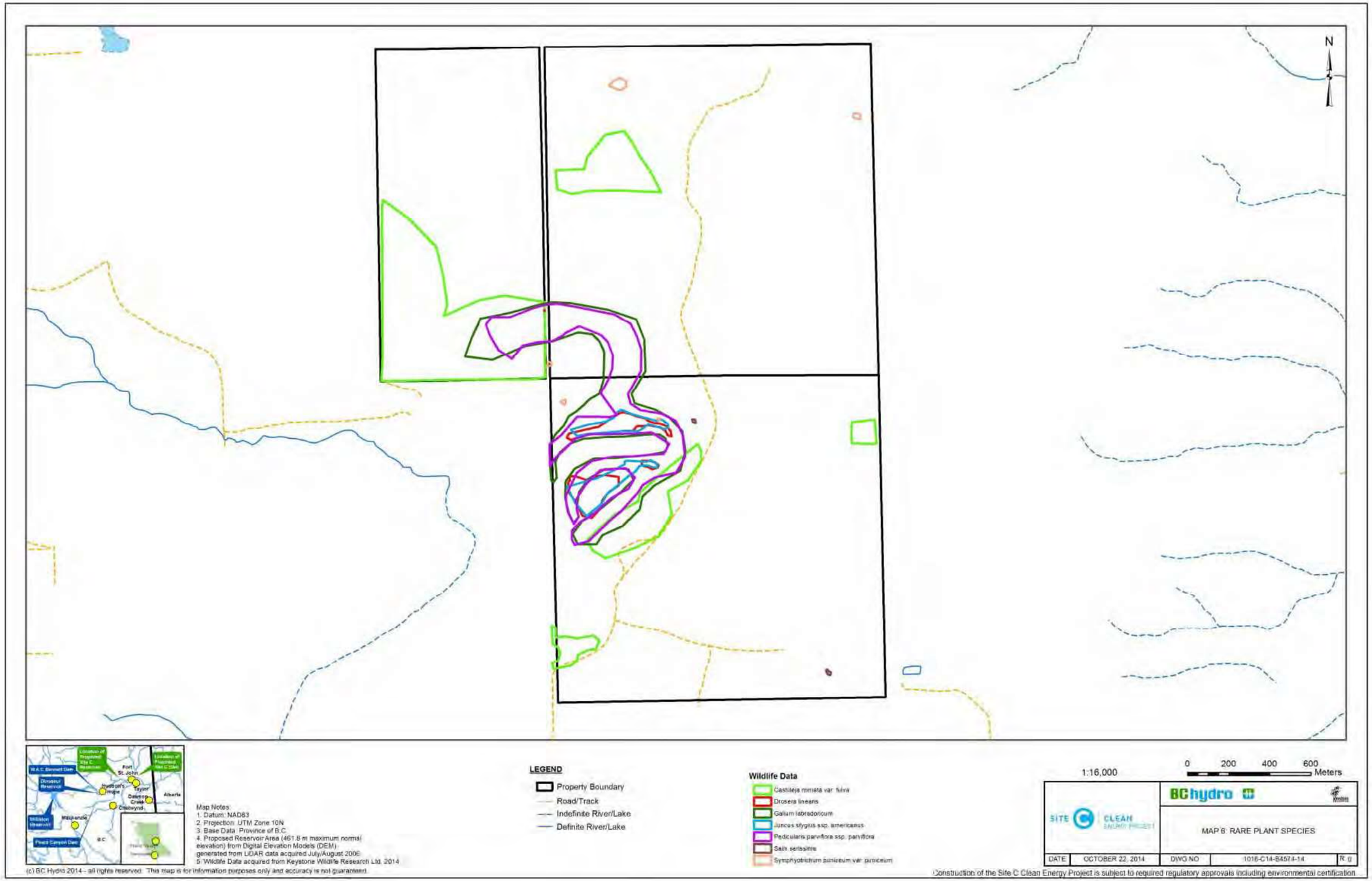
The pre-field review did not uncover any previously known rare plant occurrences on the Property. Analysis of vegetation maps and aerial imagery indicated the presence of habitats capable of supporting various rare plant species. In total 186 rare plant species thought to have potential for occurrence in the vicinity of the Property were identified (**Appendix E**).

3.3.2 Field Surveys

The field surveys located eleven occurrences of seven different vascular rare plant species (**Table 3.3, Map 6**). Two are on the BCCDC's Red list, with the remaining five on the Blue list. None are SARA or COSEWIC listed. Species accounts for each of the seven rare plant taxa found on the Property are presented in **Appendix G**. A comprehensive list of all plant species observed during surveys is presented in **Appendix F**. Twenty-five voucher species were collected on the Property in 2012 and 2014.

Table 3.3 Rare Plant Occurrences on the Property

Taxon	Common Name	BC List	Occurrences	Location
Castilleja miniata var. fulva	Tawny Paintbrush	Red	1	Eastern Wetland Complex Western Wetland Complex Northern Mesic Forest Western Mesic Forest
Drosera linearis	Slender-leaf Sundew	Red	1	Western Wetland Complex
Galium labradoricum	Northern Bog Bedstraw	Blue	1	Western Wetland Complex
Juncus stygius ssp. americanus	Bog Rush	Blue	1	Western Wetland Complex
Pedicularis parviflora ssp. parviflora	Small-flowered Lousewort	Blue	1	Western Wetland Complex
Salix serissima	Autumn Willow	Blue	2	Western Wetland Complex Southern Mesic Forest
Symphyotrichum puniceum var. puniceum	Purple-stemmed Aster	Blue	4	Northern Wetland Complex Western Wetland Complex Northern Mesic Forest



Map 6 Rare Plant Species Occurrence

3.4 Amphibians

In 2012, two wetlands were surveyed for western toads on April 28 and May 2 (**Map 7**). Survey effort was recorded as person-hours, with a total effort of 2 hours in April and 40 minutes in May (**Table 3.4**).

In 2014, surveys for western toads were completed in five distinct areas (**Map 7**). Surveys took place on May 14 and 16, June 3, and July 7. Survey effort was recorded as person hours, and ranged from 6 minutes to as many as 3 hours 8 minutes (**Table 3.4**). Total person-hour survey time in 2014 was 15 hours 56 minutes.

Weather conditions varied between survey dates, with air temperatures ranging from 11 to 25 °C and water temperatures ranging from 9.5 to 27.5 °C. There was no precipitation recorded during any of the surveys.

Table 3.4 Systematic Amphibian Wetland Surveys in 2012 and 2014

Distinct Location	Number of Surveys	Total Survey Time	Total Person-time
2012			
Western Wetland Complex	1	1:00	2:00
Western Wetland Complex	1	0:20	0:40
Total in 2012		**1:20**	**2:40**
2014			
Eastern Wetland Complex	7	1:41	3:22
Northern Cultivated Field	3	1:14	2:28
Northern Mesic Forest	2	0:18	0:36
Northern Wetland Complex	2	0:55	1:50
Western Wetland Complex	7	3:50	7:40
Total in 2014		**7:58**	**15:56**

In 2012, no western toads were detected during the systematic wetland surveys. Two boreal chorus frogs were heard calling and one wood frog was visually observed.

Two juvenile western toads were detected during the systematic wetland surveys in 2014. Both of the individuals were in the western wetland complex. Four boreal chorus frogs and 50 wood frogs were also recorded during surveys. Two juveniles and >2,500 tadpoles of an unidentified species were also observed (**Table 3.5**).

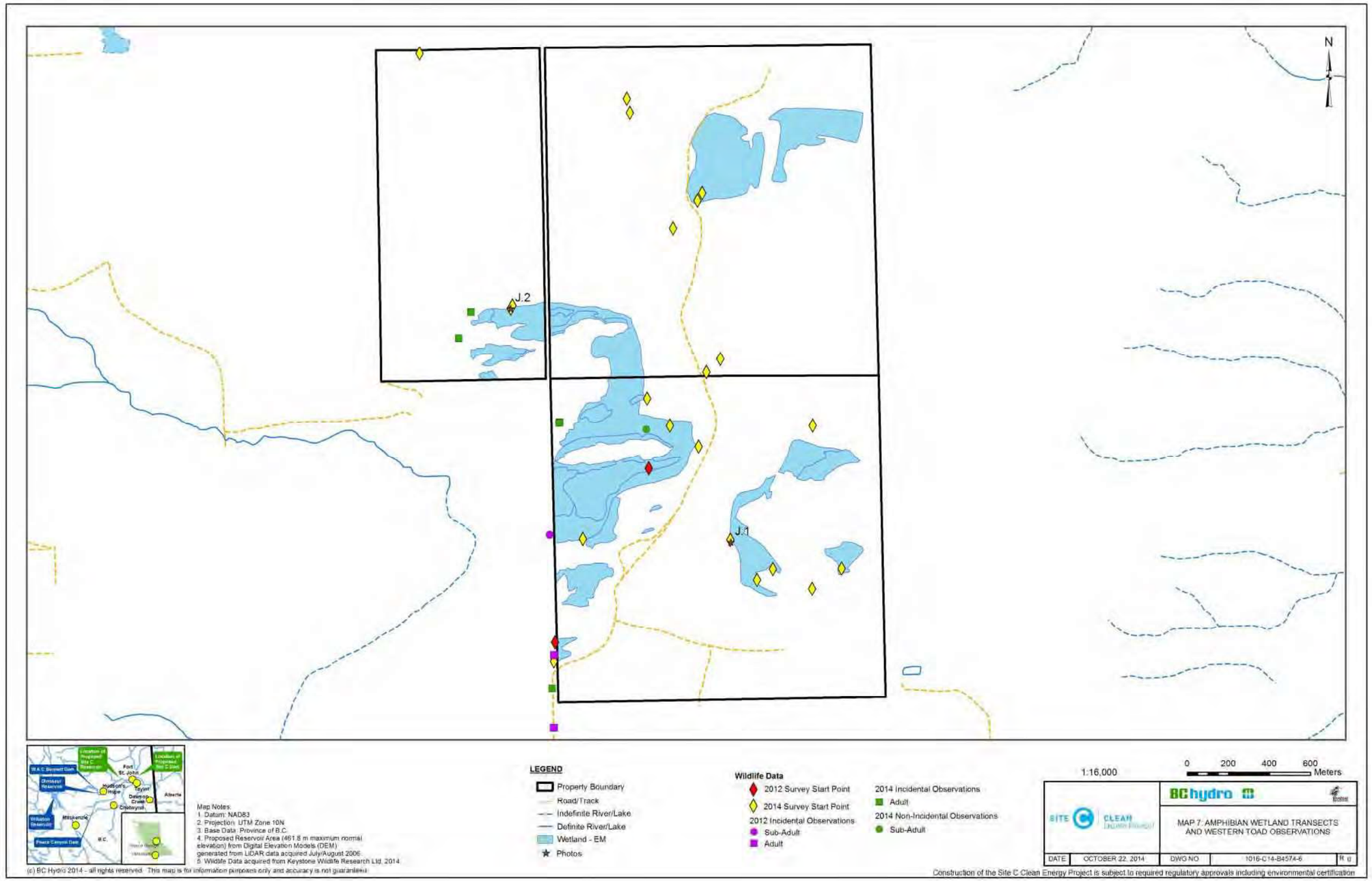
Table 3.5 Count of Amphibians Observed During Systematic Surveys in 2014

Species	Location	Tadpole	Juvenile	Adult	Total
Western Toad	Western Wetland Complex	0	2	0	2
Boreal Chorus Frog	Western Wetland Complex Northern Cultivated Field Southern Cultivated Field Northern Mesic Forest	0	1	3	4
Wood Frog	Northern Wetland Complex Eastern Wetland complex Western Wetland Complex Northern Cultivated Field Northern Mesic Forest	0	4	46	50
Unidentified Frog	Western Wetland Complex	>2500	0	2	>2500
Total		**>2500**	**7**	**7**	**>2500**

Incidental observations of western toad were made in both 2012 (n=5) and 2014 (n=6) (**Table 3.6, Appendix H**). All observations of western toad on the Property in 2012 and 2014 were within the western wetland complex. Two adults in 2012 and two adults in 2014 were observed within 250 m of the southern Property boundary.

Table 3.6 Count of Incidental Western Toad Observations in 2012 and 2014

Date	Western Toad Juvenile	Western Toad Adult	Total
12-Jun-12	2	0	2
19-Jun-12	0	2	2
07-Jul-12	0	1	1
07-Jul-14	0	2	2
25-Aug-14	0	2	2
26-Aug-14	0	2	2
Total	**2**	**9**	**11**



Map 7 Amphibian Wetland Transect and Western Toad Observations

3.5 Avian Surveys

3.5.1 Breeding Bird Surveys

One transect with 18 stations was established in 2012 and sampled three times that year (May 24, 29 and June 12) (**Map 8**). A total count of 732 birds of 67 species was observed (**Appendix I**).

In 2014, surveys at 16 point counts were repeated (**Map 8**) for a total of 5 hours and 18 minutes of survey time. The surveys took place over four days (May 17, June 4 and 25, and July 10). A total of 46 species were observed (**Appendix I**) with a total count of 508 (including unknown species detections).

The survey on May 17 was initiated with temperatures of -2^{o}C, which is below the acceptable limits of >3^{o}C for central and northern interior of BC (Resources Inventory Committee (RIC) 1999a). The temperature at the end of the survey was 6^{o}C. The June 10th survey was added to address the colder start temperature from the first survey.

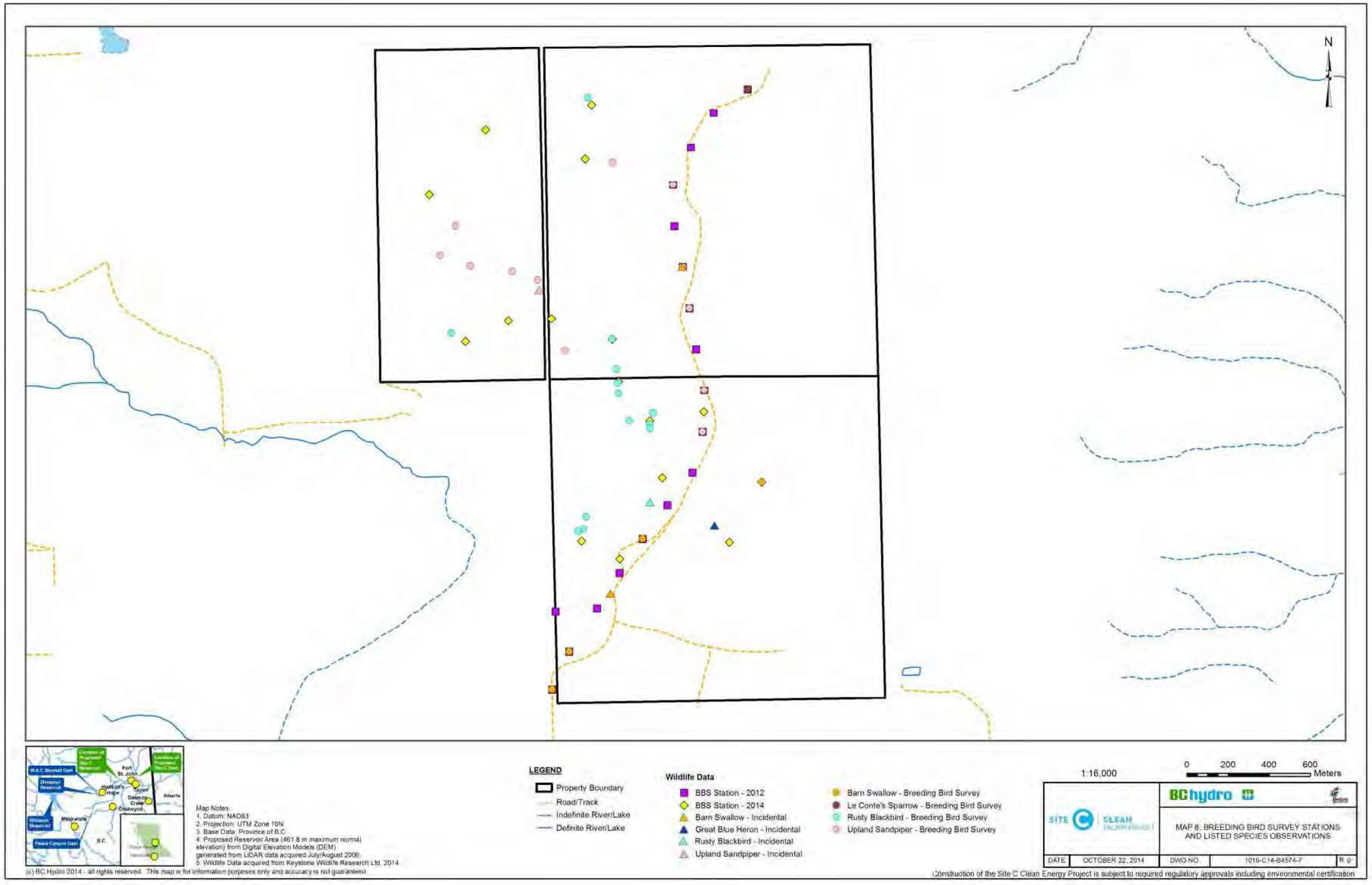
In total, 86 species have been detected on the Property (**Appendix I**). Fewer species were observed in 2014 (n=46) compared to 2012 (n=67). Four listed species were detected including the Blue-listed Rusty Blackbird, Le Conte's Sparrow, Great Blue Heron and Barn Swallow, and the Red-listed Upland Sandpiper (**Table 3.7** Listed Species Observed during Breeding Bird Surveys, Marsh Bird Surveys or Incidentally.). A Barn Swallow nest was found in one of the abandoned silos on the southern end of the Property. Although no Barn Swallows were seen on the nest, a Barn Swallow was seen leaving the silo just prior to the discovery of the nest.

The majority of listed migratory birds were observed in the northern and southern cultivated fields and in the western wetland complex.

Table 3.7 Listed Species Observed during Breeding Bird Surveys, Marsh Bird Surveys or Incidentally.

Species	2012	2014	BC Status	COSEWIC Status	Location
Barn Swallow	11	2	Blue	Threatened	Southern Cultivated Field Eastern Wetland complex
Great Blue Heron	1*		Blue	No Status	Southern Cultivated Field
LeConte's Sparrow	1		Blue	No Status	Northern Cultivated Field
Rusty Blackbird		30	Blue	Special Concern	Western Wetland Complex Northern Mesic Forest
Upland Sandpiper	6	11	Red	No Status	Northern Cultivated Field Southern Cultivated Field Northern Mixed Forest Western Wetland Complex

*only detected incidentally



Map 8 Breeding Bird Survey Stations and Listed Species Observations

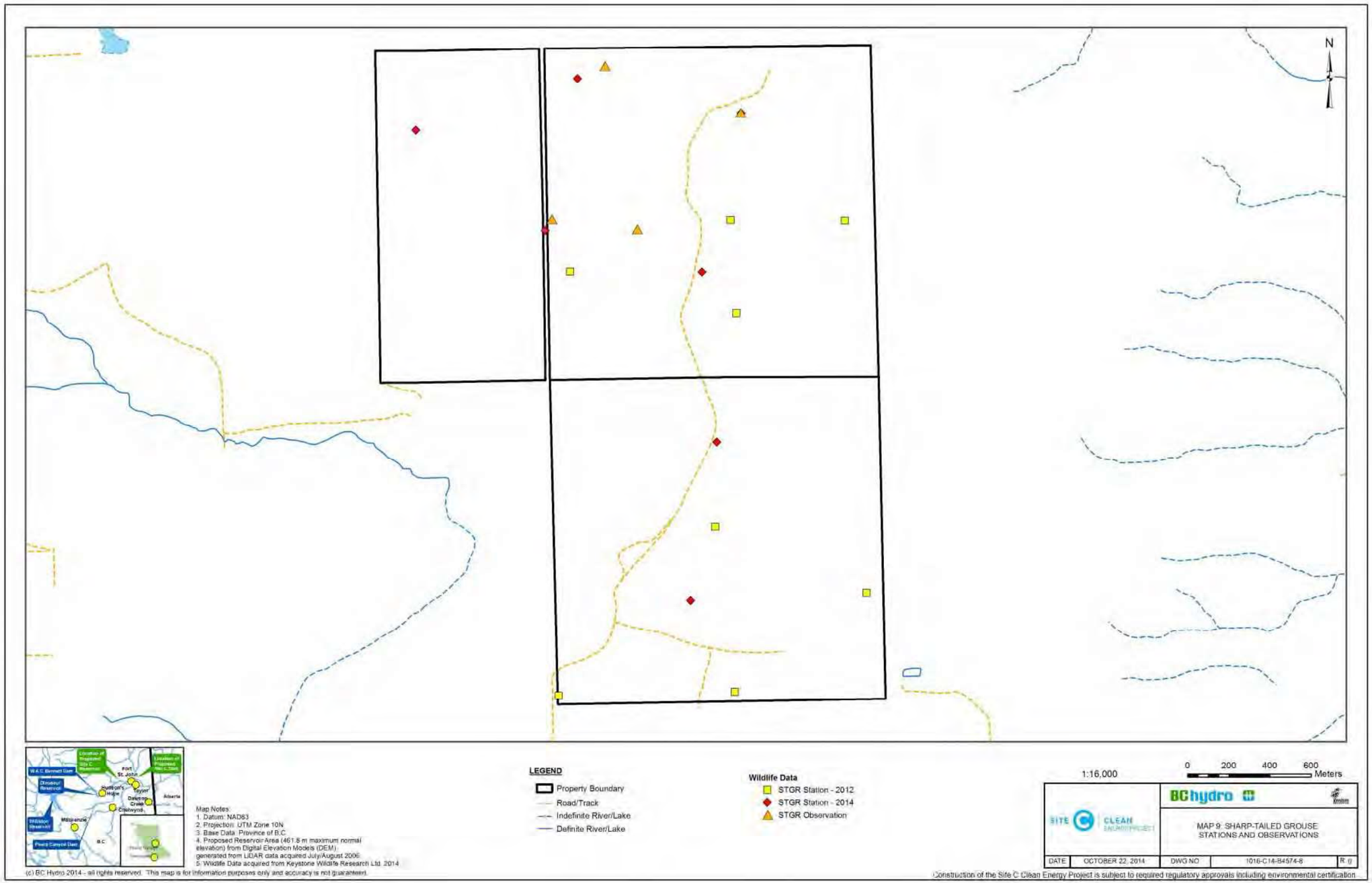
3.5.2 Sharp-tailed Grouse

Two Sharp-tailed Grouse survey transects were completed between April 28 and May 4, 2012. No grouse were observed during surveys. Six Sharp-tailed Grouse were detected incidentally on the Property: two observations of single individuals, and one observation of four adult birds on May 4 (**Map 9**)(**Appendix H**). The observation of four adult birds suggested the presence of a lek. Surveyors in 2012 were unable to confirm if a lek was present and whether it was on the Property or an adjacent property.

A total of four survey visits to 7 survey stations were completed on April 8, 24, May 1 and 16, 2014. No grouse were recorded during targeted Sharp-tailed Grouse surveys in 2014.

Two incidental observations were made with 1 bird recorded on April 24 and another single detection of one bird on April 8 (**Map 9**)(**Appendix H**). All Sharp-tailed Grouse observations were located in the northern cultivated field.

No observations of a lek or congregations of Sharp-tailed Grouse were made in 2014. Discussions with the previous land owner confirmed the presence of a lek in the northeastern portion of the Property, north of the forested sites.

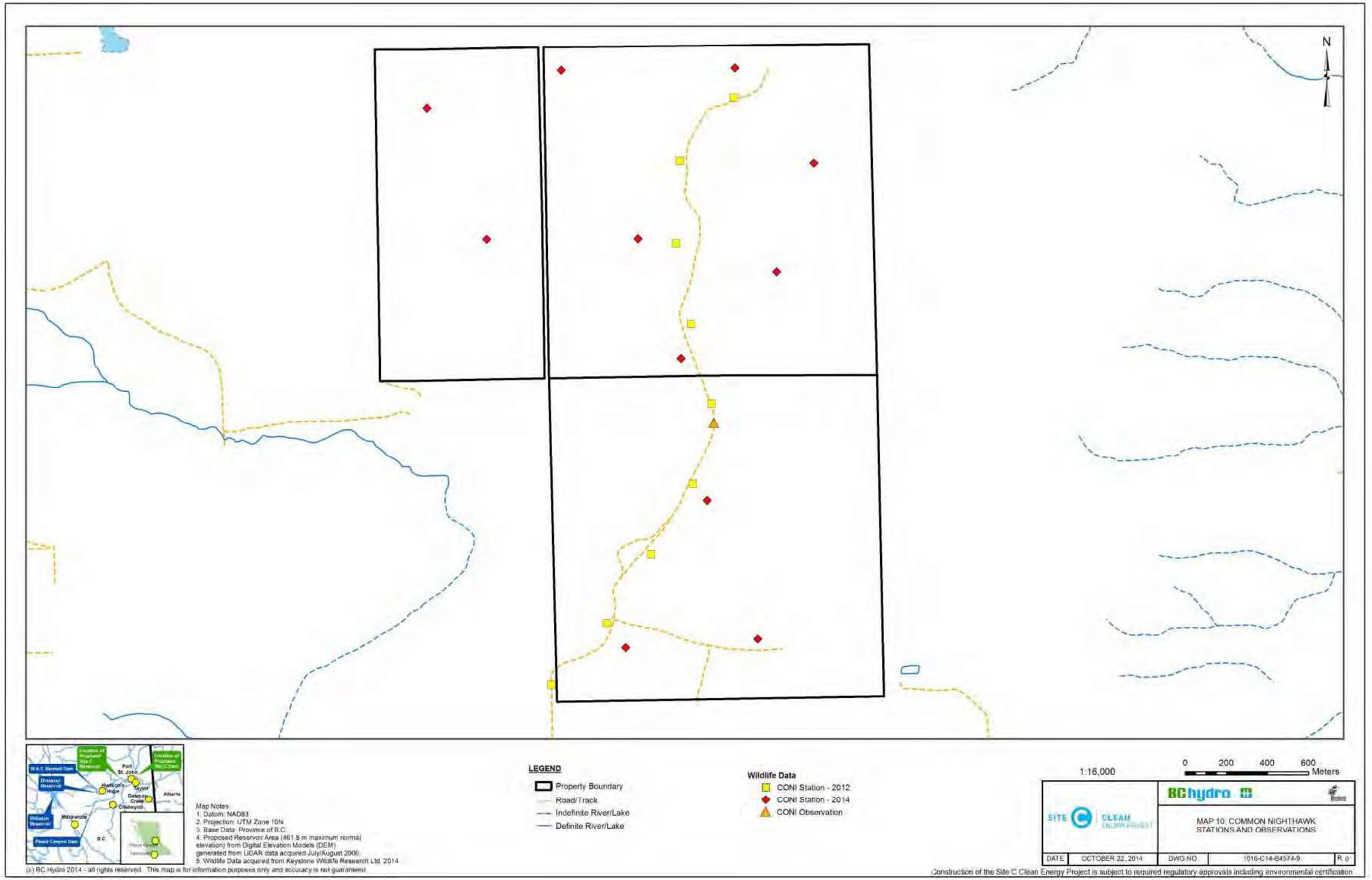


Map 9 Sharp-tailed Grouse Survey Stations and Observations

3.5.3 Common Nighthawk

In 2012, one transect comprised of nine call-playback stations was completed in the cultivated field (**Map 10**). Sampling occurred over 45 minutes on June 19, 2012. No Common Nighthawks were detected during targeted surveys. One Common Nighthawk was detected incidentally on the Property half an hour after the last call-playback listening period (**Appendix H**). This observation was in the southern cultivated field.

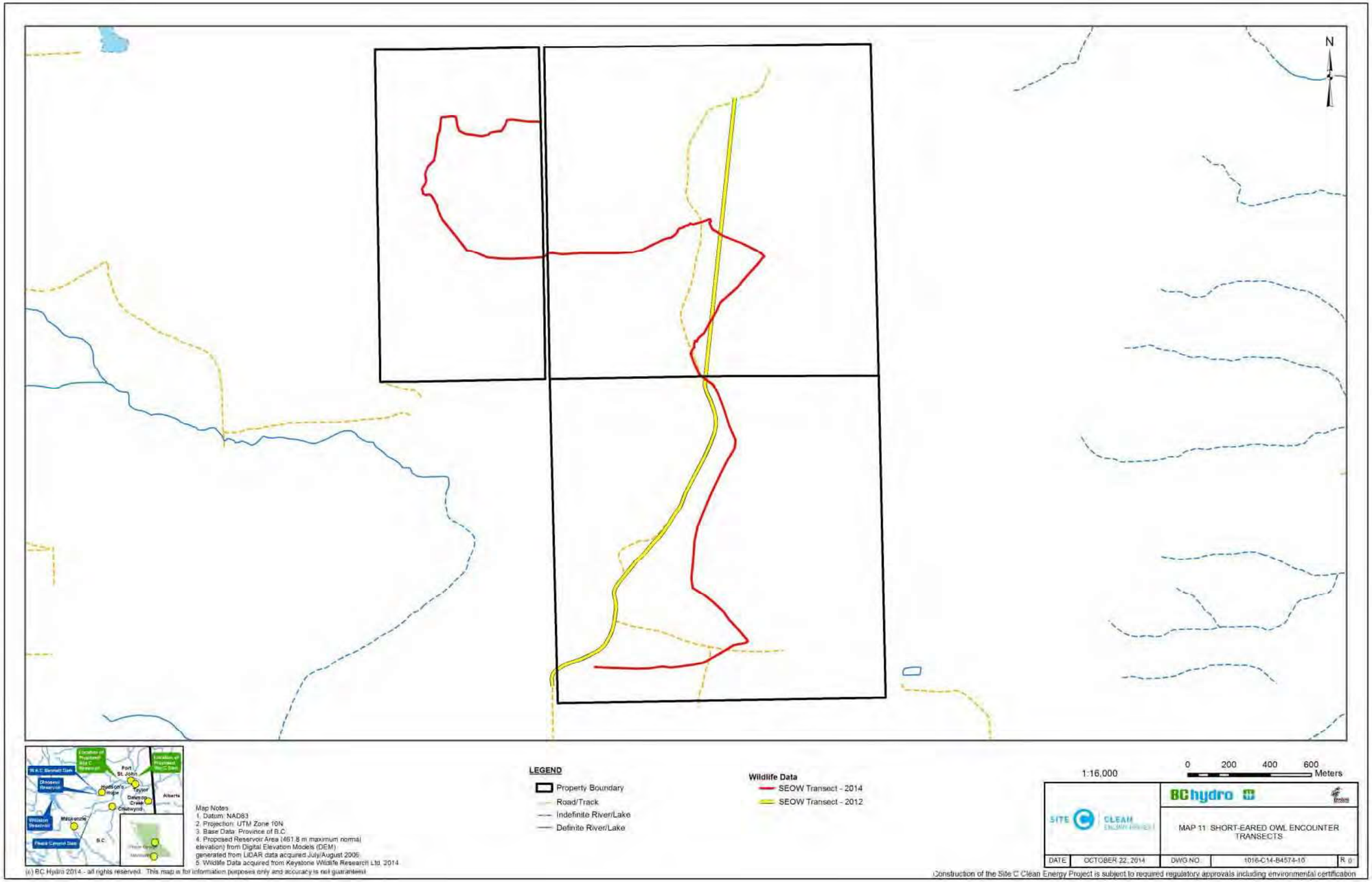
In 2014, seven stations were surveyed twice, on June 24 and July 6 (**Map 10**). An additional four stations were surveyed on July 6, as additional time allowed more stations to be added. Total survey time was 1 hour and 41 minutes. No observations or incidental detections of Common Nighthawk were recorded.



Map 10 Common Nighthawk Survey Stations and Observations

3.5.4 Short-eared Owl

In 2012, one Short-eared Owl transect lasting 1 hour and 43 minutes was completed on June 19 (**Map 11**). In 2014, three encounter transects were completed on May 1, May 15 and July 7, for a total survey time of 2 hours and 35 minutes (**Map 11**). No Short-eared Owls were detected on the Property and no incidental observations were recorded.



Map 11 Short-eared Owl Encounter transects

3.6 Bats

Prior to 2014, no inventory surveys for bats had been completed on the Property. In the general area of the Peace River valley, eight species of bats have been documented (Simpson et al. 2013), including one Red-listed and one Blue-listed species.

Acoustic sampling was conducted from June 25 to September 24, 2014. Two detectors were placed on the edge of the western wetland complex (**Map 12**). A total of 22,586 files were downloaded from the two detectors. Total operating time for each detector was 383 hours and 636 hours. The difference in total time is an artifact of the programming.

Five species of bats were confirmed present on the Property. Two other bat species may have been present on the Property, but could not be identified conclusively based on acoustic data (**Table 3.8**).

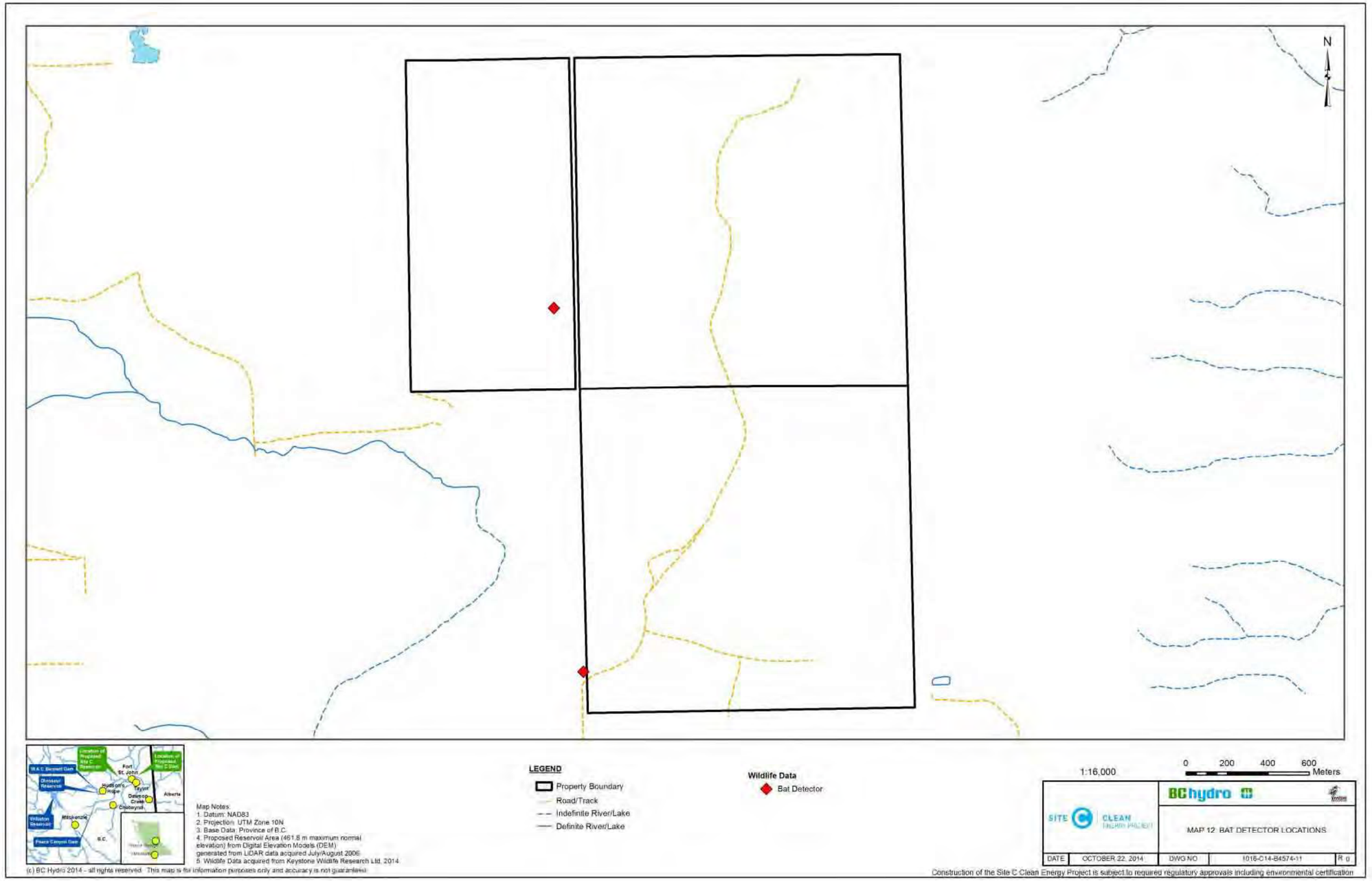
Table 3.8 Bat Species Recorded on Property

Scientific Name	Common Name	BC Status	COSEWIC Status	Identified on Property
Myotis evotis	Long-eared myotis	Yellow	No Status	Confirmed
Myotis lucifugus	Little brown myotis	Yellow	Endangered	Confirmed
Myotis septentrionalis	Northern myotis	Blue	Endangered	Confirmed
Myotis volans	Long-legged myotis	Yellow	No Status	Possible
Lasionycteris noctivagans	Silver-haired bat[a]	Yellow	No Status	Confirmed
Eptesicus fuscus	Big brown bat[a]	Yellow	No Status	Possible
Lasiurus cinereus	Hoary bat[a]	Yellow	No Status	Confirmed

[a] Species Considered Big Bats

A total of 123 hoary bat files were recorded at the southern detector (**Map 12**). Most files were recorded in a single night – July 4, 2014 between approximately 01:00-02:00 hr. This is unusual and has been identified as a potential migration event (D. Nagorsen, pers.comm.). This was the highest number of hoary bat files recorded at any of the detectors deployed for the Site C Project[3].

[3] Acoustic Sampling for the Site C Project was conducted in 2005,2006, 2008 and 2012



Map 12 Bat Detector Locations

3.7 Other Wildlife

Dragonflies and damselflies

In 2012, surveys targeted two listed species of damselflies and one listed species of dragonfly. The prairie bluet (*Coenagrion angulatum*), the Hagen's bluet (*Enallagma hageni*), and the beaverpond baskettail (*Epitheca canis*) are provincially Blue-listed species with potential to occur on the Property.

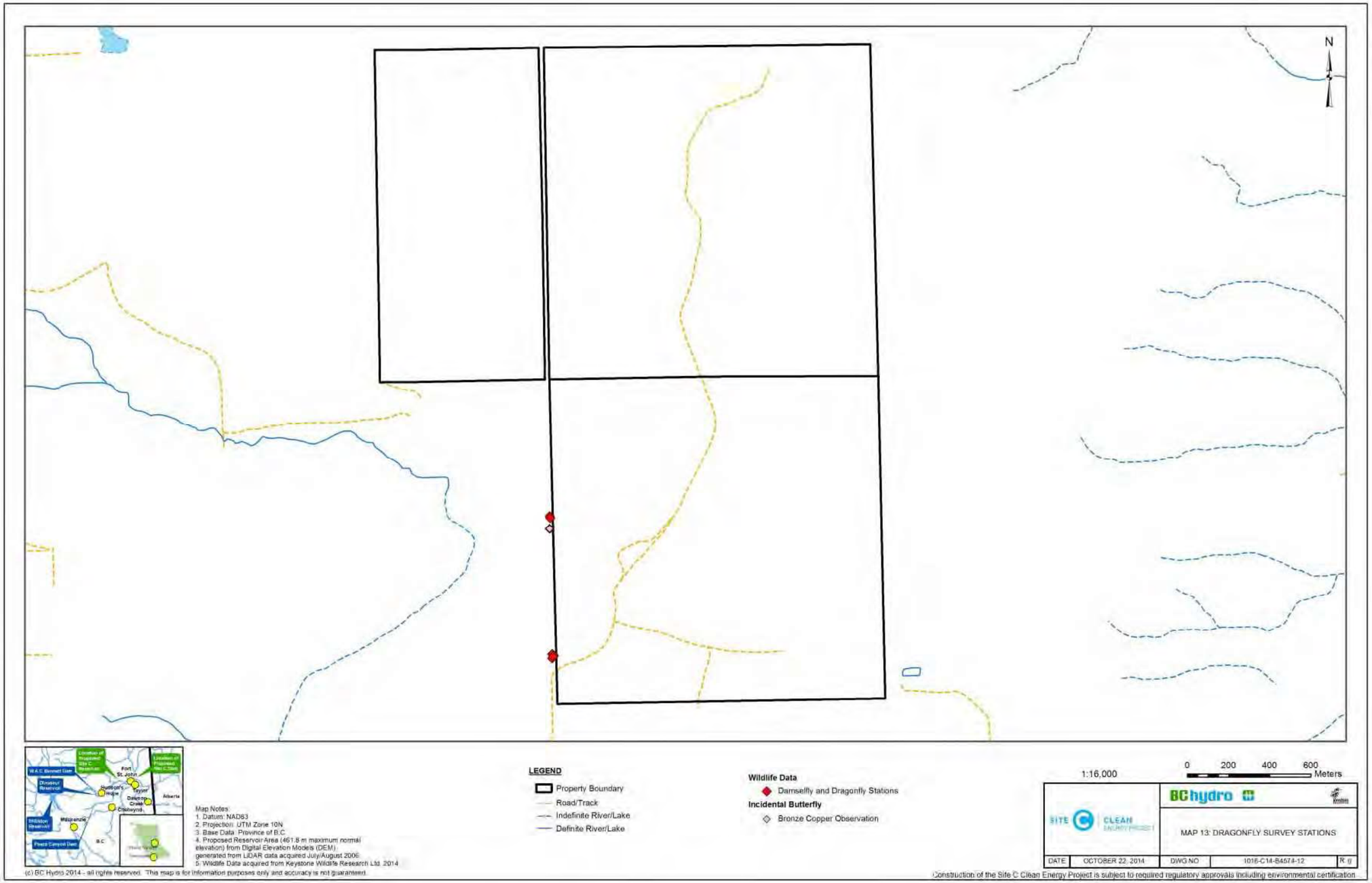
Surveys, conducted in the western wetland complex, included the collection and identification of aquatic life stages of dragonflies and damselflies. Wetlands were surveyed for exuviae that are typically left on emergent vegetation or woody vegetation and dip nets were used to sweep the bottom of the water. Adults were captured and identified opportunistically. Methods were consistent with the *Inventory Methods for Terrestrial Arthropods* (Resources Inventory Committee 1998). Sample identification was completed by entomological experts (Robert Cannings and Denis Knopp). Two survey stations were established and surveyed three times covering the western wetland complex (**Map 13**).

Surveys were completed on May 23, June 12 and July 7th. A total of 9 different species of dragonflies and 6 species of damselflies were documented on the Property (**Table 3.9**). None of the observed species are classified as species at risk.

A Blue-listed butterfly, the bronze copper (*Lycaena hyllus*), was observed incidentally during dragonfly and damselfly surveys in the western wetland complex.

Table 3.9 Count of Dragonfly and Damselfly Species Recorded in 2012

Common Name	Scientific Name	Number Observed
Dragonflies		
Sedge Darner	*Aeshna juncea*	1
Zigzag Darner	*Aeshna sitchensis*	14
Boreal Whiteface	*Leucorrhinia borealis*	2
Crimson-ringed Whiteface	*Leucorrhinia glacialis*	1
American Emerald	*Cordulia shurtleffi*	1
Four-spotted Skimmer	*Libellula quadrimaculata*	1
Whitehouse's Emerald	*Somatochlora whitehousei*	2
Black Meadowhawk	*Sympetrum danae*	20
White-faced Meadowhawk	*Sympetrum obtrusum*	6
Damselflies		
Taiga Bluet	*Coenagrion resolutum*	10
Northern Bluet	*Enallagma annexum*	34
Boreal Bluet	*Enallagma boreale*	1
Spotted Spreadwing	*Lestes congener*	3
Northern Spreadwing	*Lestes disjunctus*	37
Emerald Spreadwing	*Lestes dryas*	17
Total		**150**



Map 13 Dragonfly Survey Stations

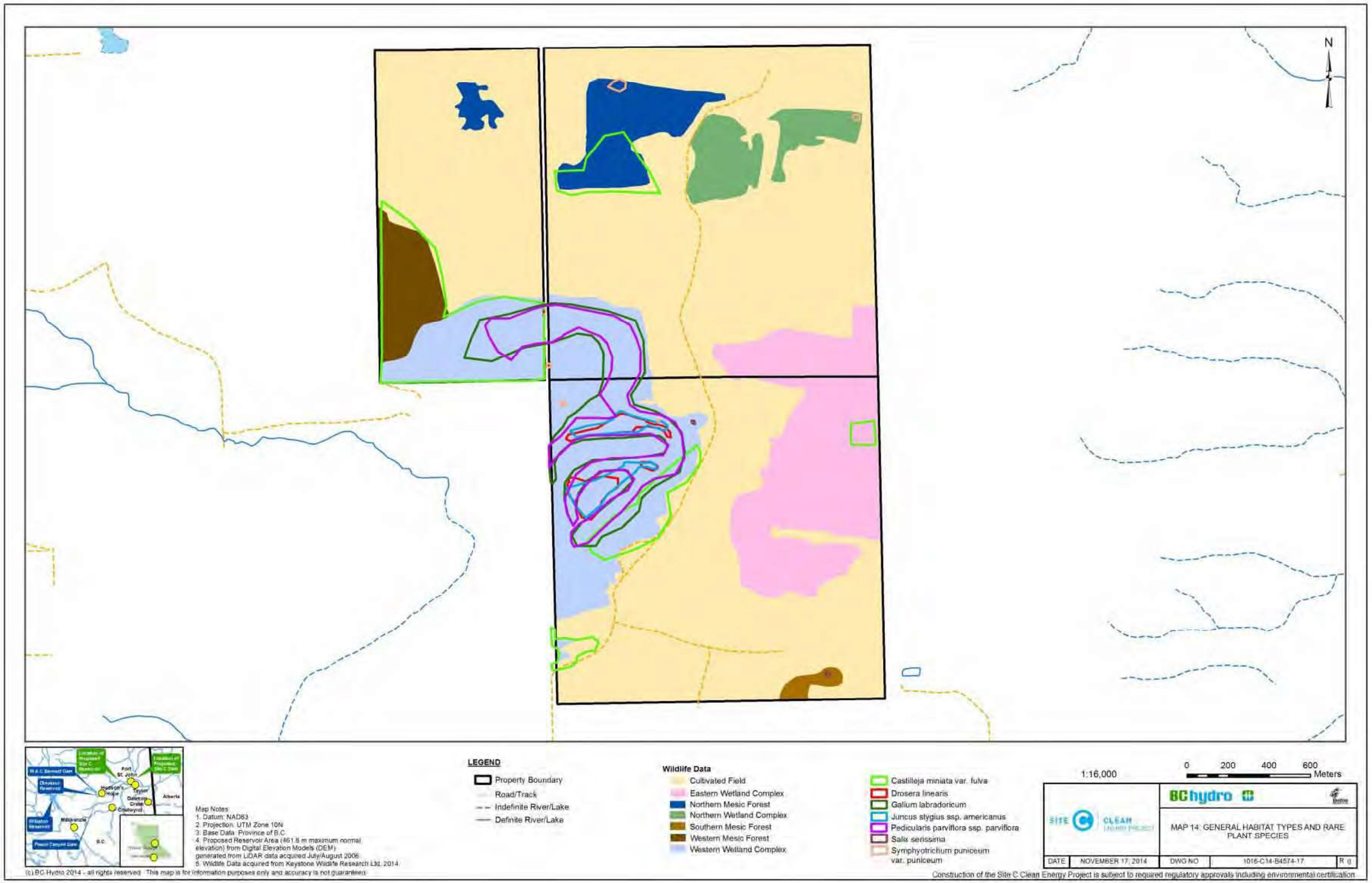
Mammals

During the course of field studies on the Property in 2012 and 2014, a number of observations of wildlife or wildlife sign (scat, bones, etc.) were made. These include, moose, elk, deer, black bear and coyote (a den was recorded on the Property, see photo in **Appendix I**).

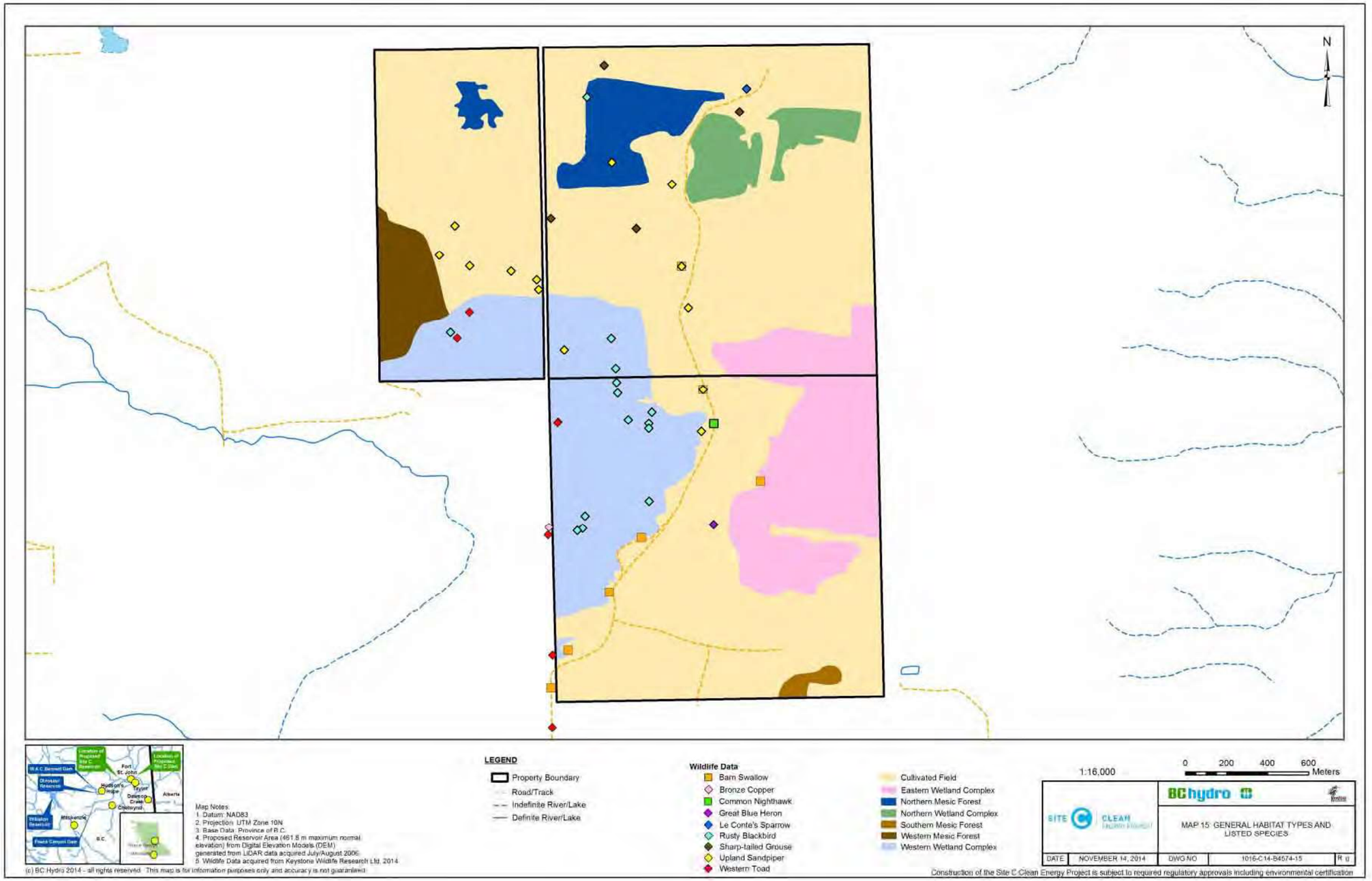
Other species observed incidentally in the general area adjacent to the Property include fisher (Blue-listed), mink, mule deer, and white-tailed deer.

4.0 DISCUSSION

The Property supports a number of rare plants and listed wildlife species. Seven distinct areas and three general habitat types were identified on the Property (**Map 14** and **Map 15**). A CDC list of Red- and Blue-species that could occur in each habitat type was generated and species occurrence was reviewed. Species occurrence and habitat features are summarized for each distinct area below.



Map 14 General Habitat Types and Rare Plant Species.



Map 15 Locations of Listed Species within Distinct Areas.

4.1 Wetland Complexes

The Property contains 194.5 ha's of wetland in three complexes, the largest of which is the western wetland complex. Nine different wetland site series were identified on the Property, seven of which are Red- or Blue-listed:

- Common cattail marsh (Wm05)
- Scrub birch / water sedge (Wf02)
- Hudson Bay clubrush-Red hook-moss (Wf10)
- Tamarack/ buckbean-shore sedge (Wf18)
- Bebb's Willow – Bluejoint (Ws03)
- Tamarack / water sedge/Fen Moss (Wb06)
- Black spruce / common horsetail / Sphagnum (Wb09)

Several wetlands within the western wetland complex were also considered to be Marl Fens. These calcareous fens are uncommon in British Columbia, as most portions of the province are lacking in the calcareous substrates that allow these wetlands to form. Marl fens are of high conservation priority, not only for the rarity of their vegetation type, but because they so often harbour rare species (Minnesota Department of Natural Resources 2011).

Rare species that were observed in wetland complexes on the Property include:

- The Blue-listed western toad (*Anaxyrus boreas*) is the only listed amphibian known to occur in the area. They are found in a variety of aquatic and terrestrial habitats, breeding in shallow, littoral zones of lakes, temporary and permanent pools and wetlands, bogs, fens, and roadside ditches (BC Conservation Data Centre 2014e).
- The Blue-listed Rusty Blackbirds (*Euphagus carolinus*) breeding habitat consists of moist coniferous woodlands, bushy bogs and fens (COSEWIC 2006; BC Conservation Data Centre 2012h).
- The Blue-listed bronze copper (*Lycaena Hyllus*) is associated with sedge wetland and herbaceous riparian habitats (Hilton et al. 2013d).
- Five species of bats, including the blue-listed northern myotis (*Myotis septentrionalis*) were confirmed on the Property. Bats were detected in the western wetland complex but this is a function of the sampling method rather

than habitat preference, since detectors are placed near water where insects congregate and bats come to feed and drink.

Other wetland-associated wildlife species that were not found during surveys but could potentially occur in the area include (BC Conservation Data Centre 2014b):

- Two blue-listed dragonfly and damselfly species could occur on the Property: prairie bluet (*Coenagrion angulatum*) and Hagen's bluet (*Enallagma hageni*). Both species breed in ponds, fens, bogs and marshes (Cannings 2002). There are multiple location records, including from Site C baseline surveys, of prairie bluets within the Peace River area (Royal British Columbia Museum and the Spencer Entomological Museum 2004a; Hilton et al. 2013d). There is one record of Hagen's bluet from the Peace Region (Royal British Columbia Museum and the Spencer Entomological Museum 2004b).
- The American Bittern (*Botaurus lentiginosus*) is a blue-listed solitary species that generally occurs at low densities (The Nature Conservancy 1998). This small wading bird is a secretive species that rarely leaves heavy cover (BC Ministry of Water, Land and Air Protection 2004), inhabiting riparian areas, marshes, wet meadows, and wetlands. This species was found in the Peace Region (Cooper Beauchesne and Associates Ltd 2009) though none were recorded during Site C baseline surveys (Hilton et al. 2013c).
- The Blue-listed Olive-sided Flycatcher (*Contopus cooperi*) nests in a variety of habitats including open forest and woodland with a mixture of wetlands, meadows, ponds and streams (Wright 1997). Olive-sided Flycatchers have been observed in the Peace River area (Ryder 1975; Preston 2008; Lambie 2011; Hilton et al. 2013c), the closest observation during Site C baseline surveys was within 40 km of the Property (Hilton et al. 2013c).
- The Red-listed Nelson's Sparrow (*Ammodramus nelsoni*) nests in freshwater marshes and wet meadows with dense emergent vegetation (BC Conservation Data Centre 2012c). Nelson's Sparrow has a small and localized breeding distribution restricted to the Peace Lowlands and Kiskatinaw Plateau (Campbell et al. 2001; Phinney 1998). Nelson's Sparrow were observed within 40 km of the Property during Site C baseline surveys (Hilton et al. 2013c).
- The Blue-listed Short-billed Dowitcher (*Limnodromus griseus*) is a shorebird whose breeding habitat consists of mossy tundra or wet meadows (BC

Conservation Data Centre 2012j). In the Peace Region, the Short-billed Dowitcher is considered a seasonal resident and a probable breeder (BC Conservation Data Centre 2012k). Siddle (2010) reports several sightings of solitary birds throughout spring and into fall near Fort St. John. No Short-billed Dowitchers were observed during Site C baseline surveys (Hilton et al. 2013c).

- The Red-listed Yellow Rail (*Coturnicops noveboracensis*) is a wading bird most frequently found in wet sedge-dominated areas. The species is very secretive and rarely leaves the cover of dense wetland vegetation during the breeding season. Yellow Rails are rare in the province with most records from the Peace Region (Alvo and Robert 1999; BC Conservation Data Centre 2012g). Yellow Rails were observed within 40 km of the Property during Site C baseline surveys (Hilton et al. 2013c).

4.1.1 Western Wetland Complex

The large wetland complex located on the western side of the Property supports several listed species and listed ecosystems (**Map 14** and **Map 15**). This 102 ha wetland complex contains subxeric to hygric forests (103, 101, 104 and 111) and 9 different wetland types (**Appendix D**). Wetlands account for 44% of the area, while mesic (101) and moist (111) forests account for 26% and 20%, respectively.

One Red-listed ecosystem was documented in this wetland complex. The Hudson's Bay clubrush / rusty hook-moss (Wf10) was documented in one 6.5 ha area in the south central portion of the wetland complex. One plot was completed to confirm the occurrence of this ecosystem.

Seven Blue-listed ECAR were documented in this wetland complex. These include:

- White Spruce / red swamp currant / horsetails (111) – 20.6 ha and 4 plots confirming its occurrence.
- Tamarack / water sedge / fen Moss (Wb06) – 25.9 ha and 4 plots confirming its occurrence
- Black spruce / common horsetail / sphagnum (Wb09) – 5.9 ha and 3 plots confirming its occurrence
- Scrub birch / water sedge (Wf02) – 0.5 ha and 2 plots confirming its occurrence
- Tamarack / buckbean / shore sedge (Wf18) – 3.8 ha and 4 plots confirming its occurrence

- Common cattail marsh (Wm05) – 0.04 ha and no plots
- Ws03 – 0.3 ha and no plots

This wetland complex also contained several marl deposits. Three areas were identified where the marl precipitates were highly concentrated. These deposits were present in TEM polygons 80, 61 and 16, though the extent of the Marl is not represented by the polygon boundary. More specifically, two areas were located north and south of an area of high ground (polygons 20, 9 and 19) in the centre of the complex. The third area was in the northern section of polygon 16. Local conditions that allow the marl to accumulate to the degree observed in these areas is uncommon regionally and provincially.

This wetland complex contains the greatest diversity and abundance of rare plants found on the Property. Listed rare-plant species found in this fen complex include: tawny paintbrush, slender-leaf sundew, northern bog bedstraw, bog rush, small-flowered lousewort, autumn willow, and purple stemmed aster. The Red-listed tawny paintbrush was found in grasslands and open forests of the western wetland complex. The Red-listed slender-leaf sundew was found in the open portions of the marl fen. The Blue-listed northern bog bedstraw occurrence was observed with sedges and other herbs in the fen and the surrounding forest. The Blue-listed bog rush was found growing in a community of low trees and shrubs, sedges, and other herbs, in the ecotone between open and shrub portions of a marl fen. The Blue-listed small-flowered lousewort was found growing with sedges and other herbs in a series of patterned and non-patterned shrub fens. The Blue-listed autumn willow was found in a clearing within mixed bog forest at the edge of a shrub fen. The Blue-listed purple stemmed aster was found in transitional zones between mixed upland forest and fen wetlands. More details can be found in **Appendix G.**

Listed wildlife species observed in the western wetland complex include bronze copper, western toad, and Rusty Blackbird. Eighteen Rusty Blackbirds were observed during breeding bird surveys in 2014 and 11 were observed incidentally in the fall of 2014. Nine western toads were observed during pond surveys and incidentally in 2012 and 2014. In addition, several thousand tadpoles were observed during amphibian surveys, but could not be identified to the species level. One bronze copper was observed incidentally during dragonfly surveys.

The western wetland complex was also relatively undisturbed compared to the rest of the Property. Although cattle had grazed the periphery, the complex was likely too wet

for cattle to venture into the interior. Livestock use of wetlands can change the vegetation structure and composition of a wetland as well as affect the habitat value for wildlife species (Jones et al. 2010). Given the number of rare plants, ecosystems and wildlife species documented in this wetland complex the structure and function should be maintained.

4.1.2 Eastern Wetland Complex

The eastern wetland complex contains submesic to hygric forests (103, 101 and 104) and two wetland types (**Appendix D**). This 73 ha wetland complex is predominantly nutrient poor forest (104, 75%) with a small wetland component (5%).

One blue-listed ECAR was documented in the wetland (Wf02). The occurrence of this ECAR was confirmed with one plot. This 0.5 ha wetland was located in the south-east portion of the wetland.

In the eastern wetland complex one Red-listed rare plant, tawny paintbrush (*Castilleja miniata ver. fulva*), was observed. Tawny paintbrush is not a wetland associated species. A sub-occurrence was observed in the forested area of the eastern wetland complex.

The eastern wetland complex provides breeding habitat for amphibians. Tadpoles were observed in the wetlands within this complex, though they could not be identified to the species. A single Barn Swallow was observed along the edge of this wetland/forest complex, but this observation was likely associated with the breeding habitat in the adjacent cultivated field. Barn Swallows are discussed in more detail under cultivated fields.

Disturbance was evident throughout this wetland complex with evidence of cattle grazing and tree clearing.

4.1.3 Northern Wetland Complex

The northern wetland complex contains mesic to hygric forests (104) and two wetland types (**Appendix D**). This 19 ha wetland complex is composed of 73% nutrient poor forest (104) and 26% wetland.

One blue-listed ECAR (Ws03) as documented in this wetland complex. The occurrence of this ECAR was confirmed with one plot. This 1.5 ha wetland was located in the eastern portion of this complex.

One occurrences of purple-stemmed aster was reported in the northern wetland complex. The purple-stemmed aster was growing in a shrubby graminoid-dominated marsh and meadow area. No listed wildlife species were found, though the area contains amphibian breeding habitat.

Disturbance was evident throughout this wetland complex with evidence of cattle grazing and tree clearing.

4.2 Cultivated fields

The majority (63%) of the Property is classified as cultivated field, and is actively grazed by cattle during the summer. The cultivated field was spilt into northern and southern areas. The Northern area is 263.7 ha and the southern is 134.2 ha. Cultivated fields provide important breeding and grazing habitat for a variety of wildlife species.

Rare species that were observed in cultivated fields on the Property include:

- Barn Swallows (*Hirundo rustica*) are a Blue-listed swallow that often nest in barns or other anthropogenic structures. Barn Swallows frequently use agricultural fields and wetlands to forage for insects (BC Conservation Data Centre 2012i).
- The Blue-listed Sharp-tailed Grouse (*Tympanuchus phasianellus*) require a mosaic of dense grass and shrubs with forb and insect foods during nesting and brood rearing (BC Conservation Data Centre 2012k). Active leks in the Peace Region have been found in a range of vegetated states, including fallow fields, grassy pastures, hayfields, cereal crop fields, and naturally vegetated clearings (Goddard 2010).
- Upland Sandpipers (*Bartramia longicauda*) are Red-listed and prefer large areas of short grass for feeding and courtship and adjacent taller grasses for nesting and brood cover (BC Conservation Data Centre 2014f). Upland Sandpipers have been observed in open fields, roadside edges and recently burned fields by Siddle (2005), who also reported that the main breeding area for Upland Sandpipers in the province is in the Peace Region.
- Common Nighthawk (*Chordeiles minor*) (SARA listed, Schedule 1 – Threatened) nesting habitat includes open areas, fields and grasslands as well as coniferous forests (BC Conservation Data Centre 2012f).
- The Blue-listed Le Conte's Sparrow (*Ammondramus leconteii*) will breed in wetlands, prairie, grassland, and idle pasture habitats, among others (BC

Conservation Data Centre 2012b). They are rare in the Peace River valley (Penner 1976), but historical records exist for the area (Thurber Consultants Ltd 1976).

Other species associated with cultivated fields that were not found during surveys but could potentially occur in the area include (BC Conservation Data Centre 2014b):

- Two Blue-listed butterflies may occur on the Property. Common ringlets (*Coenonympha tullia benjamini*) were observed during Site C baseline surveys in wet to dry forests; wetlands; roads; cultivated fields; steep, dry shrub/herb dominated slopes; and along the river (Hilton et al. 2013d). During Site C baseline surveys common woodnymphs (*Cercyonis pegala nephele)* were observed in moist to dry forests; wetlands; cultivated fields; steep, dry shrub/herb dominated slopes; and along the river (Hilton et al. 2013d). Common Ringlets have been found within 10 km of the Property. Common woodnymphs have been found within 50 km of the Property (Hilton et al. 2013d).
- The Blue-listed Short-eared Owl (*Asio flammeus*) is known to nest in broad expanses of open land with low vegetation (BC Conservation Data Centre 2012d). Short-eared Owls were observed within 5 km of the Property (Hilton et al. 2013b).
- American Bittern and Short-billed Dowitcher can also use cultivated fields. These species were described in more detail under wetlands.

4.2.1 Northern Cultivated Field

The Le Conte's Sparrow, the Upland Sandpiper and the Sharp-tailed Grouse were all observed in the northern cultivated field. No leks were observed during surveys, although discussions with the previous land owner confirmed the historical presence of a lek in the north-eastern portion of the Property, north of the forested sites. Both mule deer and elk have been observed grazing in the area, and signs of moose were also observed.

4.2.2 Southern Cultivated Field

No Le Conte's Sparrow or Sharp-tailed Grouse were detected in the southern cultivated field despite the presence of suitable habitat. Most Upland Sandpipers were also found in the northern cultivated field. Proximity to the highway or the location of neighbouring cultivated fields may be a factor influencing the occurrence of these species.

Barn Swallows were detected in the southern cultivated field. The presence of several abandoned buildings and silos provide potential breeding habitat, and the adjacent cultivated fields provide good Barn Swallow foraging habitat (BC Conservation Data Centre 2012i). A Barn Swallow nest was also found in an abandoned silo at the southern end of the Property. Barn Swallows were not observed on the nest, but an individual was seen leaving the silo immediately prior to the nest discovery.

A single Common Nighthawk was observed incidentally in the southern cultivated field. Nesting habitat for this species is present throughout the cultivated fields on the Property.

4.3 Mesic Forests

The mesic forest complexes make up 7% of the Property area. Mesic forests were split into three distinct areas, scattered across the Property. These are relatively small treed areas ranging from 2.6 to 23.4 ha.

Rare species that were observed in mesic forests on the Property include:

- The Blue-listed Northern Myotis (*Myotis septentrionalis*) is a forest-dependent species that forages and travels preferentially in forested habitats (Jung et al. 1999; Henderson and Broders 2008).

Other species associated with mesic forests that were not found during surveys but could potentially occur in the area include (BC Conservation Data Centre 2014b):

- Listed butterfly species that could occur in the forested areas of the Property include five Red-listed species: eastern pine elfin (*Callophrys niphon*), arctic skipper (*Carterocephalus palaemon mandan)*, assinboine skipper (*Hesperia assiniboia*,), Phillip's arctic (*Oeneis philipi*) and great spangled fritillary (*Speyeria cybele pseudocarpenteri)*; and four Blue-listed species: common woodnymph (*Cercyonis pegala nephele)*, common ringlet (*Coenonympha tullia benjamini)*, tawny crescent (*Phyciodes batesii)*, and Aphrodite fritillary (*Speyeria aphrodite Manitoba)* (BC Conservation Data Centre 2014a). Aphrodite fritillary, arctic skipper, great spangled fritillary and tawny crescent were all detected within 10 km of the Property during Site C baseline surveys (Hilton et al. 2013d).
- The Olive-sided Flycatcher breeds in diverse habitats including old-growth forest; young second-growth forest; burns; recent cutblocks where snags and stubs

remain (Campbell et al. 1997); and open forest and woodlands with a mixture of wetlands, meadows, ponds, and streams (Wright 1997). Additional details for Olive-sided Flycatcher are described under wetlands.

- Black-throated Green Warblers (*Setophaga virens*) are a Blue-listed species that breed in riparian stands of white spruce or mixed stands of mature white spruce - trembling aspen - balsam poplar (Campbell et al. 2001). Site C baseline surveys found Black-throated Green Warblers in coniferous and seral forests within 10 km of the Property (Hilton et al. 2013c).
- The Blue-listed Broad-winged Hawk (*Buteo platypterus*) has a limited distribution in BC and is rare in the Peace River area (Campbell et al. 1990). Evidence of breeding has been observed in the Peace Region (Phinney 2003; Hilton et al. 2013b), but the size of the regional breeding population is unknown. Broad-winged Hawks nest in broadleaf and mixed forests, preferring denser situations near wet areas and forest openings (BC Conservation Data Centre 2012e). A Broad-winged Hawk was observed within 15 km of the Property during Site C baseline surveys (Hilton et al. 2013b).
- The forested areas on the Property may also provide habitat for several mammals including the Blue-listed fisher. There is a patch of windthrow just inside the northern mesic forest that could be potential resting habitat for fisher. Tracked fisher were not found to use the Property but a fisher home range was within 5 km of the Property (Simpson et al. 2013). Due to the lack of old-growth forest, there are very few cavity trees that could support fisher reproduction, though the area could be used for resting or foraging.

4.3.1 Northern Mesic Forest

The northern mesic forest is approximately 25.5 ha in size and consists of sub mesic to hygric forests (103, 101 and 104). Mesic forests (101) is the predominant forest type (55%).

Two listed rare plant species were found in the northern mesic forest: tawny paintbrush (*Castilleja miniata* var, *fulva*) and purple stemmed aster (*Symphyotrichum puniceum* var, *puniciem*). The tawny paintbrush was found in an open forest area. The purple stemmed aster was growing in the transitional zones between a mixed upland forest and a fen wetland. There are several occurrences of these rare plant species throughout the Property.

A single observation of a Upland Sandpiper and of a Rusty Blackbird were recorded in the northern mesic forests. Upland Sandpipers do not use forest habitats for any life requisites, and this observation is unusual. Rusty Blackbirds use mixed forests occasionally, but are not thought to breed in these habitats (BC Conservation Data Centre 2012h). The presence of these species in the mesic forests is likely associated with the adjacent suitable habitat.

4.3.2 Southern Mesic Forest

The southern mesic forest consists of 2.6 ha of mesic forest (101).

One Blue-listed rare plant was observed in the southern mesic forest. Autumn willow (*Salix serissma*), was found growing with other willows in an area approximately 20 square metres in size, within a shrub- and sedge-dominated marsh (which was dry at the time of survey).

4.3.3 Western Mesic Forest

The western mesic forest consists of 16.8 ha of mesic forest (101).

One blue-listed ECAR (Ws03) as documented in this mesic forest during field work (one plot). The occurrence of this ecosystem was not mapped because it is too small and could not be differentiated on the air photo.

Tawny Paintbrush was the only listed species identified in the western mesic forest. It was found in the open forest and cut lines of the Property.

5.0 LITERATURE CITED

Alberta Native Plant Council. 2000. Alberta Native Plant Council Guidelines for Plant Surveys in Alberta. Edmonton, AB. Available at: http://www.anpc.ab.ca/assets/rareplant.pdf.

Alberta Native Plant Council. 2012. ANPC Guidelines for Rare Vascular Plant Surveys in Alberta - 2012 Update. Prepared for Alberta Native Plant Council, Edmonton, AB.

Alvo, R. and M. Robert. 1999. COSEWIC Status Report on the Yellow Rail *Coturnicops noveboracensis* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

BC Conservation Data Centre. 2014a. BC Species and Ecosystems Explorer. BC Ministry of Environment, Victoria, BC.

BC Conservation Data Centre. 2014b. Conservation Status Report: *Cygnus buccinator. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/.*

BC Conservation Data Centre. 2004. Ecological Communities in British Columbia: Conservation Status Assessment Factors. BC Ministry of Environment, Victoria, BC. Available at: http://www.env.gov.bc.ca/cdc/documents/ConsStatusAssessFactors.pdf.

BC Conservation Data Centre. 2014c. Endangered species and ecosystems - masked occurrences (spatial data). BC Ministry of Environment, Lands And Parks, Victoria, BC. Available at: http://a100.gov.bc.ca/pub/eswp/.

BC Conservation Data Centre. 2014d. Endangered species and ecosystems - non-sensitive occurrences (spatial data). BC Ministry of Environment, Lands, and Parks, Victoria, BC. Available at: https://apps.gov.bc.ca/pub/dwds/home.so.

BC Conservation Data Centre. 2012a. Field survey form (plants). Available at: http://www.env.gov.bc.ca/cdc/contribute.html.

BC Conservation Data Centre. 2012b. Species Summary: *Ammodramus leconteii. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=14254.*

BC Conservation Data Centre. 2012c. Species Summary: *Ammodramus nelsoni. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=17615.*

BC Conservation Data Centre. 2014e. Species Summary: *Anaxyrus boreas. BC Ministry of Environment, Victoria, BC. Available at: http://a100.gov.bc.ca/pub/eswp/. Accessed March 2014.*

BC Conservation Data Centre. 2012d. Species Summary: *Asio flammeus. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=14271.*

BC Conservation Data Centre. 2014f. Species Summary: *Bartramia longicauda. BC Ministry of Environment.*

BC Conservation Data Centre. 2012e. Species Summary: *Buteo platypterus. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=14687.*

BC Conservation Data Centre. 2012f. Species Summary: *Chordeiles minor. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/.*

BC Conservation Data Centre. 2012g. Species Summary: *Coturnicops noveboracensis. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=14150.*

BC Conservation Data Centre. 2012h. Species Summary: *Euphagus carolinus. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=15505.*

BC Conservation Data Centre. 2012i. Species Summary: *Hirundo rustica. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=17978.*

BC Conservation Data Centre. 2012j. Species Summary: *Limnodromus griseus. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=14983.*

BC Conservation Data Centre. 2012k. Species Summary: *Tympanuchus phasianellus. BC Ministry of Environment. Available at: http://a100.gov.bc.ca/pub/eswp/speciesSummary.do?id=17959.*

BC Ministry of Environment. 2009. Conservation Framework: Conservation Priorities for Species and Ecosystems. Victoria, BC. Available at: http://www.env.gov.bc.ca/conservationframework/documents/CF_Primer.pdf.

BC Ministry of Environment, Lands and Parks and BC Ministry of Forests. 1998. Field Manual for Describing Terrestrial Ecosystems. Land Management Handbook 25. Available at: http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/Lmh25.htm.

BC Ministry of Water, Land and Air Protection. 2004. Wildlife Habitat Features Summary of Management Guidelines Northern Interior Forest Region. Ministry of Water, Land and Air Protection, Biodiversity Branch, Victoria, BC.

Bizecki-Robson, D. 1998. Guidelines for Rare Plant Surveys. Prepared for Native Plant Society of Saskatchewan, Saskatoon, SK.

Brouillet, L., J.C. Semple, G.A. Allen, K.L. Chambers and S.D. Sundberg. 2006. Symphotrichum. In: Flora of North America Editorial Committee (ed.), Flora of North America North of Mexico. Volume 20, Magnoliophyta: Asteridae, part 7: Asteraceae, part 2. Oxford University Press, New York, NY. Pp. 465–539.

California Native Plant Society. 2001. CNPS Botanical Survey Guidelines. California Native Plant Society, Sacramento, CA. Available at: https://www.cnps.org/cnps/rareplants/pdf/cnps_survey_guidelines.pdf.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser and M.C.E. McNall. 1990. The Birds of British Columbia Volume 2: Non-passerines. Diurnal birds of prey through woodpeckers. Royal British Columbia Museum and Canadian Wildlife Service, Victoria, BC.

Campbell, R.W., N.K. Dawe, I. McTaggart-Cowan, J.M. Cooper, G.W. Kaiser and M.C.E. McNall. 2001. The Birds of British Columbia Volume 4: Passerines. Wood-warblers through Old World sparrows. BC Ministry of Environment, Lands and Parks, Canadian Wildlife Service and Royal British Columbia Museum, Vancouver, BC.

Campbell, R.W., G.E. Smith, M.C.E. McNall, G.W. Kaiser, J.M. Cooper, I. McTaggart-Cowan and N.K. Dawe. 1997. The Birds of British Columbia Volume 3: Passerines. Flycatchers through vireos. Royal British Columbia Museum and Canadian Wildlife Service, Victoria, BC.

Cannings, R.A. 2002. Introducing the Dragonflies of British Columbia and the Yukon. Royal British Columbia Museum, Victoria, BC.

Cody, W.J. 1996. Flora of the Yukon Territory. NRC Research Press, Ottawa, ON.

Cooper Beauchesne and Associates Ltd. 2009. Wetland Inventory and Management of Conservation Framework Priority Species. Report to BC Ministry of Environment, Fort St. John, BC.

COSEWIC. 2006. COSEWIC Assessment and Status Report on the Rusty Blackbird *Euphagus carolinus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON.

COSEWIC. 2014. Database of wildlife species assessed by COSEWIC. Committee on the Status of Endangered Wildlife in Canada, Ottawa, ON. Available at: http://www.cosewic.gc.ca/eng/sct1/searchform_e.cfm. Accessed May 2012.

DeLong, C. 2011. Land Units and Benchmarks for Developing Natural Disturbance-based Forest Management Guidance for Northeastern British Columbia. Tech. Rep. 059. BC Ministry of Forests and Range, Forest Science Program, Victoria, BC. Available at: www.for.gov.bc.ca/hfd/pubs/Docs/Tr/Tr059.htm.

DeLong, C., A. Banner, W. MacKenzie, B.J. Rogers and B. Kaytor. 2010. A Field Guide to Ecosystem Identification for the Boreal White and Black Spruce Zone of British Columbia. Land Management Handbook 65. BC Ministry of Forests and Range Forest Science Program, Victoria, BC.

DeLong, C., A. MacKinnon and L. Jang. 1990. A Field Guide for Identification and Interpretation of Ecosystems of the Northeast Portion of the Prince George Forest Region. Land Management Handbook 22. BC Ministry of Forests.

Demarchi, D.A. 2011. The British Columbia Ecoregion Classification. 3rd Edition. Ecosystem Information Section, BC Ministry of Environment, Victoria, BC. Available at: http://www.env.gov.bc.ca/ecology/ecoregions/index.html.

Douglas, G.W., G.B. Straley and D.V. Meidinger. 1998. Rare Native Vascular Plants of British Columbia. BC Ministry of Environment, Lands and Parks, Victoria, BC.

Flora of North America Editorial Committee (ed). 1993. Flora of North America North of Mexico (Multiple Volumes). The Flora of North America Association, New York, NY.

Goddard, A. 2010. Reproductive Success and Habitat Use by Sharp-tailed Grouse in the Peace River Region. BC Ministry of Environment.

Government of Canada. 2002. The Species At Risk Act (SARA): A Guide. Environment Canada.

Goward, T. 1994. Notes on old-growth dependent epiphytic macrolichens in inland British Columbia, Canada. Acta Botanica Fennica 150:31–38.

Goward, T. 1999. The Lichens of British Columbia: Illustrated Keys. Part 2 - Fruticose Species. Special Report Series 9. BC Ministry of Forests, Research Branch, Victoria, BC.

Henderson, D.C. 2009. Occupancy Survey Guidelines for Prairie Plant Species at Risk. Prepared for Canadian Wildlife Service, Prairie and Northern Region, Saskatoon, SK. Available at: http://www.ec.gc.ca/publications/default.asp?lang=En&xmi=156699D4-DACA-413F-8EE9-80160BD62805. Accessed March 2012.

Henderson, L.E. and H.G. Broders. 2008. Movements and resource selection of the northern long-eared bat (*Myotis septentrionalis*) in a forest-agriculture landscape. Journal of Mammalogy 89(4):952–963.

Hilton, S., L. Andrusiak, R.S. Krichbaum, L. Simpson and C. Bjork. 2013a. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Part 1 Vegetation and Ecological Communities. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson and L. Andrusiak. 2013b. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Part 6 Raptors. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, L. Andrusiak and C. Albrecht. 2013c. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Part 4 Migratory Birds. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, L. Andrusiak and C.S. Guppy. 2013d. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Part 2 Butterflies and Dragonflies. Report to BC Hydro, Vancouver, BC.

Hitchcock, C.L., A. Cronquist, M. Ownbey and J.W. Thompson. 1955. Vascular Plants of the Pacific Northwest: Volumes 1-5. University of Washington Press, Seattle, WA.

Howes, D.E. and E. Kenk (eds). 1997. Terrain Classification System for British Columbia. Version 2 (Revised). BC Ministry of Environment, Lands and Parks, Victoria, BC.

Jones, W.M., L.H. Fraser and P.J. Curtis. 2010. Plant Commnity Functional Shifts in Response to Livestock Grazing in Intermountain Depresional Wetlands in British Columbia, Canada. Biological Conservation In Press.

Jung, T.S., I.D. Thompson, R.D. Titman and A.P. Applejohn. 1999. Habitat selection by forest bats in relation to mixed-wood stand types and structure in central Ontario. Journal of Wildlife Management 63(4):1306–1319.

Keystone Wildlife Research Limited. 2013. 2012 Vegetation and Wildlife Surveys conducted on the Morris property, Hudson's Hope, BC. Report to BC Hydro, Vancouver, BC.

Klinkenberg, B. 2014. E-Flora BC: Electronic Atlas of the Plants of British Columbia. Available at: http://eflora.bc.ca.

Lambie, V. 2011. Mackenzie Nature Observatory 2011 Annual Report. Mackenzie Nature Observatory, Mackenzie, BC.

Lawton, E. 1971. Moss Flora of the Pacific Northwest. Hattori Botanical Laboratory, Nichinan, Miyazaki, Japan.

MacDougall, A.S. and J.A. Loo. 2002. Predicting occurrences of geographically restricted rare floral elements with qualitative habitat data. Canadian Forest Service Environmental Reviews 10(3):167–190.

MacKenzie, W. and J.R. Moran. 2004. Wetlands of British Columbia: A guide to identification. Land Management Handbook 52. Research Branch, BC Ministry of Forests, Victoria, BC. Available at: http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh52.htm.

Minnesota Department of Natural Resources. 2011. Calcareous Fen Fact Sheet. Minnesota Board of Water and Soil Resources. Available at: http://www.bwsr.state.mn.us/wetlands/. Accessed December 2012.

NatureServe. 2014. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: http://www.natureserve.org/explorer. Accessed September 2014.

NatureServe Explorer. 2004. Habitat-based Plant Element Occurrence Delimitation Guidance. Available at: http://explorer.natureserve.org/decision_tree.htm. Accessed November 2014.

Penner, D.E. 1976. Peace River Site C and E Environmental Impact Studies: Wildlife Resources. Thurber Consultants Report to BC Hydro and Power Authority, Burnaby, BC.

Penny, J.L. and R. Klinkenberg. 2012. Protocols for Rare Vascular Plant Surveys. In: B. Klinkenberg (ed.), 2012. E-Flora BC: Electronic Atlas of the Flora of British Columbia [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver, BC. Available at: http://www.geog.ubc.ca/biodiversity/eflora/ProtocolsforRarePlantSurveys.html.

Phinney, M. 2003. Do Black-throated Green Warblers in northeast BC require riparian forest? British Columbia Birds 13:2–5.

Phinney, M. 1998. Spring and Summer Birds of Dawson Creek - 1991-1995. Wild Bird Trust of British Columbia Wildlife Report, West Vancouver, BC.

Preston, M.I. 2008. Monitoring Birds in TFL48 for Sustainable Forestry: Six year summary, occurrence of “listed” species, and pre-treatment herbicide application summary. Report to Canadian Forest Products Ltd, Chetwynd, BC.

Resources Inventory Committee. 2001. Inventory Methods for Raptors. Version 2.0. Standards for Components of British Columbia’s Biodiversity No. 11. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/tebiodiv/.

Resources Inventory Committee. 1998. Inventory Methods for Terrestrial Arthropods. Version 2.0. Standards for Components of British Columbia’s Biodiversity No. 40. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/tebiodiv/.

Resources Inventory Committee (RIC). 1996. Guidelines and Standards to Terrain Mapping in British Columbia. BC Ministry of Environment, Lands and Parks, Resource Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/earthsci/012/index.htm.

Resources Inventory Committee (RIC). 1998a. Inventory Methods for Bats. Version 2.0. Standards for Components of British Columbia’s Biodiversity No. 20. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC.

Resources Inventory Committee (RIC). 1999a. Inventory Methods for Forest and Grassland Songbirds. Version 2.0. Standards for Components of British Columbia’s Biodiversity No. 15. BC Ministry of Environment, Lands and Parks, Resource Inventory Branch, Victoria, BC.

Resources Inventory Committee (RIC). 1998b. Inventory Methods for Nighthawks and Poorwills. Version 2.0. Standards for Components of British Columbia’s Biodiversity No. 9. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/tebiodiv/.

Resources Inventory Committee (RIC). 1998c. Inventory Methods for Pond-breeding Amphibians and Painted Turtle. Version 2.0. Standards for Components of British Columbia's Biodiversity No. 37. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/tebiodiv/pond/assets/pond.pdf.

Resources Inventory Committee (RIC). 1997. Inventory Methods for Upland Gamebirds. Version 1.1. Standards for Components of British Columbia's Biodiversity No. 17. BC Ministry of Environment, Lands and Parks, Resources Inventory Branch, Victoria, BC. Available at: http://archive.ilmb.gov.bc.ca/risc/pubs/tebiodiv/.

Resources Inventory Committee (RIC). 1998d. Standard for Terrestrial Ecosystem Mapping in British Columbia. Province of BC, Victoria, BC.

Resources Inventory Committee (RIC). 1999b. Voucher Specimen Collection, Preparation, Identification and Storage Protocol: Plants & Fungi. Standards for Components of British Columbia's Biodiversity No. 4b. BC Ministry of Environment, Lands and Parks, Resource Inventory Branch, Victoria, BC. Available at: http://www.ilmb.gov.bc.ca/risc/pubs/tebiodiv/index.htm. Accessed March 2012.

Royal British Columbia Museum and the Spencer Entomological Museum. 2004a. *Coenagrion angulatum* in Royal Brtish Columbia Museum and the Spencer Entomological Museum.

Royal British Columbia Museum and the Spencer Entomological Museum. 2004b. *Enallagma hageni* in Royal British Columbia Museum and Spencer Entomological Museum.

Ryder, G. 1975. Survey of Birds in the Peace River Floodplain Habitats. Report to Birds of British Columbia Project.

Siddle, C. 2010. Birds of North Peace River (Fort St. John and Vicinity), British Columbia, 1975-1999: Part 2 (Passerines: Flycatchers through Old World Sparrows). Wildlife Afield 7(2):143–280.

Siddle, C. 2005. Migratory occurrence and status of select shorebirds in the vicinity of Fort St. John, British Columbia. Wildlife Afield 2:3–7.

Simpson, K., T.K. Simpson, L. Simpson, L. Andrusiak, S. Hilton, M. Kellner, R. Klafki, I. Mattson and A. Creagh. 2013. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Part 7 Mammals. Report to BC Hydro, Vancouver, BC.

The Nature Conservancy. 1998. Species Management Abstract: American Bittern (*Botaurus lentiginosus*). Available at: http://conserveonline.org/docs/2001/03/ambi.doc.

Thurber Consultants Ltd. 1976. Site C and E Hydroelectric Development Proposals. Lower Peace River Environmental Study. Volume IA. Report to BC Hydro and Power Authority, Lower Peace River.

Whiteaker, L., J. Henderson, R. Holmes, L. Hoover, R. Lesher, J. Lippert, E. Olson, L. Potash, J. Seevers, M. Stein and N. Wogen. 1998. Survey Protocols for Survey and Manage Strategy 2 Vascular Plants: V 2.0. Prepared For US Bureau of Land Management, Oregon. Available at: http://www.blm.gov/or/plans/surveyandmanage/SP/VascularPlants/cover.htm. Accessed November 2011.

Wright, J.M. 1997. Preliminary Study of Olive-sided Flycatchers, 1 July 1994 To 24 April, 1997. Final research report. Endangered Species Conservation Fund Federal Aid Studies SE-3-3, 4 and 5. Alaska Department of Fish and Game, Juneau, AK. Available at: http://www.wildlife.alaska.gov/index.cfm?adfg=concern.ol_fly.

APPENDIX A TEM MAP LEGEND

The Property is located in northeastern British Columbia approximately 3.5 km northwest of Hudson's Hope, on portions of 1:20,000 mapsheets 094A.001 and 094B.010. The 637 ha Property is within the Peace Forest District in the Northern Interior Forest Region.

The main ecosystems present on the Property are grazed pasture, wetlands of several different types, and mixed forest. Rare marl fen wetland types have been noted. Tree species present include white spruce (*Picea glauca*), lodgepole pine (*Pinus contorta*), black spruce (*Picea mariana*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*), subalpine fir (*Abies lasiocarpa*) and tamarack (*Larix laricina*).

The ecosystem mapping methodology used is standard Terrestrial Ecosystem Mapping (TEM; Resources Inventory Committee 1998). There are three levels of ecosystem classification applicable to this map: the ecosection unit, biogeoclimatic unit (subzones) and ecosystem unit. Ecosections are large physiographic units influenced by particular macroclimate processes and are characterized by all the plant communities and wildlife populations present (Demarchi 2011). The biogeoclimatic ecosystem classification system (BEC) describes the variation in climate, vegetation and site conditions occurring within an ecosection, and divides the area into subzones and their variants. Ecosystem units are defined for each subzone and are indicated in the map label by a 2-letter code, with site modifiers if applicable, followed by the structural stage at the time the area was mapped. Ecosystems were mapped according to the latest provincial field guidebooks (MacKenzie and Moran 2004; DeLong 2011) and the provincial list of two-letter map codes for non-vegetated or anthropogenic ecosystems.

The Property lies within the Peace River Basin ecoregion and the Peace Lowlands (PEL) ecosection. One subzone is present, the moist, warm Boreal White and Black Spruce (BWBSmw).

MAP BOUNDARIES

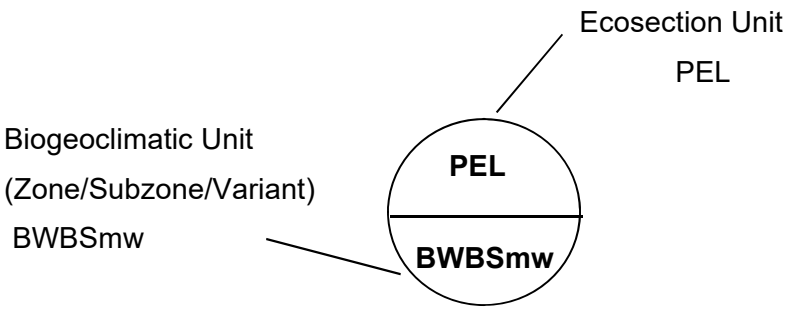
Ecosection Boundary

Study Area Boundary

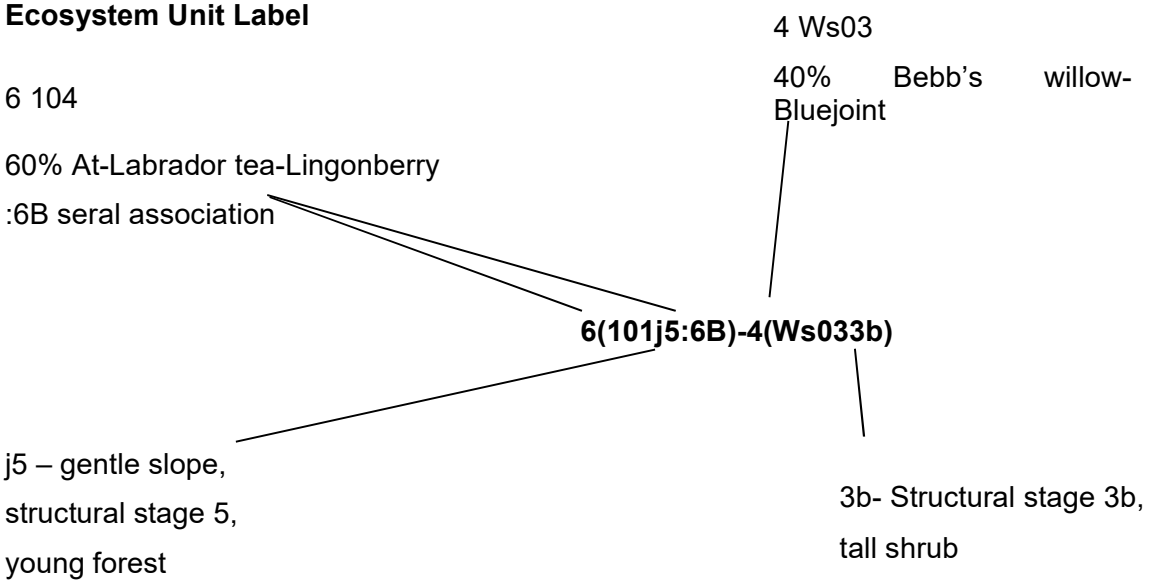
Ecosystem Map Unit

MAP LABEL FORMAT

Ecosection and Biogeoclimatic Unit Label



Ecosystem Unit Label



ECOSECTION

Peace Lowlands

The Property lies within the Peace Lowlands (PEL) ecosection. The Peace Lowlands ecosection is a blocky mountain area on the east side of the Rocky Mountains, with strong rainshadows (Demarchi 2011).

BIOGEOCLIMATIC SUBZONE

Moist, warm Boreal White and Black Spruce (BWBSmw)

The BWBSmw subzone is found on the rolling plains that extend from near the Alberta border, north to near the Beatton River (DeLong et al. 2010). Soils are generally fine-textured. Elevation ranges from 750 to 1050 m. Aspen forests are common due to past history of frequent fires. Balsam poplar occurs on moister sites. White spruce is present on moist to wetter sites where there has been limited fire history and human disturbance. Lodgepole pine occurs as a seral species on drier and poorer sites. Black spruce forests, often with a minor component of tamarack, are common on organic soils.

MAPPED ECOSYSTEMS

Site Series #	Seral Code	Ecosystem Name	Typical Conditions	Moisture Regime
BWBSmw				
101		Sw-Trailing raspberry-Step moss	gentle to moderate slopes	submesic-subhygric
103		SwPl-Soopolallie-Fuzzy-spiked wildrye	variable slope and slope position, often on glaciofluvial parent materials	submesic
104		Sb-Labrador tea-Step moss	Gentle slopes on medium to fine-textured soils	submesic-hygric
111		Sw-Currant-Horsetail	floodplains, gentle lower slopes or steeper cool aspects	subhygric-hygric
101	6B	At-Rose-Creamy peavine	Gentle to moderate slopes on level to upper slope positions	submesic-subhygric
103	6B	At-Rose-Fuzzy-spiked wildrye	Level to gentle slopes or on steep warm aspects	submesic
104	6B	At-Labrador tea-Lingonberry	Level to gentle slopes	submesic-subhygric
111	6B	At-Cow-parsnip-Meadowrue	level to gentle slopes; often along watercourses	mesic-subhygric
Wb06	-	Tamarack-Water sedge-Fen moss	Hummocky sites with deep peat	

Site Series #	Seral Code	Ecosystem Name	Typical Conditions	Moisture Regime
Wb09	-	Black spruce – Common horsetail-Sphagnum	Hummocky sites with shallow to deep peat veneer over mineral soils	
Wf01	-	Water sedge-Beaked sedge	Sedge fen subject to shallow flooding with late-season drawdown	
Wf02	-	Scrub birch-Water sedge	On thin to deep peat with fluctuating water table	
Wf10	-	Hudson Bay clubrush-Red hook-moss	Often underlain by marl, usually deep peat	
Wf18	-	Tamarack-Scrub birch-Buckbean	Patterned fen with mounded organic soils	
Wm01	-	Beaked sedge-Water sedge	Shallow marsh on mineral substrates with thin peat veneers	
Wm05	-	Cattail Marsh	Well-decomposed peat veneer over mineral soil	
Ws03	-	Bebb’s willow-Bluejoint	Peat veneer over fine-textured Gleysols	

SITE MODIFIERS

g gullying occurring, or in a gully bottom

h hummocky terrain

j gentle to moderate slope, <25% slope

k cool aspect (285-135 deg.; 25-100% slope)

m medium-textured soils

p peaty material at the surface

r ridge

w warm aspect slope (135 to 285 deg.; slope 25-100%)

ANTHROPOGENIC, SPARSELY VEGETATED OR NON-VEGETATED SITES

CF Cultivated field (incl. pastures)

OW Shallow open water

STRUCTURAL STAGE

1 Non-vegetated/Sparse (< 20 yrs since major disturbance unless disclimax ecosystem)

1a Non – vegetated (less than 5% vegetation cover)

1b Sparse (bryophyte and lichen-dominated communities) (less than 10% cover of vascular plants)

2 Herb (< 20 yrs old unless disclimax)

2a Forb-dominated (dominated by non-graminoid herbs)

2b Graminoid-dominated (dominated by grasses, sedges, reeds and rushes)

2d Dwarf Shrub (dominated by dwarf woody species)

3 Shrub (shrubs <10 m tall, < 20 yrs old for forested sites)

3a Low Shrub (shrubs < 2 m tall)

3b Tall Shrub (shrubs 2-10 m tall)

4 Pole /Sapling (trees > 10 m tall & usually < 40 yrs old)

5 Young Forest (trees > 10 m tall & 40-80 yrs old)

6 Mature Forest (trees > 10 m tall; 80-140 yrs old)

7 Old Forest (trees > 10 m tall; >140 yrs old)

DATA SOURCES

Vegetation Map Sheets 094A.001 and 094B.010. Province of BC.

Map Base: 1:20,000 TRIM maps as above.

DeLong, C., A. Banner, W. MacKenzie, B. J. Rogers, and B. Kaytor. 2011. *A Field Guide to Ecosystem Identification for the Boreal White and Black Spruce Zone of British Columbia*. Land Management Handbook 65. Victoria, BC: BC Ministry of Forests and Range Forest Science Program.

Demarchi, DA. 2011. *The British Columbia Ecoregion Classification* 3rd ed. Victoria, BC: Ecosystem Information Section, BC Ministry of Environment. Available at: http://www.env.gov.bc.ca/ecology/ecoregions/index.html.

MacKenzie, W. and J.R. Moran. 2004. *Wetlands of British Columbia: A guide to identification*. Research Branch, BC Ministry of Forests, Victoria, BC. Available at: http://www.for.gov.bc.ca/hfd/pubs/docs/lmh/lmh52.htm.

Resources Inventory Committee (RIC). 1998e. *Standard for Terrestrial Ecosystem Mapping in British Columbia*. Province of BC, Victoria, BC.

APPENDIX B CONVERSION OF TEM UNITS

The TEM for the Property was completed to the new TEM standards. Outlined in the table below is the new TEM codes that correspond to old TEM codes used for mapping the Site C Project.

Site Series	Map Code	Old Ecosystem Name	New Site Series	New Ecosystem Name
02	LL	Pl - Lingonberry - Velvet-leaved blueberry	102	Pl - Kinnikinnick - Ligonberry
03	SW	Sw - Wildrye - Peavine	103	SwPl - Soopolallie - Wildrye
04	BL	Sb - Lingonberry - Coltsfoot	104	Sb - Labrador tea - Step moss
01	AM	SwAt - Step moss	101	Sw - Trailing Raspberry - Stepmoss
05	SO	Sw - Current - Oak fern	110	Sw - Oak fern - Sarsaparilla
06	SC	Sw - Current - Bluebells	101	Sw - Trailing Raspberry - Stepmoss
07	SH	Sw - Current - Horsetail	111	Sw - Current - Horsetail
08	BT	Sb - Labrador tea - Sphagnum	Wb03	Sb - Ligonberry - Peatmoss
09	Fm02	ActSw - Red-osier dogwood	112	AcbSw - Mountain alder - Dogwood
10	TS	Tamarack - Sedge – Fen	Wb06	Lt - Water sedge - Fen moss
$02	ak	$At - Soopolallie - Kinnikinnick	102$6B.1	At - Soopolallie - Kinnikinnick
$03	as	$At - Soopolallie - Wildrye	103$6B.1	At - Rose - Fuzzy-spiked wildrye
$04	al	$At - Labrador tea	104$6B.1	At - Labrador tea - Ligonberry
$01	ap	$At - Creamy peavine	101$6B.1	At - Rose - Creamy peavine
$05	ab	$At - Black Twinberry	101$6B.1	At - Rose - Creamy peavine
$06	ao	$At - Oak-fern	110$6B.1	At - Highbush cranberry - Oak fern
$07	ac	$Ac - Cow parsnip	111$6B.1	Acb - Dogwood - Highbush-cranberry
$07	ac	$Ac - Cow parsnip	111$6B.2	At - Cow-parsnip - Meadowrue

APPENDIX C TERRESTRIAL ECOSYSTEM MAPPING

Site Series Number	Letter Code	Ecosystem Name	Site Modifier	Structural Stage	Structural Stage Modifier	Seral Code	Ha
00	CF	Cultivated Field		2	b		399.5
00	OW	Shallow Open Water					0.5
101		Sw-Trailing raspberry-Step moss		3			0.3
101		Sw-Trailing raspberry-Step moss	j	3			2.7
101		Sw-Trailing raspberry-Step moss		4			0.3
101		Sw-Trailing raspberry-Step moss	j	4			4.0
101		Sw-Trailing raspberry-Step moss		5			1.0
101		Sw-Trailing raspberry-Step moss	j	5			4.9
101		Sw-Trailing raspberry-Step moss	r	5			0.4
101		Sw-Trailing raspberry-Step moss	j	5			2.1
101		At-Rose-Creamy peavine		3		6B	11.8
101		At-Rose-Creamy peavine	j	3		6B	19.8
101		At-Rose-Creamy peavine		4		6B	0.9
101		At-Rose-Creamy peavine	j	4		6B	12.5
101		At-Rose-Creamy peavine	j	4		6B	13.5
101		At-Rose-Creamy peavine		5		6B	2.1
101		At-Rose-Creamy peavine	j	5		6B	1.6
103		SwPl-Soopolallie-Fuzzy-spiked wildrye	r	5			2.2
103		At-Rose-Fuzzy-spiked wildrye	j	3		6B	1.7
103		At-Rose-Fuzzy-spiked wildrye	j	3		6B	1.5
103		At-Rose-Fuzzy-spiked wildrye	j	4		6B	6.0
104		Sb-Labrador tea-Step moss		3			2.8
104		Sb-Labrador tea-Step moss	j	3			3.8

Site Series Number	Letter Code	Ecosystem Name	Site Modifier	Structural Stage	Structural Stage Modifier	Seral Code	Ha
104		Sb-Labrador tea-Step moss		4			2.2
104		Sb-Labrador tea-Step moss	j	4			16.1
104		Sb-Labrador tea-Step moss		4			2.1
104		Sb-Labrador tea-Step moss	j	4			1.9
104		Sb-Labrador tea-Step moss	j	5			4.6
104		Sb-Labrador tea-Step moss	j	5			25.0
104		At-Labrador tea-Lingonberry		3		6B	7.5
104		At-Labrador tea-Lingonberry	j	3		6B	8.9
104		At-Labrador tea-Lingonberry	j	4		6B	4.8
111		Sw-Currant-Horsetail	j	3			2.0
111		Sw-Currant-Horsetail		4			0.3
111		Sw-Currant-Horsetail	j	4			3.9
111		Sw-Currant-Horsetail		5			0.9
111		Sw-Currant-Horsetail	j	5			7.2
111		At-Cow-parsnip-Meadowrue		3		6B	0.1
111		At-Cow-parsnip-Meadowrue	j	4		6B	0.9
Wb06		Tamarack-Water sedge-Fen moss	p	3			0.2
Wb06		Tamarack-Water sedge-Fen moss	p	3	b		25.7
Wb09		Black spruce – Common horsetail-Sphagnum		3			0.4
Wb09		Black spruce – Common horsetail-Sphagnum	p	4			3.2
Wb09		Black spruce – Common horsetail-Sphagnum	p	5			2.3
Wf01		Water sedge-Beaked sedge		2	b		4.4
Wf01		Water sedge-Beaked sedge		2			3.6
Wf02		Scrub birch-Water sedge		2	b		0.2

Site Series Number	Letter Code	Ecosystem Name	Site Modifier	Structural Stage	Structural Stage Modifier	Seral Code	Ha
Wf02		Scrub birch-Water sedge		3	a		0.7
Wf10		Hudson Bay clubrush-Red hook-moss		2	b		6.5
Wf18		Tamarack-Scrub birch-Buckbean		3			1.3
Wf18		Tamarack-Scrub birch-Buckbean		3	b		1.4
Wf18		Tamarack-Scrub birch-Buckbean		4			1.1
Wm01		Beaked sedge-Water sedge		2	b		0.2
Wm05		Cattail Marsh		2	b		0.0
Ws03		Bebb's willow-Bluejoint		3	b		1.8
Total							**637.2**

APPENDIX D TEM SUMMARY OF DISTINCT AREAS

Distinct Area	Site Series Number	Letter Code	Site Modifier	Structural Stage	Structural Stage Modifier	Seral	Ha
Eastern Wetland Complex	00	CF		2	b		0.4
	101			4			0.3
	101		j	4			1.0
	101			5			1.0
	101		j	5			2.1
	101		j	3		6B	8.5
	103		j	3		6B	1.7
	104			3			2.2
	104		j	3			3.8
	104			4			4.3
	104		j	4			12.9
	104		j	5			25.0
	104			3		6B	3.8
	104		j	3		6B	2.9
	Wf01			2	b		2.7
	Wf02			3	a		0.5
Northern Cultivated Field	00	CF		2	b		263.5
	00	OW					0.2
Northern Mesic Forest	101			3		6B	2.0
	101		j	3		6B	6.0
	101		j	4		6B	6.1
	103		j	4		6B	6.0
	104			3			0.7
	104		j	5			2.0
	104		j	5			2.6
Northern Wetland Complex	104			3		6B	3.6
	104		j	3		6B	5.9
	104		j	4		6B	4.8
	Wf01			2			3.6
	Ws03			3	b		1.5
Southern Cultivated Field	00	CF		2	b		134.2
Southern Mesic Forest	101		j	3			2.6
Western Mesic Forest	101			3		6B	8.4
	101		j	4		6B	8.4
Western Wetland Complex	00	CF		2	b		1.4
	00	OW					0.2

Distinct Area	Site Series Number	Letter Code	Site Modifier	Structural Stage	Structural Stage Modifier	Seral	Ha
	101			3			0.3
	101		j	3			0.1
	101		j	4			3.0
	101		j	5			4.9
	101		r	5			0.4
	101			3		6B	1.4
	101		j	3		6B	5.2
	101			4		6B	0.9
	101		j	4		6B	6.2
	101			5		6B	2.1
	101		j	5		6B	1.6
	103		r	5			2.2
	103		j	3		6B	1.5
	104		j	4			5.1
	111		j	3			2.0
	111			4			0.3
	111		j	4			8.2
	111			5			1.9
	111		j	5			7.2
	111			3		6B	0.1
	111		j	4		6B	0.9
	Wb06		p	3			0.2
	Wb06		p	3	b		25.7
	Wb09			3			0.4
	Wb09		p	4			3.2
	Wb09		p	5			2.3
	Wf01			2	b		1.7
	Wf02			2	b		0.2
	Wf02			3	a		0.3
	Wf10			2	b		6.5
	Wf18			3			1.3
	Wf18			3	b		1.4
	Wf18			4			1.1
	Wm01			2	b		0.2
	Wm05			2	b		0.0
	Ws03			3	b		0.3
TOTAL							**637.2**

APPENDIX E POTENTIAL RARE PLANT OCCURRENCE ON PROPERTY

Group	Taxon	Common Name	BCList	COSEWIC	SARA
vascular	*Acorus americanus*	American Sweet-flag	Blue		
vascular	*Alopecurus magellanicus*	Alpine Meadow-foxtail	Red		
vascular	*Anemone canadensis*	Canada Anemone	Blue		
vascular	*Anemone virginiana var. cylindroidea*	Riverbank Anemone	Blue		
vascular	*Arctophila fulva*	Pendantgrass	Blue		
vascular	*Artemisia alaskana*	Alaskan Sagebrush	Blue		
vascular	*Artemisia herriotii*	Herriot's Sage	Red		
vascular	*Astragalus bourgovii*	Bourgeau's Milk-vetch	Blue		
vascular	*Astragalus umbellatus*	Tundra Milk-vetch	Blue		
vascular	*Astragalus vexilliflexus var. vexilliflexus*	Bent-flowered Milk-vetch	Blue		
vascular	*Atriplex gardneri var. gardneri*	Gardner's Sagebrush	Red		
vascular	*Avenula hookeri*	Spike-oat	Blue		
vascular	*Boechera sparsiflora*	Stretching Suncress	Red		
vascular	*Botrychium ascendens*	Upswept Moonwort	Red		
vascular	*Botrychium crenulatum*	Dainty Moonwort	Blue		
vascular	*Botrychium lineare*	Linear-leaf Moonwort	Red		
vascular	*Botrychium montanum*	Mountain Moonwort	Red		
vascular	*Botrychium paradoxum*	Two-spiked Moonwort	Red		
vascular	*Botrychium pedunculosum*	Stalked Moonwort	Blue		
vascular	*Botrychium simplex var. compositum*	Least Moonwort	Blue		
vascular	*Botrychium spathulatum*	Spoon-shaped Moonwort	Blue		
vascular	*Botrychium yaaxudakeit*	Yakutat Moonwort	Red		
vascular	*Braya glabella ssp. glabella*	Smooth Northern-Rockcress	Red		
vascular	*Calamagrostis montanensis*	Plains Reedgrass	Blue		
vascular	*Carex bicolor*	Two-coloured Sedge	Blue		
vascular	*Carex heleonastes*	Hudson Bay Sedge	Blue		
vascular	*Carex lapponica*	Lapland Sedge	Blue		
vascular	*Carex membranacea*	Fragile Sedge	Blue		
vascular	*Carex rostrata*	Swollen Beaked Sedge	Blue		
vascular	*Carex rupestris ssp. rupestris*	Curly Sedge	Blue		
vascular	*Carex sprengelii*	Sprengel's Sedge	Red		
vascular	*Carex sychnocephala*	Many-headed Sedge	Blue		
vascular	*Carex tenera*	Tender Sedge	Blue		
vascular	*Carex torreyi*	Torrey's Sedge	Blue		
vascular	*Carex vulpinoidea*	Fox Sedge	Blue		

Group	Taxon	Common Name	BCList	COSEWIC	SARA
vascular	*Carex xerantica*	Dry-land Sedge	Red		
vascular	*Castilleja miniata var. fulva*	Tawny Paintbrush	Red		
vascular	*Chamaerhodos erecta ssp. nuttallii*	American Chamaerhodos	Blue		
vascular	*Chenopodium hians*	Gaping Goosefoot	Red		
vascular	*Chrysosplenium iowense*	Iowa Golden-saxifrage	Red		
vascular	*Cirsium drummondii*	Drummond's Thistle	Red		
vascular	*Descurainia sophioides*	Northern Tansymustard	Red		
vascular	*Draba cinerea*	Gray-leaved Draba	Blue		
vascular	*Draba lactea*	Milky Draba	Blue		
vascular	*Drosera linearis*	Slender-leaf Sundew	Red		
vascular	*Dryopteris cristata*	Crested Wood Fern	Blue		
vascular	*Eleocharis elliptica*	Elliptic Spike-rush	Blue		
vascular	*Elymus lanceolatus ssp. psammophilus*	Sand-dune Wheatgrass	Blue		
vascular	*Epilobium halleanum*	Hall's Willowherb	Blue		
vascular	*Epilobium saximontanum*	Rocky Mountain Willowherb	Red		
vascular	*Galium labradoricum*	Northern Bog Bedstraw	Blue		
vascular	*Gentianella tenella ssp. tenella*	Slender Gentian	Red		
vascular	*Glyceria pulchella*	Slender Mannagrass	Blue		
vascular	*Gymnocarpium jessoense ssp. parvulum*	Nahanni Oak Fern	Blue		
vascular	*Helianthus nuttallii ssp. rydbergii*	Nuttall's Sunflower	Red		
vascular	*Hesperostipa spartea*	Porcupinegrass	Red		
vascular	*Impatiens aurella*	Orange Touch-me-not	Blue		
vascular	*Juncus albescens*	Whitish Rush	Blue		
vascular	*Juncus confusus*	Colorado Rush	Red		
vascular	*Lomatium foeniculaceum var. foeniculaceum*	Fennel-leaved Desert-parsley	Red		
vascular	*Lupinus kuschei*	Yukon Lupine	Blue		
vascular	*Luzula nivalis*	Arctic Wood-rush	Blue		
vascular	*Malaxis brachypoda*	White Adder's-mouth Orchid	Blue		
vascular	*Micranthes nelsoniana var. carlottae*	Dotted Saxifrage	Blue		
vascular	*Ophioglossum pusillum*	Northern Adder's-tongue	Blue		
vascular	*Oxytropis campestris var. davisii*	Davis' Locoweed	Blue		
vascular	*Oxytropis maydelliana*	Maydell's Locoweed	Blue		
vascular	*Packera ogotorukensis*	Ogotoruk Creek Butterweed	Red		
vascular	*Pedicularis parviflora ssp. parviflora*	Small-flowered Lousewort	Blue		
vascular	*Pedicularis verticillata*	Whorled Lousewort	Blue		

Group	Taxon	Common Name	BCList	COSEWIC	SARA
vascular	*Penstemon gormanii*	Gorman's Penstemon	Blue		
vascular	*Penstemon gracilis*	Slender Penstemon	Red		
vascular	*Physaria arctica*	Arctic Bladderpod	Blue		
vascular	*Physaria didymocarpa ssp. didymocarpa*	Common Twinpod	Blue		
vascular	*Pinguicula villosa*	Hairy Butterwort	Blue		
vascular	*Piptatherum canadense*	Canada Ryegrass	Red		
vascular	*Plantago eriopoda*	Alkali Plantain	Blue		
vascular	*Polemonium boreale*	Northern Jacob's-ladder	Blue		
vascular	*Polygala senega*	Seneca-snakeroot	Red		
vascular	*Polypodium sibiricum*	Siberian Polypody	Red		
vascular	*Potamogeton perfoliatus*	Perfoliate Pondweed	Blue		
vascular	*Potentilla nivea var. pentaphylla*	Five-leaved Cinquefoil	Blue		
vascular	*Prenanthes racemosa*	Purple Rattlesnake-root	Red		
vascular	*Pyrola elliptica*	Shinleaf Wintergreen	Blue		
vascular	*Ranunculus cardiophyllus*	Heart-leaved Buttercup	Red		
vascular	*Ranunculus pedatifidus ssp. affinis*	Birdfoot Buttercup	Blue		
vascular	*Ranunculus rhomboideus*	Prairie Buttercup	Red		
vascular	*Rorippa calycina*	Persistent-sepal Yellowcress	Red		
vascular	*Rosa arkansana var. arkansana*	Arkansas Rose	Blue		
vascular	*Rumex arcticus*	Arctic Dock	Blue		
vascular	*Salix petiolaris*	Meadow Willow	Blue		
vascular	*Salix raupii*	Raup's Willow	Red		
vascular	*Salix serissima*	Autumn Willow	Blue		
vascular	*Sarracenia purpurea ssp. purpurea*	Common Pitcher-plant	Blue		
vascular	*Saussurea angustifolia var. angustifolia*	Northern Sawwort	Red		
vascular	*Schizachyrium scoparium*	Little Bluestem	Red		
vascular	*Selaginella rupestris*	Rock Selaginella	Red		
vascular	*Senecio sheldonensis*	Mount Sheldon Butterweed	Blue		
vascular	*Silene drummondii var. drummondii*	Drummond's Campion	Blue		
vascular	*Silene ostenfeldii*	Taimyr Campion	Blue		
vascular	*Silene repens*	Pink Campion	Red		
vascular	*Sphaeralcea coccinea*	Scarlet Globe-mallow	Red		
vascular	*Sphenopholis intermedia*	Slender Wedgegrass	Blue		
vascular	*Sphenopholis obtusata*	Prairie Wedgegrass	Red		
vascular	*Stuckenia vaginata*	Sheathing Pondweed	Blue		
vascular	*Symphyotrichum puniceum var.*	Purple-stemmed Aster	Blue		

Group	Taxon	Common Name	BCList	COSEWIC	SARA
	puniceum				
vascular	*Tephroseris palustris*	Marsh Fleabane	Blue		
vascular	*Thalictrum dasycarpum*	Purple Meadowrue	Blue		
vascular	*Thermopsis rhombifolia*	Prairie Golden Bean	Red		
vascular	*Tofieldia coccinea*	Northern False Asphodel	Blue		
vascular	*Townsendia hookeri*	Hooker's Townsendia	Red		
vascular	*Utricularia ochroleuca*	Ochroleucous Bladderwort	Blue		
moss	*Acaulon muticum var. rufescens*		Red		
moss	*Amblyodon dealbatus*		Blue		
moss	*Atrichum tenellum*		Blue		
moss	*Aulacomnium acuminatum*		Blue		
moss	*Barbula convoluta var. gallinula*		Red		
moss	*Bartramia halleriana*	Haller's Apple Moss	Red	T (Nov 2011)	1-T (Jun 2003)
moss	*Brachythecium trachypodium*		Blue		
moss	*Bryum uliginosum*		Blue		
moss	*Didymodon rigidulus var. icmadophilus*		Blue		
moss	*Didymodon subandreaeoides*		Red		
moss	*Encalypta mutica*		Blue		
moss	*Encalypta spathulata*		Blue		
moss	*Grimmia teretinervis*		Red		
moss	*Haplodontium macrocarpum*	Porsild's Bryum	Red	T (Nov 2003)	1-T (Feb 2011)
moss	*Hygrohypnum alpinum*		Blue		
moss	*Lescuraea saxicola*		Blue		
moss	*Meesia longiseta*		Blue		
moss	*Myurella sibirica*		Red		
moss	*Philonotis yezoana*		Blue		
moss	*Pohlia bulbifera*		Red		
moss	*Pohlia vexans*		Blue		
moss	*Pseudocalliergon turgescens*		Blue		
moss	*Schistidium boreale*		Blue		
moss	*Schistidium confertum*		Red		
moss	*Schistidium pulchrum*		Blue		
moss	*Schistidium robustum*		Blue		
moss	*Schistidium trichodon*		Blue		
moss	*Sphagnum contortum*		Blue		
moss	*Sphagnum wulfianum*		Blue		
moss	*Splachnum vasculosum*		Blue		
moss	*Stegonia latifolia var. latifolia*		Blue		
moss	*Stegonia latifolia var. pilifera*		Red		
moss	*Tayloria froelichiana*		Blue		

Group	Taxon	Common Name	BCList	COSEWIC	SARA
moss	*Tayloria splachnoides*		Red		
moss	*Tetraplodon urceolatus*		Red		
moss	*Timmia norvegica*		Blue		
moss	*Timmia sibirica*		Red		
moss	*Tomentypnum falcifolium*		Blue		
moss	*Tortella humilis*		Red		
moss	*Weissia brachycarpa*		Red		
lichen	*Anaptychia crinalis*	Electrified millepede	Red		
lichen	*Anaptychia ulotrichoides*	Amputated millepede	Blue		
lichen	*Cladonia grayi*	Gray's pixie-cup	Red		
lichen	*Cladonia parasitica*	Fence-rail pixie	Red		
lichen	*Collema bachmanianum*	Caesar's tarpaper	Red		
lichen	*Collema coniophilum*	Crumpled tarpaper	Red	T (Nov 2010)	
lichen	*Collema multipartitum*	Protracted tarpaper	Red		
lichen	*Fulgensia bracteata*	Goldnugget sulphur	Blue		
lichen	*Fulgensia bracteata*	Goldnugget sulphur	Blue		
lichen	*Fulgensia desertorum*	Desert sulphur	Red		
lichen	*Heterodermia speciosa*	Smiling centipede	Red		
lichen	*Lempholemma polyanthes*	Mourning phlegm	Blue		
lichen	*Leptogium intermedium*	Fourty-five vinyl	Blue		
lichen	*Leptogium plicatile*	Starfish vinyl	Blue		
lichen	*Leptogium pseudofurfuraceum*	Concentric vinyl	Blue		
lichen	*Leptogium schraderi*	Collapsing vinyl	Red		
lichen	*Leptogium tenuissimum*	Birdnest vinyl	Red		
lichen	*Peltigera degenii*	Lustrous pelt	Red		
lichen	*Peltigera evansiana*	Peppered pelt	Red		
lichen	*Phaeophyscia adiastola*	Granulating shadow	Red		
lichen	*Phaeophyscia hirsuta*	Smiling shadow	Red		
lichen	*Phaeophyscia hispidula*	Whiskered shadow	Red		
lichen	*Phaeophyscia kairamoi*	Five o'clock shadow	Blue		
lichen	*Phaeophyscia nigricans*	Least shadow	Red		
lichen	*Physcia dimidiata*	Exuberant rosette	Red		
lichen	*Physcia stellaris*	Immaculate rosette	Blue		
lichen	*Physcia tribacia*	Beaded rosette	Red		
lichen	*Physciella chloantha*	Downside shade	Blue		
lichen	*Punctelia perreticulata*	Galactic speckleback	Red		
lichen	*Ramalina sinensis*	Threadbare ribbon	Blue		
lichen	*Squamarina cartilaginea*	Pea-green dimple	Red		
lichen	*Squamarina lentigera*	Snow-white dimple	Red		
lichen	*Usnea cavernosa*	Pitted beard	Blue		
lichen	*Usnea glabrata*	Lustrous beard	Blue		

APPENDIX F COMPREHENSIVE SPECIES LIST

The following table presents a listing of all vascular plants and bryophytes identified on the Property during the two years of rare plant surveys.

Category	Taxon	Common Name
Vascular	*Achillea millefolium var. lanulosa*	Yarrow
Vascular	*Actaea rubra*	Baneberry
Vascular	*Agropyron cristatum ssp. pectinatum*	Crested Wheatgrass
Vascular	*Agrostis scabra*	Hair Bentgrass
Vascular	*Alisma triviale*	American Water-plantain
Vascular	*Alnus viridis ssp. crispa*	Green Alder
Vascular	*Alopecurus aequalis*	Little Meadow-foxtail
Vascular	*Amelanchier alnifolia*	Saskatoon Berry
Vascular	*Amerorchis rotundifolia*	Round-leaved Orchis
Vascular	*Andromeda polifolia var. polifolia*	Bog-rosemary
Vascular	*Anemone multifida var. multifida*	Cut-leaved Anemone
Vascular	*Antennaria microphylla*	White Pussytoes
Vascular	*Antennaria neglecta*	Field Pussytoes
Vascular	*Antennaria pulcherrima ssp. pulcherrima*	Showy Pussytoes
Vascular	*Antennaria racemosa*	Racemose Pussytoes
Vascular	*Antennaria rosea*	Rosy Pussytoes
Vascular	*Apocynum cannabinum*	Hemp
Vascular	*Aralia nudicaulis*	Wild Sarsaparilla
Vascular	*Arctostaphylos uva-ursi*	Kinnikinnick
Vascular	*Astragalus americanus*	American Milk-vetch
Vascular	*Betula papyrifera*	Paper Birch
Vascular	*Betula pumila var. glandulifera*	Low Birch
Vascular	*Bidens cernua*	Nodding Beggarticks
Vascular	*Botrypus virginianus*	Rattlesnake Fern
Vascular	*Bromus ciliatus*	Fringed Brome
Vascular	*Bromus inermis*	Smooth Brome
Vascular	*Bromus pumpellianus ssp. pumpellianus*	Pumpelly Brome
Vascular	*Calamagrostis canadensis var. canadensis*	Bluejoint Reedgrass
Vascular	*Calamagrostis canadensis var. langsdorfii*	Bluejoint Reedgrass
Vascular	*Calamagrostis stricta ssp. inexpansa*	Slimstem Reedgrass
Vascular	*Calamagrostis stricta ssp. stricta*	Slimstem Reedgrass
Vascular	*Calla palustris*	Wild Calla
Vascular	*Callitriche palustris*	Spring Water-starwort
Vascular	*Capsella bursa-pastoris*	Shepherd's Purse
Vascular	*Carex aenea*	Bronze Sedge
Vascular	*Carex aquatilis var. aquatilis*	Water Sedge
Vascular	*Carex atherodes*	Awned Sedge
Vascular	*Carex atratiformis*	Black Sedge

Category	Taxon	Common Name
Vascular	*Carex aurea*	Golden Sedge
Vascular	*Carex bebbii*	Bebb's Sedge
Vascular	*Carex brevior*	Short-beaked Sedge
Vascular	*Carex brunnescens*	Brownish Sedge
Vascular	*Carex capillaris*	Hairlike Sedge
Vascular	*Carex chordorrhiza*	Cordroot Sedge
Vascular	*Carex concinna*	Low Northern Sedge
Vascular	*Carex crawfordii*	Crawford's Sedge
Vascular	*Carex cusickii*	Cusick's Sedge
Vascular	*Carex deweyana var. deweyana*	Dewey's Sedge
Vascular	*Carex diandra*	Lesser-panicled Sedge
Vascular	*Carex disperma*	Soft-leaved Sedge
Vascular	*Carex gynocrates*	Yellow Bog Sedge
Vascular	*Carex inops ssp. heliophila*	Long-stoloned Sedge
Vascular	*Carex interior*	Inland Sedge
Vascular	*Carex lasiocarpa ssp. americana*	Slender Sedge
Vascular	*Carex leptalea ssp. leptalea*	Bristle-stalked Sedge
Vascular	*Carex limosa*	Shore Sedge
Vascular	*Carex livida var. radicaulis*	Pale Sedge
Vascular	*Carex magellanica ssp. irrigua*	Poor Sedge
Vascular	*Carex microglochin*	Few-seeded Fen Sedge
Vascular	*Carex microptera*	Small-winged Sedge
Vascular	*Carex obtusata*	Blunt Sedge
Vascular	*Carex pachystachya*	Thick-headed Sedge
Vascular	*Carex pellita*	Woolly Sedge
Vascular	*Carex prairea*	Prairie Sedge
Vascular	*Carex praticola*	Meadow Sedge
Vascular	*Carex sartwellii var. sartwellii*	Sartwell's Sedge
Vascular	*Carex siccata*	Hay Sedge
Vascular	*Carex utriculata*	Beaked Sedge
Vascular	*Carex vaginata*	Sheathed Sedge
Vascular	*Carex vesicaria*	Lesser Bladder Sedge
Vascular	*Castilleja miniata var. fulva*	Tawny Paintbrush
Vascular	*Cerastium arvense*	Field Chickweed
Vascular	*Cerastium nutans*	Nodding Chickweed
Vascular	*Chenopodium album ssp. album*	Lamb's-quarters
Vascular	*Chenopodium album ssp. striatum*	Lamb's-quarters
Vascular	*Cicuta bulbifera*	Bulbous Water-hemlock
Vascular	*Cinna latifolia*	Nodding Wood-reed
Vascular	*Cirsium arvense*	Canada Thistle
Vascular	*Coeloglossum viride var. virescens*	Long-bracted Frog Orchid
Vascular	*Comarum palustre*	Marsh Cinquefoil
Vascular	*Corallorhiza maculata*	Spotted Coralroot

Category	Taxon	Common Name
Vascular	*Corallorhiza trifida*	Yellow Coralroot
Vascular	*Cornus canadensis*	Bunchberry
Vascular	*Cornus stolonifera*	Red-osier Dogwood
Vascular	*Dactylis glomerata*	Orchard grass
Vascular	*Descurainia sophia*	Flixweed
Vascular	*Drosera linearis*	Slender-leaf Sundew
Vascular	*Drosera rotundifolia var. rotundifolia*	Round-leaved Sundew
Vascular	*Dryopteris carthusiana*	Toothed Wood Fern
Vascular	*Eleocharis mamillata ssp. mamillata*	Nipple Spike-rush
Vascular	*Eleocharis palustris*	Common Spike-rush
Vascular	*Elymus trachycaulus ssp. trachycaulus*	Slender Wheatgrass
Vascular	*Epilobium angustifolium*	Fireweed
Vascular	*Epilobium ciliatum ssp. ciliatum*	Purple-leaved Willowherb
Vascular	*Epilobium hornemannii ssp. hornemannii*	Hornemann's Willowherb
Vascular	*Epilobium leptophyllum*	Narrow-leaved Willowherb
Vascular	*Epilobium palustre*	Swamp Willowherb
Vascular	*Equisetum arvense*	Common Horsetail
Vascular	*Equisetum fluviatile*	Swamp Horsetail
Vascular	*Equisetum palustre*	Marsh Horsetail
Vascular	*Equisetum pratense*	Meadow Horsetail
Vascular	*Equisetum scirpoides*	Dwarf Scouring-rush
Vascular	*Equisetum sylvaticum*	Wood Horsetail
Vascular	*Erigeron acris var. kamtschaticus*	Bitter Fleabane
Vascular	*Eriophorum angustifolium*	Narrow-leaved Cotton-grass
Vascular	*Eriophorum chamissonis var. chamissonis*	Chamisso's Cotton-grass
Vascular	*Eriophorum gracile*	Slender Cotton-grass
Vascular	*Eriophorum viridicarinatum*	Green-keeled Cotton-grass
Vascular	*Eurybia conspicua*	Showy Aster
Vascular	*Festuca rubra ssp. rubra*	Red Fescue
Vascular	*Festuca saximontana*	Rocky Mountain Fescue
Vascular	*Fragaria vesca var. bracteata*	Wood Strawberry
Vascular	*Fragaria virginiana*	Wild Strawberry
Vascular	*Fragaria virginiana var. platypetala*	Wild Strawberry
Vascular	*Galeopsis bifida*	Split-lip Hemp-nettle
Vascular	*Galium boreale*	Northern Bedstraw
Vascular	*Galium labradoricum*	Northern Bog Bedstraw
Vascular	*Galium trifidum ssp. subbiflorum*	Small Bedstraw
Vascular	*Galium trifidum ssp. trifidum*	Small Bedstraw
Vascular	*Galium triflorum*	Sweet-scented Bedstraw
Vascular	*Gentianella amarella ssp. acuta*	Northern Gentian
Vascular	*Geocaulon lividum*	False Toad-flax
Vascular	*Geum aleppicum*	Yellow Avens
Vascular	*Geum macrophyllum ssp. perincisum*	Large-leaved Avens

Category	Taxon	Common Name
Vascular	*Geum rivale*	Water Avens
Vascular	*Glyceria borealis*	Northern Mannagrass
Vascular	*Glyceria elata*	Tall Mannagrass
Vascular	*Glyceria grandis var. grandis*	Reed Mannagrass
Vascular	*Glyceria striata*	Fowl Mannagrass
Vascular	*Goodyera oblongifolia*	Rattlesnake-plantain
Vascular	*Gymnocarpium dryopteris*	Oak Fern
Vascular	*Hieracium umbellatum ssp. umbellatum*	Narrow-leaved Hawkweed
Vascular	*Hippuris vulgaris*	Common Mare's-tail
Vascular	*Hordeum jubatum ssp. jubatum*	Foxtail Barley
Vascular	*Hypopitys monotropa*	Pinesap
Vascular	*Juncus alpinoarticulatus ssp. americanus*	Northern Green Rush
Vascular	*Juncus articulatus ssp. articulatus*	Jointed Rush
Vascular	*Juncus balticus ssp. ater*	Baltic Rush
Vascular	*Juncus bufonius*	Toad Rush
Vascular	*Juncus dudleyi*	Dudley's Rush
Vascular	*Juncus stygius ssp. americanus*	Bog Rush
Vascular	*Juncus vaseyi*	Vasey's Rush
Vascular	*Lactuca serriola*	Prickly Lettuce
Vascular	*Larix laricina*	Tamarack
Vascular	*Lathyrus ochroleucus*	Creamy Peavine
Vascular	*Lemna minor*	Common Duckweed
Vascular	*Leymus innovatus*	Fuzzy-spiked Wildrye
Vascular	*Limosella aquatica*	Water Mudwort
Vascular	*Linnaea borealis*	Twinflower
Vascular	*Listera cordata*	Heart-leaved Twayblade
Vascular	*Lonicera dioica var. glaucescens*	Glaucous-leaved Honeysuckle
Vascular	*Lonicera involucrata*	Black Twinberry
Vascular	*Lycopodium dendroideum*	Ground-pine
Vascular	*Maianthemum canadense*	Wild Lily-of-the-valley
Vascular	*Maianthemum trifolium*	Three-leaved False Solomon's-seal
Vascular	*Matricaria discoidea*	Pineapple Weed
Vascular	*Medicago sativa ssp. sativa*	Alfalfa
Vascular	*Mentha arvensis*	Field Mint
Vascular	*Menyanthes trifoliata*	Buckbean
Vascular	*Mertensia paniculata var. paniculata*	Tall Bluebells
Vascular	*Mitella nuda*	Common Mitrewort
Vascular	*Moehringia lateriflora*	Blunt-leaved Sandwort
Vascular	*Moneses uniflora*	Single Delight
Vascular	*Monotropa uniflora*	Indian-pipe
Vascular	*Muhlenbergia glomerata*	Marsh Muhly
Vascular	*Orthilia secunda*	One-sided Wintergreen
Vascular	*Orthilia secunda var. secunda*	One-sided Wintergreen

Category	Taxon	Common Name
Vascular	*Osmorhiza depauperata*	Blunt-fruited Sweet-cicely
Vascular	*Packera paupercula*	Canadian Butterweed
Vascular	*Packera plattensis*	Plains Butterweed
Vascular	*Parnassia palustris*	Northern Grass-of-parnassus
Vascular	*Pedicularis parviflora ssp. parviflora*	Small-flowered Lousewort
Vascular	*Persicaria amphibia var. emersa*	Water Smartweed
Vascular	*Persicaria amphibia var. stipulacea*	Water Smartweed
Vascular	*Persicaria hydropiper*	Marshpepper Smartweed
Vascular	*Petasites frigidus var. palmatus*	Sweet Coltsfoot
Vascular	*Petasites frigidus var. sagittatus*	Arrow-leaved Coltsfoot
Vascular	*Phalaris arundinacea*	Reed Canarygrass
Vascular	*Phleum pratense*	Common Timothy
Vascular	*Picea glauca*	White Spruce
Vascular	*Picea mariana*	Black Spruce
Vascular	*Pinus contorta var. latifolia*	Lodgepole Pine
Vascular	*Piptatherum pungens*	Short-awned Ricegrass
Vascular	*Plantago major*	Common Plantain
Vascular	*Platanthera aquilonis*	Northern Green Rein Orchid
Vascular	*Platanthera huronensis*	Great Lakes Rein Orchid
Vascular	*Platanthera orbiculata*	Large Round-leaved Rein Orchid
Vascular	*Platanthera sp.*	Rein Orchid
Vascular	*Poa annua*	Annual Bluegrass
Vascular	*Poa compressa*	Canada Bluegrass
Vascular	*Poa palustris*	Fowl Bluegrass
Vascular	*Poa pratensis ssp. pratensis*	Kentucky Bluegrass
Vascular	*Polygonum achoreum*	Blake's Knotweed
Vascular	*Polygonum aviculare*	Common Knotweed
Vascular	*Polygonum ramosissimum*	Yellow-flowered Knotweed
Vascular	*Populus balsamifera*	Balsam Poplar
Vascular	*Populus tremuloides*	Trembling Aspen
Vascular	*Potamogeton alpinus*	Northern Pondweed
Vascular	*Potamogeton foliosus*	Closed-leaved Pondweed
Vascular	*Potamogeton gramineus*	Grass-leaved Pondweed
Vascular	*Potamogeton pusillus ssp. tenuissimus*	Small Pondweed
Vascular	*Potentilla norvegica*	Norwegian Cinquefoil
Vascular	*Prosartes trachycarpa*	Rough-fruited Fairybells
Vascular	*Puccinellia distans*	Weeping Alkaligrass
Vascular	*Pyrola asarifolia*	Pink Wintergreen
Vascular	*Ranunculus aquatilis var. aquatilis*	White Water-buttercup
Vascular	*Ranunculus lapponicus*	Lapland Buttercup
Vascular	*Ranunculus macounii*	Macoun's Buttercup
Vascular	*Ranunculus sceleratus var. multifidus*	Celery-leaved Buttercup
Vascular	*Rhinanthus minor*	Yellow Rattle

Category	Taxon	Common Name
Vascular	*Rhododendron groenlandicum*	Labrador-Tea
Vascular	*Ribes hudsonianum var. hudsonianum*	Northern Blackcurrant
Vascular	*Ribes lacustre*	Black Gooseberry
Vascular	*Ribes oxyacanthoides ssp. oxyacanthoides*	Northern Gooseberry
Vascular	*Rorippa palustris ssp. hispida*	Hispid Yellowcress
Vascular	*Rosa acicularis ssp. sayi*	Prickly Rose
Vascular	*Rubus arcticus ssp. acaulis*	Nagoonberry
Vascular	*Rubus idaeus ssp. strigosus*	Red Raspberry
Vascular	*Rubus pedatus*	Five-leaved Bramble
Vascular	*Rubus pubescens var. pubescens*	Dwarf Red Raspberry
Vascular	*Rumex occidentalis*	Western Dock
Vascular	*Sagittaria cuneata*	Arum-leaved Arrowhead
Vascular	*Salix arbusculoides*	Northern Bush Willow
Vascular	*Salix bebbiana*	Bebb's Willow
Vascular	*Salix candida*	Sage Willow
Vascular	*Salix discolor*	Pussy Willow
Vascular	*Salix maccalliana*	Maccalla's Willow
Vascular	*Salix myrtillifolia*	Bilberry Willow
Vascular	*Salix pedicellaris*	Bog Willow
Vascular	*Salix planifolia*	Plane-leaved Willow
Vascular	*Salix pseudomonticola*	Serviceberry Willow
Vascular	*Salix pseudomyrsinites*	Tall Blueberry Willow
Vascular	*Salix scouleriana*	Scouler's Willow
Vascular	*Salix serissima*	Autumn Willow
Vascular	*Schizachne purpurascens*	False Melic
Vascular	*Scirpus microcarpus*	Small-flowered Bulrush
Vascular	*Scutellaria galericulata*	Marsh Skullcap
Vascular	*Shepherdia canadensis*	Soopolallie
Vascular	*Sium suave*	Hemlock Water-parsnip
Vascular	*Solidago lepida var. salebrosa*	Western Canada Goldenrod
Vascular	*Solidago simplex var. simplex*	Spikelike Goldenrod
Vascular	*Sparganium emersum*	Emersed Bur-reed
Vascular	*Spiraea betulifolia ssp. lucida*	Birch-leaved Spirea
Vascular	*Spiranthes romanzoffiana*	Hooded Ladies' Tresses
Vascular	*Stellaria longipes var. longipes*	Long-stalked Starwort
Vascular	*Symphyotrichum boreale*	Rush Aster
Vascular	*Symphyotrichum ciliolatum*	Lindley's Aster
Vascular	*Symphyotrichum puniceum var. puniceum*	Purple-stemmed Aster
Vascular	*Taraxacum officinale*	Common Dandelion
Vascular	*Thalictrum venulosum*	Veiny Meadowrue
Vascular	*Triantha glutinosa*	Sticky False Asphodel
Vascular	*Trichophorum cespitosum*	Tufted Clubrush
Vascular	*Trifolium hybridum*	Alsike Clover

Category	Taxon	Common Name
Vascular	*Trifolium pratense*	Red Clover
Vascular	*Trifolium repens*	White Clover
Vascular	*Triglochin maritima*	Seaside Arrow-grass
Vascular	*Triglochin palustris*	Marsh Arrow-grass
Vascular	*Trisetum spicatum*	Spike Trisetum
Vascular	*Turritis glabra*	Tower Mustard
Vascular	*Typha latifolia*	Common Cattail
Vascular	*Urtica dioica ssp. gracilis*	Stinging Nettle
Vascular	*Utricularia intermedia*	Flat-leaved Bladderwort
Vascular	*Utricularia macrorhiza*	Greater Bladderwort
Vascular	*Vaccinium caespitosum*	Dwarf Blueberry
Vascular	*Vaccinium myrtilloides*	Velvet-leaved Blueberry
Vascular	*Vaccinium oxycoccos*	Bog Cranberry
Vascular	*Vaccinium vitis-idaea ssp. minus*	Lingonberry
Vascular	*Veronica peregrina var. xalapensis*	Purslane Speedwell
Vascular	*Veronica scutellata*	Marsh Speedwell
Vascular	*Viburnum edule*	Highbush-cranberry
Vascular	*Vicia americana*	American Vetch
Bryophyte	*Amblystegium serpens*	
Bryophyte	*Aulacomnium palustre*	
Bryophyte	*Brachythecium sp.*	
Bryophyte	*Bryoerythrophyllum recurvirostre var. recurvirostre*	
Bryophyte	*Bryum caespiticium*	
Bryophyte	*Bryum pseudotriquetrum*	
Bryophyte	*Bryum sp.*	
Bryophyte	*Calliergon trifarium*	
Bryophyte	*Calypogeia sphagnicola*	
Bryophyte	*Campylium sp.*	
Bryophyte	*Campylium stellatum*	
Bryophyte	*Cephalozia lunulifolia*	
Bryophyte	*Ceratodon purpureus*	
Bryophyte	*Conardia compacta*	
Bryophyte	*Dicranum fuscescens var. fuscescens*	
Bryophyte	*Dicranum polysetum*	
Bryophyte	*Dicranum undulatum*	
Bryophyte	*Distichium capillaceum*	
Bryophyte	*Drepanocladus aduncus*	
Bryophyte	*Funaria hygrometrica*	
Bryophyte	*Helodium blandowii*	
Bryophyte	*Hylocomium splendens*	Step Moss
Bryophyte	*Hypnum revolutum var. revolutum*	
Bryophyte	*Hypnum sp.*	
Bryophyte	*Leptobryum pyriforme*	

Category	Taxon	Common Name
Bryophyte	*Marchantia polymorpha*	
Bryophyte	*Meesia triquetra*	
Bryophyte	*Mesoptychia badensis*	
Bryophyte	*Mylia anomala*	
Bryophyte	*Myurella julacea*	
Bryophyte	*Paludella squarrosa*	
Bryophyte	*Plagiomnium ellipticum*	
Bryophyte	*Pleurozium schreberi*	Red-stemmed Feathermoss
Bryophyte	*Pohlia nutans*	
Bryophyte	*Polytrichum commune var. commune*	
Bryophyte	*Polytrichum strictum*	
Bryophyte	*Preissia quadrata*	
Bryophyte	*Ptilidium pulcherrimum*	
Bryophyte	*Ptilium crista-castrensis*	Knight's Plume
Bryophyte	*Sanionia uncinata*	
Bryophyte	*Scorpidium revolvens*	
Bryophyte	*Scorpidium scorpioides*	
Bryophyte	*Sphagnum capillifolium*	
Bryophyte	*Sphagnum fuscum*	
Bryophyte	*Sphagnum warnstorfii*	
Bryophyte	*Tetraplodon angustatus*	
Bryophyte	*Tomentypnum nitens*	
Bryophyte	*Warnstorfia fluitans*	

APPENDIX G SPECIES ACCOUNTS FOR RARE PLANT TAXA ON PROPERTY

***Castilleja miniata var. fulva* (tawny paintbrush)**

Tawny paintbrush is a perennial herb in the Orobanchaceae (Broom-rape family) which grows in grasslands, open forests, and roadsides in the Peace River region (Douglas et al. 1998; Egger 2008). Although the common variety of *Castilleja miniata* occurs throughout the Province, variety *fulva* is only known from the Hudson's Hope area extending south towards Chetwynd, and east towards Fort St. John.

Tawny paintbrush is currently ranked SH (Historical) in BC, and is on the Red list for the province (BCCDC 2014a). Globally tawny paintbrush is classed G1Q, meaning that there are unresolved questions regarding the taxonomy or distribution of the taxon. Because of the taxonomic uncertainty regarding the species, tawny paintbrush was not tracked at the time the rare plant surveys were being conducted for the Project Environmental Assessment. New work being conducted for the upcoming Flora of North America treatment of the Broom-rape family has suggested that variety *fulva* is a valid taxon (Egger 2008).

Tawny paintbrush was found in five large sub-occurrences in the open forests and cut lines of the Property. These sub-occurrences are extensive, containing thousands of individuals and covering several hectares.

***Drosera linearis* (slender-leaf sundew)**

Slender-leaf sundew is a small, insectivorous perennial of the Droseraceae (sundew family) that inhabits calcareous wetlands and shorelines across much of northern North America (Gray and Fernald 1950; Moss and Packer 1983). The species is known from only two locations in BC, both along the axis of the Rocky Mountains, and is reported from fewer than 20 sites in Alberta (Williston and Bartemucci 2007; Klinkenberg 2014; BCCDC 2014b). Slender-leaf sundew also ranges north into the Northwest Territories and east to New Brunswick and Newfoundland, as well as south into five US states (Montana, Minnesota, Wisconsin, Michigan, and Maine) (Natureserve 2014).

In BC, slender-leaf sundew is ranked S1 (Critically Imperilled), and is on the Red list for the province (BCCDC 2014a). The species has a global status of G4 (Apparently Secure). Sub-national rankings for the taxon vary: S4 (Apparently Secure) in Ontario; S3

(Vulnerable) in Alberta, Québec and Minnesota; S2 (Imperilled) in Manitoba and Montana; and S1 (Critically Imperilled) in Saskatchewan, New Brunswick, Newfoundland, Wisconsin, and Maine. The Northwest Territories and Michigan do not provide a rank (Natureserve 2014).

A single occurrence of slender-leaf sundew is reported for the Property. Rare plant surveys in 2012 and 2014 located a large site comprising three subpopulations that contained an estimated total of 7,000 plants over approximately 6,000 square metres. The sundew plants were discovered growing with low shrubs, sedges, and other herbs, in the open portions of a marl fen near the western boundary of the Property. Five other rare plant taxa were also located within the same fen complex.

***Galium labradoricum* (northern bog bedstraw)**

Northern bog bedstraw—a creeping perennial herb in the Rubiaceae (madder family)—is found growing in bogs, wet meadows, and moist woods in the montane zone (Moss and Packer 1983; Douglas, et al. 1998). In BC the species is located primarily in the northeast section of the province, with one occurrence also reported from near Salmon Arm (Klinkenberg 2014; BCCDC 2014b). Globally, northern bog bedstraw occurs in all Canadian provinces and territories except Yukon, and extends south into the US as far as North Dakota, Iowa, Illinois, and across the Midwest to New Jersey (Moss and Packer 1983; NatureServe 2014).

Northern bog bedstraw is an S3 (Vulnerable) species in BC, and is on the provincial Blue list (BCCDC 2014a). The species is ranked G5 (Secure) globally, although along the southern edge of its range many jurisdictions indicate some degree of rarity for the taxon: S3 (Vulnerable) in Alberta and North Dakota; S2 (Imperilled) in New Brunswick, Nova Scotia, Illinois, Massachusetts, and Maine; and S1 (Critically Imperilled) in Prince Edward Island, Iowa, Ohio, Pennsylvania, New Jersey, Connecticut, and Vermont (NatureServe 2014).

One occurrence of northern bog bedstraw is reported for the Property. The 2012 and 2014 rare plant surveys identified a large site along the western boundary, containing an estimated 10,000 plants covering approximately 50,000 square metres. The bedstraw plants were observed growing with sedges and other herbs in a shrub fen and in the surrounding forest. Five other rare plant taxa were also located within this fen complex.

***Juncus stygius spp. americanus* (bog rush)**

Bog rush, a small, tufted perennial in the Juncaceae (rush family), grows in and around peat bogs and pools from the lowland to montane zones (Douglas, et al. 1998; Brooks and Clemants 2000). The taxon is found scattered in two general areas in central BC: in and near the Rocky Mountains; and also along the coast (Klinkenberg 2014; BCCDC 2014a). The species' global range extends east across Canada to Newfoundland, south into several US states, and north through Yukon and Alaska into parts of northern and central Eurasia (Brooks and Clemants 2000; NatureServe 2014; Kilgallen 2012).

Bog rush is ranked S2S3 (Imperilled and Vulnerable) in BC, and is on the Blue list for the province (BCCDC 2014a). Globally the species is classed G5 (Secure). Most North American sub-national jurisdictions indicate a rare status: SH (Possibly Extirpated) in New York; S1 (Critically Imperilled) in Saskatchewan, Manitoba, New Brunswick, Nova Scotia, New Hampshire, Wisconsin, and Michigan; S2 (Imperilled) in Yukon, Alberta, and Maine; and S3 (Vulnerable) in Québec, Newfoundland, and Minnesota. Bog rush is ranked S4 (Apparently Secure) in Ontario (Natureserve 2014).

One occurrence of bog rush is reported for the Property. Rare plant survey work in 2012 and 2014 recorded two subpopulations near the western boundary, containing an estimated total of 1,050 plants over approximately 600 square metres. The bog rush plants were found growing in a community of low trees and shrubs, sedges, and other herbs, in the ecotone between open and shrub portions of a marl fen. Five other rare plant taxa were also located within the same fen complex.

***Pedicularis parviflora ssp. parviflora* (small-flowered lousewort)**

Small-flowered lousewort is a branching annual or biennial herb in the Scrophulariaceae (figwort family), that is found in wet montane and subalpine habitats such as bogs, fens, and meadows (Hitchcock, et al. 1955; Douglas, et al. 1998). In BC, the taxon has been reported from numerous scattered locations across the central and northern parts of the province (Klinkenberg 2014; BCCDC 2014b). Globally it is distributed north into the Northwest Territories and Nunavut and east as far as Québec, and has also been collected in the US states of Alaska and Oregon (NatureServe 2014).

Small-flowered lousewort is classified S3 (Vulnerable) in BC, and is on the Blue list for the province (BCCDC 2014a). The species and subspecies are both ranked Apparently Secure globally (G4T4). Other sub-national rankings include S3 (Vulnerable) status in Alberta and S4 (Apparently Secure) status in Ontario for the species, and S3

(Vulnerable) status in Alaska for the subspecies; the remainder of the jurisdictions with occurrences of small-flowered lousewort do not provide a rank (NatureServe 2014).

One occurrence of small-flowered lousewort is reported for the Property. Rare plant survey work in 2012 and 2014 located a large site along the western boundary, containing an estimated 250 – 1,000 plants over roughly 50,000 square metres. The lousewort plants were found growing with sedges and other herbs in a series of patterned and non-patterned shrub fens. Five other rare plant taxa were also located within this fen complex.

***Salix serissima* (autumn willow)**

Autumn willow—a shrub that sets fruit late in the growing season—is a member of the Salicaceae (willow family). The taxon is found in wet thickets, fens, bogs, meadows, and along lakes and stream shorelines, from lower elevations into the mountains (Douglas, et al. 1998; Argus 2000). The species has been reported from scattered locations in northern BC (predominantly in the Peace River/Dawson Creek area), in addition to one record near the town of Williams Lake (Klinkenberg 2014; BCCDC 2014b).

Globally, autumn willow is known from the Northern Territories and Alberta across Canada to Newfoundland and New Brunswick. It occurs more sporadically in the US, from Montana through the northern Midwest into a number of northeastern states, and is also known from several disjunct populations in South Dakota, Wyoming, and Colorado (Argus 2000; NatureServe 2014).

Autumn willow is ranked S2S3 (Imperilled and Vulnerable) in BC, and is on the province's Blue list (BCCDC 2014a). While the species is listed as Apparently Secure globally (G4), along the margins of its range many subnational jurisdictions indicate some degree of rarity: S3 (Vulnerable) in Québec, Massachusetts, Connecticut, Ohio and Montana; S2 (Imperilled) in Newfoundland, New Jersey, Pennsylvania, and Indiana; and S1 (Critically Imperilled) in New Brunswick, Vermont, Illinois, South Dakota, Wyoming, and Colorado (NatureServe 2014).

Two occurrences of autumn willow are reported for the Property. The 2012 rare plant surveys identified one plant near the western boundary, in a clearing within mixed bog forest at the edge of a shrub fen. Five other rare plant taxa were also located in within this fen complex. An additional two autumn willow plants were discovered on the Property's southern boundary. These were found growing with other willows in an area

approximately 20 square metres in size, within a shrub- and sedge-dominated marsh (which was dry at the time of survey).

***Symphyotrichum puniceum var. puniceum* (purple-stemmed aster)**

Purple-stemmed aster is a branching perennial of the Asteraceae (sunflower family). It grows along streams and lake shores, in marshes and wet meadows, and at the edges of bogs (Douglas et al. 1998; Brouillet et al. 2006). In BC, the taxon is found in the Northeast, predominantly in the Peace River region (BCCDC 2007; Klinkenberg 2014). Purple-stemmed aster ranges north into the Northwest Territories, east to the Atlantic coast, and south in the central and eastern US to Nebraska, Missouri, and Florida (NatureServe 2014).

Purple-stemmed aster is ranked S3 (Vulnerable) in BC and is on the province's Blue list (BCCDC 2014a). The taxon is considered Secure globally (G5T5) and, outside of BC, Kentucky is the only other jurisdiction to rank purple-stemmed aster as rare at the sub-national level (S3 [Vulnerable]) (NatureServe 2014).

A total of four occurrences of purple-stemmed aster are reported for the Property. Rare plant surveys in 2012 and 2014 recorded the taxon in scattered locations near the northern and western boundaries. All of the sites contained fewer than 50 individuals, and ranged in estimated size from 25 to 200 square metres. Two of the occurrences were located in or near a fen complex that also supported five other rare plant taxa; one of these sites comprised two subpopulations. The purple-stemmed aster plants were growing in a variety of habitats, including shrubby graminoid-dominated marsh and meadow areas, as well as transitional zones between mixed upland forest and fen wetlands.

References

Argus, G.W. 2010. *Salix*. In Flora of North America Editorial Committee (ed.). *Flora of North America North of Mexico*. Oxford University Press. New York, New York.

BC Conservation Data Centre (BCCDC). 2014a. *BC Species and Ecosystems Explorer*. Available at: http://a100.gov.bc.ca/pub/eswp.

BC Conservation Data Centre (BCCDC). 2014b. *Species summaries for tracked taxa*. Available at: http://a100.gov.bc.ca/pub/eswp/.

Brooks, R.E. and S.E. Clemants. 2000. *Juncus*. In Flora of North America Editorial Committee (ed.). *Flora of North America North of Mexico*. Oxford University Press. New York, New York. 267.

Brouillet, L., J.C. Semple, G.A. Allen, K.L. Chambers and S.D. Sundberg. 2006. *Symphyotrichum*. In Flora of North America Editorial Committee (ed.). *Flora of North America North of Mexico*. Oxford University Press. New York, New York. 458–466.

Douglas, G.W., D. Meidinger and J. Pojar eds. 1998. *Illustrated flora of British Columbia: vols 1–8*. Ministry of Environment, Lands & Parks ; Ministry of Forests. Victoria, British Columbia.

Egger, J.M. 2008. Nomenclatural changes and selected lectotypification in Castilleja (Orobanchaceae). *Phytologia* 90(1): 63–82.

Gray, A. and M.L. Fernald. 1950. *Gray's manual of botany : a handbook of the flowering plants and ferns of the central and northeastern United States and adjacent Canada.* 8th ed. Dioscorides Press. Portland, Oregon.

Hitchcock, C.L., A. Cronquist, M. Ownbey and J.W. Thompson. 1955. *Vascular plants of the Pacific Northwest: vols 1-5*. University of Washington Press. Seattle, Washington.

Kilgallen, N. 2012. *Juncaceae Scratchpad*. Available at: http://juncaceae.e-monocot.org/taxonomy/term/1355/descriptions. Accessed: February 22, 2013.

Klinkenberg, B. 2014. *E-Flora BC: Electronic Atlas of the Plants of British Columbia*. Available at: http://eflora.bc.ca. Accessed: January 1, 2014.

Moss, E.H. and J.G. Packer. 1983. *Flora of Alberta: a manual of flowering plants, conifers, ferns and fern allies found growing without cultivation in the province of Alberta, Canada*. University of Toronto Press. Toronto, Ontario.

NatureServe. 2014. *NatureServe Explorer: An online encyclopedia of life: Version 7.1*. Available at: http://explorer.natureserve.org/. Accessed: June 8, 2014.

Williston, P. and P. Bartemucci. 2007. Notes on *Drosera* in British Columbia. *Botanical Electronic News* (Number 371).

APPENDIX H INCIDENTAL OBSERVATIONS

Incidental observations recorded on the Property in 2014.

Detection Survey	Date	Species	UTM Zone	UTM Easting	UTM Northing	Count
CONI-CP	07/07/2014	Western Toad	10V	562925	6210878	1
STGR-Lek	08/08/2014	Sharp-tailed Grouse	10V	563832	6213993	1
STGR-Lek	24/08/2014	Sharp-tailed Grouse	10V	563173	6214219	1
A-ANBO	07/07/2014	Western Toad	10V	562517	6213017	1
TEM	25/08/2014	Western Toad	10V	562458	6212890	1
TEM	25/08/2014	Western Toad	10V	562949	6212481	1
TEM	26/08/2014	Western Toad	10V	562946	6212477	1
TEM	26/08/2014	Western Toad	10V	562913	6211185	1
CONI-CP	24/06/2014	Red-tailed Hawk	10V	562301	6214011	2
CONI-CP	24/06/2014	American Kestrel	10V	562960	6214201	2
A-ANBO	07/07/2014	Upland Sandpiper	10V	562854	6213127	4
BBS	10/07/2014	Sandhill Crane	10V	562930	6213110	2
TEM	24/08/2014	Northern Harrier	10V	562913	6211185	1
TEM	27/08/2014	Rusty Blackbird	10V	563392	6212095	12
Bat Detector Servicing	01/08/2014	Barn Swallow	10V	563200	6211650	1

APPENDIX I BREEDING BIRD OBSERVATIONS

Breeding Bird Survey Results and Incidental Reports From 2012 and 2014. NWC – Northern Wetland Complex; EWC – Eastern Wetland Complex; WWC – Western Wetland Complex; NCF – Northern Cultivated Field; SCF – Southern Cultivated Field; NMF – Northern Mesic Forest; SMF – Southern Mesic Forest; and WMF – Western Mesic Forest.

Common Name	2012 Count	2014 Count	Incidental 2012 2014	NWC	EWC	WWC	NCF	SCF	NMF	SMF	WMF
Alder Flycatcher	3	0						X			
American Crow	11	1						X			
American Kestrel	0	2	2				X				
American Pipit	30	0					X				
American Redstart	7	0				X	X	X			
American Robin	42	23		X	X	X	X	X	X		
American Three-toed	2	0						X			
Barn Swallow*	10	1	2		X		X	X			
Black-and-white Warbler	5	0					X	X			
Black-billed Magpie	4	1				X	X	X			
Black-capped Chickadee	3	10				X	X	X			
Brown-headed Cowbird	11	2		X		X	X	X			
Blue-headed Vireo	9	0		X		X	X	X			
Blackpoll Warbler	3	1				X	X	X			
Bank Swallow	8	0					X	X			
Blue Jay	1	0						X			
Boreal Chickadee	2	0						X			
Bufflehead	1	0						X			
Blue-winged Teal	8	0					X	X			
Canada Goose	24	7				X	X	X			
Clay-colored Sparrow	14	4		X		X	X	X			
Chipping Sparrow	27	44		X	X	X	X	X	X		
Common Nighthawk	0	0	1					X			
Common Raven	11	38		X	X	X	X	X	X		
Common Yellowthroat	3	11				X		X	X		
Dark-eyed Junco	9	25			X	X	X	X	X		
Downy Woodpecker	0	2				X	X				
Fox Sparrow	1	0						X			
Great Blue Heron*	0	0	1					X			

Common Name	2012 Count	2014 Count	Incidental 2012 2014	NWC	EWC	WWC	NCF	SCF	NMF	SMF	WMF
Golden-crowned Kinglet	0	9				X		X			
Gray Jay	5	4				X	X	X			
Greater Yellowlegs	0	4				X		X			
Hairy Woodpecker	0	2			X		X				
Hermit Thrush	32	2		X	X	X	X	X			
Killdeer	3	0					X	X			
Lapland Longspur	1	0					X				
Long-billed Dowitcher	1	0					X				
Le Conte's Sparrow*	1	0					X				
Least Flycatcher	8	3					X				
Least Sandpiper	0	0	2	X							
Lesser Yellowlegs	15	0				X	X	X			
Lincoln's Sparrow	15	1		X			X	X			
Mallard	9	0				X	X	X			
Mountain Chickadee	0	2				X					
Northern Flicker	4	4		X	X	X	X	X	X		
Northern Harrier	1	1	3			X	X	X			
Northern Pintail	3	0					X				
Northern Shoveler	4	0					X	X			
Northern Waterthrush	5	3				X		X			
Orange-crowned	14	0					X	X			
Pectoral Sandpiper	5	0					X				
Pine Siskin	45	0		X		X	X	X			
Pacific-slope Flycatcher	0	1				X					
Purple Finch	0	3				X	X				
Rose-beaked Grosbeak	2	0						X			
Red-breasted Nuthatch	2	0						X			
Ruby-crowned Kinglet	23	23			X	X	X	X			
Red-eyed Vireo	17	0		X			X	X			
Red-tailed Hawk	1	4	7			X	X	X			
Rusty Blackbird*	0	18	12			X			X		
Ruffed Grouse	0	3	3			X	X	X			
Red-winged Blackbird	10	7				X	X	X			
Sandhill Crane	5	4	2			X	X	X	X		

Common Name	2012 Count	2014 Count	Incidental 2012 2014	NWC	EWC	WWC	NCF	SCF	NMF	SMF	WMF
Savannah Sparrow	45	34		X		X	X	X			
Semipalmated Plover	0	0	1				X				
Sora	8	0				X	X	X			
Solitary Sandpiper	2	0					X	X			
Song Sparrow	0	1				X					
Sharp-tailed Grouse*	0	0	16				X				
Swainson's Thrush	16	63			X	X	X	X	X		X
Tennessee Warbler	44	17			X	X	X	X	X		X
Townsend's Solitaire	0	1							X		
Tree Swallow	2	6				X	X	X			
Upland Sandpiper**	6	7	4			X	X	X	X		
Unknown Owl	0	1					X				
Unknown Shorebird	3	0					X	X			
Unknown Passerine	0	2						X	X		
Unknown Sapsucker	0	1				X					
Unknown Sparrow	4	0						X			
Varied Thrush	1	0						X			
Vesper Sparrow	1	0						X			
Warbling Vireo	5	0					X	X			
White-crowned Sparrow	0	29				X	X	X	X		
Wilson's Snipe	42	51		X	X	X	X	X	X		X
Wilson's Warbler	4	4		X	X	X		X	X		X
White-throated Sparrow	14	0		X		X	X	X			
Yellow-bellied Flycatcher	1	0		X							
Yellow-bellied Sapsucker	11	0				X	X	X			
Yellow Warbler	11	4			X	X	X	X			
Yellow-rumped Warbler	32	17		X		X	X	X	X		
TOTAL	**732**	**508**	**55**								

*Provincially Blue-listed (Threatened), **Provincially Red-listed (Endangered)

APPENDIX J PHOTOGRAPHS

Photo J.1

Location: 10 V 563782 6211896

Description: Wetland within eastern wetland complex, from western toad surveys

Date: June 3, 2014

Photo J.2

Location: 10 V 562711 6213033

Description: Wetland within western wetland complex, from western toad surveys

Date: June 3, 2014

Photo J.3

Location: 10 V 564181 6212463

Description: Wetland within eastern wetland complex, from western toad surveys

Date: June 3, 2014

Photo J.4

Location: 10 V 562953 6210797

Description: Aerial view of Property, taken from ~200 m south of entrance, facing north

Date: May 2, 2014

Photo J.5

Location: 10 V 562992 6211102

Description: Aerial view of Property, taken from entrance, facing north, with small wetland in foreground

Date: May 2, 2014

Photo J.6

Location: 10 V 563998 6211557

Description: Eastern edge of Property, looking northwest

Date: May 2, 2014

Photo J.7

Location: 10 V 562933 6211881

Description: Typical black spruce horsetail ecosystem

Date: Aug. 27, 2014

Photo J.8

Location: 10 V 562921 6211692

Description: Coyote den

Date: Aug. 27, 2014

Appendix 3: Monthly Reporting Form and Leaseholder Field Records 2016-2024

September 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	SUMMARY
					1 Drove through cows and calves checking	2 Ran well pump in field #5 for 1hr	# cattle on site= ___ Cattle in field#s:____ Cattle in wetland:___ Weather:
3 Drove through cows and calves checking	4 Ran well pump in field #5 for 2hrs	5	6 Ran well pump in field #5 for 2hrs	7 Drove through cows and calves checking	8 Ran well pump in field #5 for 2hrs	9 Put out salt and mineral for cows	# cattle on site= ___ Cattle in field#s:____ Cattle in wetland:___ Weather:
10	11 Ran well pump in field #5 for 2hrs	12 Drove through cows and calves checking	13 Ran well pump in field #5 for 2hrs	14 3 hrs fixing fence in field #1	15 Ran well pump in field #5 for 2hrs Opened gates to allow cattle access to Field #2	16 Opened gates to allow cattle access to Field #1	# cattle on site= ___ Cattle in field#s:____ Cattle in wetland:___ Weather:
17 Ran well pump in field #5 for 2hrs	18 Drove through cows checking Moved Cattle out of Field#6 closed gates	19 Ran well pump in field #5 for 2hrs Harvested green feed from field #4	20 Drove through cows checking Harvested green feed from field #4 77 bales @1250lbs	21 Drove through cows checking 1.5 hrs fixing fence in field #4 Opened gates to allow for cattle access to field #4	22 Ran well pump in field #5 for 2hrs Drove through cows checking Opened Gates to allow cattle access to field #7	23 Drove through cows checking	# cattle on site= ___ Cattle in field#s:____ Cattle in wetland:___ Weather:
24 Ran well pump in field #5 for 2hrs Drove through cows checking	25 Drove through cows checking, Moved cows out of field #1 &#2 closed gates.	26 Ran well pump in field #5 for 2hrs Drove through cows checking	27 Drove through cows checking	28 Drove through cows checking	29 Ran well pump in field #5 for 2hrs	30 Drove through cows checking	# cattle on site= ___ Cattle in field#s:____ Cattle in wetland:___ Weather:

September 2023 Marl Fen Summary

Date Cattle Entered Property = _____ Date Cattle Removed from Property = _____

Field	# Cattle	Date Cattle In	Date Cattle Out	Grass Length on Entry (cm)	Grass Length on Removal (cm)	Did Cattle get in Wetland
1						
2						
3						
4						
5						
6						
7						

Weather Conditions Summary:

Wildlife Observations (including issues with wildlife):

Water Use Summary:
Hours pump on:_____
Approximate water volume = hours x XX m^3 = _____

2016 Hydro land Date Diary

Apr 24 - disced field 7
Jun 2+3 - power harrowed 7
Jun 5 - seeded peas + oats in field 7.

Jun 23 - moved cows to hydro - 236 cow/calf pairs
- moved into field 5 with access to 3

Checked cows Jun 26 - something had rubbed gate down
+ around 10 pairs were in wetlands.
Logan went over with dogs + got them out + fixed
fence

July 2 - put bulls with cows.
" - started pumping water from wetlands

July 14 - put cows in fields 1+2 with access to 3
for water

Aug 15 - put cows in field 4 - access to field 3.

Sept 5 - put cows in field 6 - "

Sept 16 - Annie, Jim + Daryl came. We asked for
some more steel gates + for hay seed to be paid for
by hydro + the road to be fixed.

Sept 27 - moved cows from 6 + moved them to 1+2.
(enough rain that we didn't have to pump water)
Sept 27 - started swathing + baling field 7
Sept 30 - mostly finished swathing + baling - (3 to 4 hrs left)
but got snowed out.

Date

Oct 7-8 Hauled bales from field 7 + put in
feed yard as we couldn't use road
Oct 8 - turned cows into field 7 to eat rest of crop

Oct 17 - Started feeding at hydro
Fed cows from Oct 17 to Oct 31st
Cows had access to all fields as well.
- snow between 7" + 12" deep
Fed on pasture 3.
Nov 1 - trailed cows home.

2018 Field record for Hydro (Mod Fen)

Jun 9 - desired field # 3
Jun 11 - seeded field # 3 with oats.
- finished on the 12th.
Jun 30 - checked + fixed fences on perimeter of hydro.

July 4 - moved 150 cow/calf pairs to hydro.
- left them in feedyard overnight to pair up.
July 5 - put cows in pastures 1+2.
July 6 - put 10 bulls with cows.
July 14 - set up water system at well in field 2
Aug 7 - started cutting hay on field # 7.
" 9 - raked + started baling " "
Aug 10 - moved cows to field # 6 with access to 1/2 section of hayland to the north of hydro property - water is in private crop
Aug 18 - finished haying field # 7 + started hauling bales home. - finished hauling Aug 29th.
Sept 19 - started cutting oats on field # 3
- snowed + had a killing frost so had to leave greenfeed until nitrates went down in plants
Sept 23 - cut + baled greenfeed on field 3.
Sept 24 - Someone shot lock at Hydro + ran into gate + broke it. broke some posts.
Sept 25 - Reported damage at hydro + RCMP came to look at damage. They gathered broken lights + shell casings.
Sept 26 - Had to take Tractor + wagon with some panels over to hydro to temporarily fix access.
Sept 29 - Finished baling oats on field # 3.
Sept 30 - Hauled greenfeed bales.
Oct 28 - Brought cows home from hydro.

Field Record for Hydro

Date 2019

Jun 3 Cultivated field 3 except for around feed yard

5. Cultivated field 3 - finished. Rained day before so field broke up well.

Jun 12 Dave disced field #3

Jun 13 - spent part of day finding invoices to prove we paid Hydro for lease dues for 2017. Wrote a letter explaining payment for 2017 & '18 which involved gravelling access road which was approved by Anne McCutcheon & Jim Roberts & sent by E-mail to Mike Walker by Mike Mont.

Jun 16 Leah checked perimeter fence starting at N gate & going east. She had to stretch some wire & restaple part of fence. (6 hours)

Jun 17 Leah finished going around perimeter. She fixed fence on SW corner & along wet lands that all had loose wires & popped staples. (6 hours)

Jun 18 Disced field 3 again

Jun 20 Moved 156 cow/calf pairs to Hydro
left them in feed yard to push up for a couple of hours & turned them into fields 1 & 2.

Jun 21 - hooked up water to well in field 2. Everything worked well

Jun 22 - very windy - checked cows to make sure they were settled and pumped water.
Leah rolled field 3.

Jun 24 Rained all day - had to treat a sick calf for it August

25 Still raining - sick calf is a little better

27 Sunny - checked cows & started water. Drove around pasture to make sure everything is right

Jun 28 - Seeded oats in field 3

Jun 30 - Hauled bulls (8) to hydro + put with the cows

July 4 to 14 - Checked cows + started water every ~~second~~ day
- checked grass + fences & while water was filling tanks

July 16 - Moved cows to field 2 + started water + salted.
17 - Checked fence around field 7. Moved cows to field 7 with access to water in field 2.

July 20+23 - watered cows + checked pasture.

July 26 - phoned Nikki Walker because we had not heard anything about fixing gate. She said she was leaving + to deal with her replacement, so we still don't know about fixing gate.

July 31 - checked + watered cows found a dead calf that looked like a bear kill.

Aug 4 - checked cows
9 - " " - Found one of our bulls dead + carcass pulled through fence in NE corner of field 7. Tracks + hair on fence indicate a grizzly
17 - rained all day - bears are bothering cows. We found 2 new dead calves. We decided to move cows to field 6
Aug 20 - checked + moved salt to field 6
Aug 26 - Moved cows to ~~fenced~~ pasture W of field 6.
Sept 19 - Swathed oats on field 3

Oct 6. - put cows in oats - snowed 3" -
decided to swath graze it.
- they have access to fields 4+5 + to water.
- salted them

Oct 12th to 26 - checked cows every other day

Oct 24 - had an injured calf that we found while checking cows + crop. We went over with truck + trailer + brought it home.

Oct 27 Brought cows home from hydro.
Drained water tanks + took generator home.

Field Record for Hydro Date 2020

May 18 Went over to check fences + repair. Checked N + E perimeter fence - some elk damage to N.E. fence. Had to staple wires + tighten. (5 hours)

May 21 Finished going around fences + repairing - used aides side as it is too wet to access with a truck - checked S + W perimeter. - stapled + tighten wires in numerous places (7 hrs.)
- Checked grass in various fields - good covering of fescue in 1 + 2

May 23 Moved cows to hydro - 150 cow/calf pairs
Left them in feed yard for a couple of hours to pair up + moved them to fields 1 + 2. Hooked up water tank pumps + watering troughs to generator + pumped some water to make sure everything worked.

May 26 6°C + very windy - checked cows + water tanks

Jun 1 - checked cows + watered. - went around fence against wet lands in field 1 - to see if fence is tight - while water tanks were filling.

Jun 3 to 10 - checked cows + watered everyday

Jun 11 - - checked fences against wetland in field 3 while water was filling.

Jun 12 - cultivated field 3.

Jun 13 + 14 - finished cultivating field 3, rolled it + seeded to oats + undrseeded to hay - pasture mixture (Timothy, clover + brome)

Jun 15 to 25 - checked + watered

Jun 26 - checked perimeter fence on field 7 + stapled up some wires.

Jun 27 - fixed fence between fields 3 + 7 + moved cows to field 7 with access to field 2 for water.

PTO

Date 2020 cont.

Jun 30 Took six bulls to hydro
- rained all afternoon + next 3 days.

July 4 to 12 - checked + watered

July 13 - Took tracta + post pounder over to hydro to put some new posts around feed yard + to fix gates as the old posts are rotting off. Took around 6 hrs.

July 14 to 3 - checked cows + fill water troughs every other day.

July 31 - Moved cows to fields 4 + 5 where there are some sloughs with water.

Aug 6 - Opened fence + gave cows access to deeded section N of field 5 as well as fields 4 + 5. Salted.

Aug 11 to 28 - Cows are spending 80% of time on deeded land.
Aug 14 - extremely windy. Checked cows + fences to make sure no cows had gone over fence.

Sept 2. Checked + salted. Found a dead cow. Went + got the Tractor + hauled her away.

Sept. 12 - checked cows.
13 - brought bulls home

Sept 15 - Dad disced 30 acres on east side of field 1.

18 - Moved cows to crop on field 3 to engage it with access to water on field 4 + 6

Sept 29 - brought cows home.

Page

Field Record - Hydro

Date 2021

May 5 — Got a call from Tom Brent to say our lease had expired. I didn't realize that it was up to us to ask for renewal.

May 7 — Wrote a letter to Tom Brent requesting the Mail Fenn property for this year with a request to renew our lease for a further 5 yrs.

May 11 - Went to check grass + fences at hydro but across road was too soft

May 20 signed a 1 year lease.

Jun 1 — Dave disced part of field 1 that he broke up the fall before.

Jun 4 — Had seeded oats in part of field 1 + rolled it.

Jun 10 — Went over to hydro with post pounder to pound posts between fields 7 + 3. Put up + stapled wire. Went around perimeter fence.

Jun 13 — Moved cows to hydro - 120 pairs.

Jun 13 — We were very late in moving cows to hydro because we wanted to make sure we had a lease before putting cows there. Held them in feed yard for a couple of hours + put them in field 7 with access to field 2.

Jun 14 — Dave went to start water. He took generator over + started pumps to fill tanks. Everything worked.

Jun 20 - Checked water + filled tanks.

Jun 22 - Starting to get very hot. Dave took a cattle oiler over to hydro to help control flys on cows. They put on it + it has an insecticide on it to repell flys.

Jun 23 - Went to fill water troughs. Hauled 21 more pairs over to hydro.

Date

Jun 24 to 26 - Went to hydro to water cows everyday. The temperature is in the 30°c.

Jun 26 - Put 12 bulls with cows.

Jun 28 - Went to water cows. Let cows into trees in field #2 for shade as the temperature is supposed to get into the 40's. Anne MacIntosh gave us permission to do this because she hadn't realized when she fenced all the treed areas that she hadn't left any shelter for the cows

Jun 29 to July 5 - watered cows everyday. Checked cows + fields + salted + picked up some twine on fields

July 15 - Moved cows to new hay on field 3 with access to water on field 2

July 16 to 30 - Checked + watered everyday.

~~July~~ Aug 8 - Moved cows to field 5 with access to deeded land N of field 5. They had good water on deeded land + we didn't have to water them everyday

Aug 17 - Let cows have access to fields 4 + 6 as well as field 5 + field to N of 5.

Aug 30 - Brought cows home from hydro.

Sept 4 & 5 - broke up field 4.

Page

land N of 5

April 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28 4 hrs Fixed fence on field #3	29 1 hr Fixed fence on field #3 1.5 hrs fixing fence field #6	30 2hrs Fixed fence on field #3 2hrs fixing fence field#7

May 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2 3 hrs fixing fence on Field #4 Trailed 115 cows from Home to field #3 Drove through cows checking for new calves' morning and evening	3 6 hrs fixing fence on Field #5 Drove through cows checking for new calves' morning and evening	4 Drove through cows checking for new calves' morning and evening	5 Moved110 cow/calf pairs from our private property to the north into field #3 Drove through cows checking for new calves' morning and evening	6 Put out salt and mineral for cows Drove through cows checking for new calves' morning and evening	7 3.5 hrs fixing fence on Field #7 Drove through cows checking for new calves' morning and evening
8 Drove through cows checking for new calves' morning and evening	9 Drove through cows checking for new calves' morning and evening	10 4hrs checking fence on fields #1 &#2 Drove through cows checking for new calves' morning and evening	11 Drove through cows checking for new calves' morning and evening	12 Moved cows to Field #5 Drove through cows checking for new calves' morning and evening	13 Drove through cows checking for new calves' morning and evening	14 2hrs checking fence on fields #1 &#2 Moved cows that had not calved to field #7 Drove through cows checking for new calves' morning and evening
15 Drove through cows checking for new calves' morning and evening	16 Drove through cows checking for new calves' morning and evening	17 Drove through cows checking for new calves' morning and evening	18 Put out salt and mineral for cows Drove through cows checking for new calves' morning and evening	19 Drove through cows checking for new calves' morning and evening	20 Drove through cows checking for new calves' morning and evening	21 Drove through cows checking for new calves' morning and evening

22 Drove through cows checking for new calves' morning and evening	23 Drove through cows checking for new calves' morning and evening	24 Started discing field#4 Drove through cows checking for new calves' morning and evening	25 Moved cows from Field #7 to Field #5 Discing field #4 Drove through cows checking for new calves' morning and evening	26 Drove through cows checking for new calves' morning and evening	27 3 hrs fixing fence on Field #1&2 Drove through cows checking for new calves' morning and evening	28 Drove through cows checking for new calves' morning and evening
29 Drove through cows checking for new calves' morning and evening	30 Moved cows from field #5 to fields #1 &#2 Drove through cows checking for new calves' morning and evening	31 Started well pump in field #2 Drove through cows checking for new calves' morning and evening				

June 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1 Drove through cows checking for new calves	2 Ran well pump in field #2 for 2hrs Drove through cows checking for new calves	3 Drove through cows checking for new calves	4 2hrs fixing fence in field #5. Ran well pump in field #2 for 2hrs Drove through cows checking for new calves
5 Drove through cows checking for new calves	6 Ran well pump in field #2 for 2hrs Drove through cows checking for new calves	7 Meeting with BC Hydro, toured field #5,#3,#2,#1 Drove through cows checking for new calves	8 Ran well pump in field #2 for 2hrs Drove through cows checking for new calves	9 Drove through cows checking for new calves	10 Ran well pump in field #2 for 2hrs Drove through cows checking for new calves	11 Moved cows to field #5 and field #3 Drove through cows checking for new calves
12 Power harrowed field #4 Drove through cows checking for new calves	13 Seeded field #4 with 3 bushels per acre Oats	14 Put out salt and mineral for cows Drove through cows checking for new calves	15 Drove through cows checking for new calves	16 3 hrs fixing fence in field #7 Drove through cows checking for new calves	17 Drove through cows checking for new calves	18 Moved cows to field #7 Drove through cows checking for new calves
19 Hauled 13 bulls and put them with cows Drove through cows checking for new calves	20 Drove through cows checking for new calves	21 Drove through cows checking for new calves	22 Drove through cows checking	23 Drove through cows checking	24 Drove through cows checking	25 Drove through cows checking
26 Drove through cows checking	27 Drove through cows checking	28 Moved cows to field #3 Drove through cows checking	29 Put out salt and mineral for cows Drove through cows checking	30		

July 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1 3 hrs fixing fence on Field #4	2 6 hrs fixing fence on Field #1	3 Moved Cows from Field #7 to Field #1and #2 Ran well pump in field #2 for 2hrs	4 Drove through cows checking	5 Drove through cows checking	6
7	8 Ran well in field #2 for 1.5hrs Put out salt and mineral for cows	9	10	11 Moved cows to Field #3 and #2 Ran well in field #2 for 1.5hrs	12	13 Ran well in field #2 for 1.5hrs Drove through cows checking
14	15 Ran well in field #2 for 2hrs Drove through cows checking	16	17 Ran well in field #2 for 3hrs	18	19	20 Ran well in field #2 for 3hrs Drove through cows checking Checked fence
21	22 Ran well in field #2 for 2.5hrs	23	24 Moved cows to Field #6	25 Drove through cows checking	26	27 Drove through cows checking
28	29	30 Drove through cows checking	31			

Note * Field #2 opened up to allow for access to water

August 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2 Checked fence in fields #7 1.5hrs	3	4 Checked fence in fields #6 1.5hrs	5 Checked fence	6
7	8 Checked fence Drove through cows checking	9	10 Put out salt and mineral for cows Drove through cows checking	11 Checked fence	12	13 Checked fence Drove through cows checking
14	15	16 Checked fence Drove through cows checking	17	18 Removed #13 bulls from the property Ran well pump in field #2 for 2hrs Checked fence in fields #1 1.5hrs	19	20 Moved cows off BCH property to private property to the north
21 Gary pringle requested access to bring equipment through	22 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	23 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	24 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	25 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	26 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	27 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.
28 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	29 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	30 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.	31 Gary Pringle access through field #5, #3, #2 and #1 multiple times a day.			

September 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Gary Pringle completed using BC Hydro property as access for his property.	2	3
4	5	6 Checked fence in fields #6, #7 and #2 2.5hrs	7	8 Moved cows from Private property north back to Field #6, field #7 and field #2	9 Ran well in field #2 for 3hrs Put out salt and mineral for cows	10 EVAC order Opened gates to allow access to Field #1, #2,#3,#7,#6,#5,
11 EVAC order	12 EVAC order	13 EVAC order	14 EVAC order	15 EVAC order	16 EVAC order	17 Ran well pump in field #2 for 4hrs
18 Moved cows into Fields #3, #2, #7	19 Ran well pump in field #2 for 2hrs Drove through cows checking	20	21 Ran well pump in field #2 for 2.5hrs Checked fence in fields #1 1.5hrs Drove through cows checking	22	23 Ran well pump in field #2 for 2hrs Drove through cows checking	24 Swathed field #4 to allow cows to graze it
25 Swathed field #4 to allow cows to graze it	26 Ran well pump in field #2 for 3hrs Drove through cows checking	27 Moved cows out of Field #7	28	29 Checked cows	30	

October 2022

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Moved water truck to well in field #5 Closed gates to Field #2 Moved cows to field #4 and #5
2	3 Ran well pump in field #5 for 3.5hrs	4 Drove through cows checking	5	6 Ran well pump in field #5 for 2.5hrs Drove through cows checking	7	8 Ran well pump in field #5 for 3.5hrs Drove through cows checking
9	10 Moved Cows off Hydro property back home	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

Note * Field #2 opened up to allow for access to water

June 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1	2	3
4	5	6	7 Took a tour of the property to access fence conditions	8	9 2hrs fixing fence in field#4	10
11	12 12:30-3:30 Meeting with BC Hydro and BC enforcement officer toured property	13 Put out salt and mineral for cows in field #4 3hrs fixing fence in field #4	14 Ran well pump in field #5 for 1hr(water trough in field #4)	15 Moved 220 pairs of cows and calves to hydro property into field #4	16 Ran well pump in field #5 for 1hr Hauled 12 bulls over to field #4 and put with cows	17 Checked cows and calves Ran well pump in field #5 for 1hr
18 Ran well pump in field #5 for 1hr	19 4.5hrs fixing fence in field#5 Ran well pump in field #5 for 1hr	20 Ran well pump in field #5 for 1hr	21 2.5hrs fixing fence in field#5 Moved cows into Field #5	22 Ran well pump in field #5 for 1hr	23 Ran well pump in field #5 for 1hr	24 Drove through cows checking Ran well pump in field #5 for 1hr
25 Ran well pump in field #5 for 1hr	26 2hrs fixing fence in field#3 Drove through cows checking Ran well pump in field #5 for 1hr	27 Ran well pump in field #5 for 1hr	28 Put out salt and mineral for cows Drove through cows checking Ran well pump in field #5 for 1hr	29 3.5hrs fixing fence in field#3 Ran well pump in field #5 for 1hr	30 Moved cows into Field #3 with access to field #5 for fresh water Ran well pump in field #5 for 1hr	

July 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Ran well pump in field #5 for 1hr
2 Rejuvenating Field#4 using vertical tillage 6.5 hrs.	3 Ran well pump in field #5 for 2hrs Rejuvenating Field#4 using vertical tillage 9.5hrs. Drove through cows and calves checking	4 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	5 Ran well pump in field #5 for 2hrs Planted field #4 with 3 bushels per acre Mustang oats Drove through cows and calves checking	6 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	7 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	8 3 hrs. fixing fence in field #2 Drove through cows and calves checking
9 Drove through cows and calves checking	10 Open Gates to allow cows access to field #2 Ran well pump in field #5 for 1.5hrs	11 Put out salt and mineral for cows Drove through cows and calves checking	12 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	13 Drove through cows and calves checking	14 Ran well pump in field #5 for 1.5hrs	15 Drove through cows and calves checking
16 Ran well pump in field #5 for 2hrs	17 Drove through cows and calves checking	18 Ran well pump in field #5 for 2hrs	19 Drove through cows & Calves checking	20 Ran well pump in field #5 for 2hrs Drove through cows checking	21 Ran well pump in field #5 for 2hrs Drove through cows checking	22 Drove through cows checking
23	24	25	26	27	28	29

Ran well pump in field #5 for 2hrs Drove through cows checking	Drove through cows checking	Ran well pump in field #5 for 2hrs Drove through cows checking	Put out salt and mineral for cows Drove through cows checking			
30 Ran well pump in field #5 for 2hrs Drove through cows checking	31 Drove through cows checking					

August 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5 Ran well pump in field #5 for 1hr
6 Closed access to field #2 4.5hrs fixing fence field #7 Ran well pump in field #5 for 1hrs	7 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	8 Drove through cows and calves checking	9 Ran well pump in field #5 for 2hrs Opened gates to allow cattle access to field #7	10 Drove through cows and calves checking	11 Ran well pump in field #5 for 2hrs	12 Drove through cows and calves checking
13 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	14 Ran well pump in field #5 for 2hrs	15 Put out salt and mineral for cows Drove through cows and calves checking	16 Ran well pump in field #5 for 2hrs	17 2.5 hrs fixing fence in field #7	18 Ran well pump in field #5 for 2hrs	19 Drove through cows and calves checking
20 Ran well pump in field #5 for 2hrs	21 4.5hrs fixing fence field #6 Drove through cows and calves checking	22 Ran well pump in field #5 for 2hrs	23 Drove through cows checking, moved cows out of field #7, Open gates to allow cattle access to field#6	24 Drove through cows checking	25 Ran well pump in field #5 for 2hrs Drove through cows checking	26 Drove through cows checking
27 Ran well pump in field #5 for 2hrs Drove through cows checking	28 Drove through cows checking	29 Ran well pump in field #5 for 2hrs Drove through cows checking	30 Put out salt and mineral for cows Drove through cows checking	31 Ran well pump in field #5 for 1.5hrs		

September 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 Drove through cows and calves checking	2 Ran well pump in field #5 for 1hr
3 Drove through cows and calves checking	4 Ran well pump in field #5 for 2hrs	5	6 Ran well pump in field #5 for 2hrs	7 Drove through cows and calves checking	8 Ran well pump in field #5 for 2hrs	9 Put out salt and mineral for cows
10	11 Ran well pump in field #5 for 2hrs	12 Drove through cows and calves checking	13 Ran well pump in field #5 for 2hrs	14 3 hrs fixing fence in field #1	15 Ran well pump in field #5 for 2hrs Opened gates to allow cattle access to Field #2	16 Opened gates to allow cattle access to Field #1
17 Ran well pump in field #5 for 2hrs	18 Drove through cows checking Moved Cattle out of Field#6 closed gates	19 Ran well pump in field #5 for 2hrs Harvested green feed from field #4	20 Drove through cows checking Harvested green feed from field #4 77 bales @1250lbs	21 Drove through cows checking 1.5 hrs fixing fence in field #4 Opened gates to allow for cattle access to field #4	22 Ran well pump in field #5 for 2hrs Drove through cows checking Opened Gates to allow cattle access to field #7	23 Drove through cows checking
24 Ran well pump in field #5 for 2hrs Drove through cows checking	25 Drove through cows checking, Moved cows out of field #1 &#2 closed gates.	26 Ran well pump in field #5 for 2hrs Drove through cows checking	27 Drove through cows checking	28 Drove through cows checking	29 Ran well pump in field #5 for 2hrs	30 Drove through cows checking

October 2023

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1 Ran well pump in field #5 for 1hr Drove through cows checking	2 Ran well pump in field #5 for 1hr Drove through cows checking	3 Ran well pump in field #5 for 1hr Drove through cows checking	4 Moved cattle home off BC Hydro property	5	6	7
8	9	10 Plowed field #2 See pictures below	11 Plowed field #2 See pictures below	12 Plowed field #2 See pictures below	13	14
15	16 6.5 hrs repairing fencing, Closed all gates, locked main gate and left for the winter season	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

May 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5 Rejuvenating Field#4 using vertical tillage 7.5 hrs.	6 Rejuvenating Field#4 using vertical tillage 9.5hrs.	7	8 Planted field #4 with 3 bushels per acre Mustang oats, under seeded with hay mixture, 10 hrs	9 Rejuvenating Field#2 using vertical tillage 2.5 hrs.	10	11
12	13 Rejuvenating Field#2 using vertical tillage 8 hrs.	14 Planted field #2 with 3 bushels per acre Mustang oats, 6.5 hrs	15	16	17	18
19	20	21	22	23	24 Ran well pump in field #5 for 2.5hrs Put out salt and mineral for cows Fixed fence field #5 3.5 hours	25

26	27	28	29	30	31	
Fixed fence field #6 5.5 hours		Fixed fence field #3 and #4, 5 hours	Moved 162 pairs of cow calves onto field #5	Ran well pump in field #5 for 1.5 hrs	Ran well pump in field #5 for 1hrs	Picture below is planting field #4 and field #2.

June 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1 Ran well pump in field #5 for 1hr
2	3 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	4 Ran well pump in field #5 for 2hrs, open gates into field #3 to allow cows to move on their own Drove through cows and calves checking	5 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	6 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	7 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	8 3 hrs. fixing fence in field #2. Put out salt and mineral for cows Ran well pump in field #5 for 2hrs Drove through cows and calves checking
9 Drove through cows and calves checking Hauled over 10 pairs cows and cavles Ran well pump in field #5 for 2hrs	10 Open Gates to allow cows access to field #7 Ran well pump in field #5 for 1.5hrs	11 Put out salt and mineral for cows Ran well pump in field #5 for 2hrs Drove through cows and calves checking	12 Ran well pump in field #5 for 2hrs Drove through cows and calves checking, Put out 8 bulls with cows	13 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	14 Ran well pump in field #5 for 1.5hrs	15 Ran well pump in field #5 for 2hrs Drove through cows and calves checking

16 Ran well pump in field #5 for 2hrs	17 Drove through cows and calves checking Ran well pump in field #5 for 2hrs	18 Ran well pump in field #5 for 2hrs	19 Drove through cows & Calves checking Ran well pump in field #5 for 2hrs	20 Ran well pump in field #5 for 2hrs Drove through cows checking	21 Ran well pump in field #5 for 2hrs Drove through cows checking	22 Drove through cows checking Ran well pump in field #5 for 2hrs
23 Ran well pump in field #5 for 2hrs Drove through cows checking	24 Drove through cows checking Ran well pump in field #5 for 2hrs	25 Ran well pump in field #5 for 2hrs Drove through cows checking	26 Put out salt and mineral for cows Drove through cows checking	27 Ran well pump in field #5 for 2hrs	28 Ran well pump in field #5 for 2hrs	29 Ran well pump in field #5 for 2hrs
30 Ran well pump in field #5 for 2hrs Drove through cows checking		Picture below is of typical fence repair from wild life.				

July 2024

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	1	2	3	4	5	6 Ran well pump in field #5 for 1hr
7 Ran well pump in field #5 for 2hrs .	8 Ran well pump in field #5 for 2hrs . Drove through cows and calves checking	9 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	10 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	11 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	12 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	13 3 hrs. fixing fence in field #6 Drove through cows and calves checking
14 Drove through cows and calves checking	15 # Ran well pump in field #5 for 1.5hrs 2 hrs. fixing fence in field #6	16 Put out salt and mineral for cows Open Gates to allow cows access to field #6, closed gates to fields #3 and #7 Drove through cows and calves checking	17 Ran well pump in field #5 for 2hrs Drove through cows and calves checking	18 Drove through cows and calves checking Ran well pump in field #5 for 1.5hrs	19 Ran well pump in field #5 for 1.5hrs	20 Drove through cows and calves checking Ran well pump in field #5 for 1.5hrs
21 Ran well pump in field #5 for 2hrs	22 Drove through cows and calves checking Ran well pump in field #5 for 1.5hrs	23 Ran well pump in field #5 for 2hrs	24 Drove through cows & Calves checking Ran well pump in field #5 for 1.5hrs	25 Ran well pump in field #5 for 2hrs Drove through cows checking	26 Ran well pump in field #5 for 2hrs Drove through cows checking	27 Drove through cows checking

28 Ran well pump in field #5 for 2hrs Drove through cows checking	29 Moved cows to private property to the north.	30 N/A	31 N/A	Picture below is of dugout #5		

Appendix 8. Rutledge Management Plan 2025 Update

SITE C CLEAN ENERGY PROJECT

RUTLEDGE PROPERTY MANAGEMENT PLAN V2.1

Prepared by:

P. A. Christie, P.Ag., R.P.Bio. -Talisman Land Resource Consultants Inc.
and
K. Anré McIntosh, P.Ag., R.P.Bio. - BC Hydro

Updated in 2026 by:
Dan Webster, P.Ag., R.P.Bio., P.Biol. – Eco-Web Ecological Consulting Ltd.
and
Brent M. Matsuda, R.P.Bio. – BC Hydro

Version 2.2
March 2026

EXECUTIVE SUMMARY

BC Hydro owns five land parcels, totalling approximately 208 hectares (ha) that will be retained and managed to provide habitat for rare plants and wildlife such as ungulates, ground-nesting raptors, and non-wetland migratory birds. Collectively these properties are referred to as the Rutledge Property (the Property) and were purchased by BC Hydro on July 23, 2014. The Property is located on either side of Dry Creek, west of Farrell Creek about 12 kilometres (km) northeast of Hudson's Hope adjacent to the Site C reservoir.

The lands are located along the north bank of the Peace River and comprise gently sloping river terraces which back onto steep, warm southern aspect valley wall slopes. The cultivated terraces are within the provincial Agricultural Land Reserve (ALR). The uncultivated slopes are not in the ALR and have been identified as a candidate ungulate winter range (UWR) by the Ministry of Environment (now Ministry of Water, Land, and Resource Stewardship) although they have not been officially designated as UWR under the *Forest and Range Practices Act*.

This management plan (the Plan) has been prepared to add this UWR as compensation for the reduction of ungulate winter habitat resulting from the Site C Clean Energy Project (the Project) and subsequent filling of the Site C reservoir. This document outlines how the Property will be managed to protect UWR on the south-facing native grassland slopes, maintain and enhance values for non-wetland migratory birds, ground-nesting raptors, species at risk, and maintain agricultural production on the main forage fields above Hwy 97.

Management of the Property will aid in fulfilling various conditions attached to the Project's environmental certification as stated in the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC; Schedule B). These include:

- **FDS Condition 10.1 and 10.2**: addressing potential effects of the Project on non-wetland migratory bird habitat
- **FDS Condition16.1 and 16.2**: addressing potential effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants
- **EAC Condition 4**: addressing provision of riparian habitat and bank stabilization
- **EAC Condition 16**: Implement various mitigation and compensation measures and describe in the Vegetation and Wildlife Mitigation and Monitoring Plan.
- **EAC Condition 21**: Survey songbirds and ground-nesting raptors populations during construction and operations
- **EAC Condition 24**: The EAC Holder must identify and maintain suitable lands for ungulate winter range on BC Hydro-owned lands.

This document is intended to be a high-level guidance document that will be amended as needed based on monitoring of the effects of agricultural activities on the Property and further studies assessing wildlife use of the Property by ground-nesting raptors, non-wetland migratory birds, and species at risk. Management objectives and results will be reviewed annually with the leaseholder and refined as and when needed.

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List of Acronyms

ALR - Agriculture Land Reserve

asl - above sea level

BC - British Columbia

BCLI - BC Land Inventory

BR - Branham soil unit

cm - centimeter

CY - Clayhurst soil unit

EAC - Environmental Approval Certificate

FDS - Federal Decision Statement

FFP - freeze free period

FRPA – Forest and Range Practices Act

GDD - Growing Degree Days

GWM - General Wildlife Measure

ha - hectare

Hwy - Highway

km - kilometer

m - meter

mm - millimetre

MFLNRO - Ministry of Forests, Lands, Natural Resource Operations and Rural Development

MOF - Ministry of Forests

PRRD - Peace River Regional District

SARA - Species At Risk Act

t/ac – ton / acre

t/ha – tonnes / hectare

TEM - Terrestrial Ecosystem Mapping

UWR - Ungulate Winter Range

WW –Fuzzy-Spiked Wildrye – Wolf Willow ecological community

1.0 INTRODUCTION

BC Hydro owns five land parcels, totalling approximately 208 hectares (ha) that will be retained and managed to provide habitat for rare plants and wildlife such as ungulates, ground-nesting raptors, and non-wetland migratory birds. Collectively these properties are referred to as the Rutledge Property (the Property) and were purchased by BC Hydro on July 23, 2014. The Property is located on either side of Dry Creek, west of Farrell Creek about 12 kilometres (km) northeast of Hudson's Hope adjacent to the Site C reservoir (Figure 1). The legal descriptions of the five parcels that will be managed for rare plants and wildlife are summarized in Table 1.

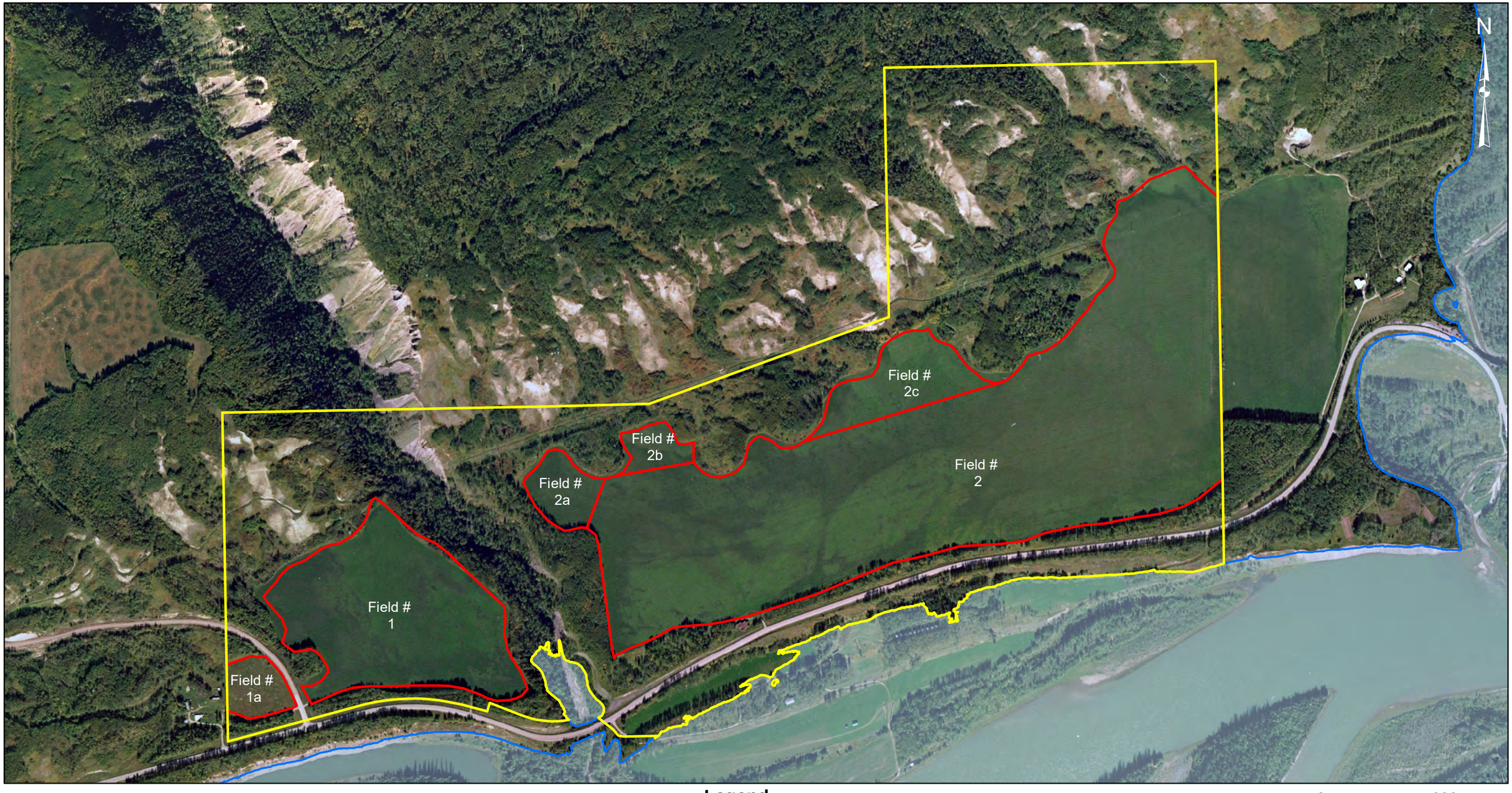
The lands are located along the north bank of the Peace River and comprise gently sloping river terraces which back onto steep, warm southern aspect valley wall slopes. The cultivated terraces are within the provincial Agricultural Land Reserve (ALR). The uncultivated slopes are not in the ALR and have been identified as a candidate ungulate winter range (UWR) by the Ministry of Environment (now Ministry of Water, Land, and Resource Stewardship) although they have not been officially designated as UWR under the *Forest and Range Practices Act*. This management plan (the Plan) has been prepared to add this UWR as compensation for the reduction of ungulate winter habitat resulting from the Site C Clean Energy Project (the Project) and subsequent filling of the Site C reservoir.

The Property parcels located south of Highway (Hwy) 29 have been inundated with the reservoir filling, but the hayfields were used for forage production until reservoir fill in the fall of 2024. These lands are not discussed further in this Plan.

The current value of the Property as wildlife habitat reflects past agricultural management practices. An understanding of this past use is summarized below and will be used to guide the development of the long-term Property management plan.

Table 1. Legal descriptions of Rutledge Property

Parcel No.	Field Number	Legal description	Area (ha)
254	Field 2, Field 2c	Northwest 1/4 of Section 19, Township 82, Range 24 west of the 6th meridian Peace River District	64.56
254.1	Field 2c	Block A of the northeast 1/4 of Section 24, Township 82, Range 25 west of the 6th meridian Peace River District	5.27
255	Field 2	Part of the southwest 1/4 of Section 19, Township 82, Range 24 west of the 6th meridian Peace River District lying north of the left bank of the Peace River Except Plan 21821	29.07
257	Field 2, Field 2a, Field 2b	Southeast 1/4 of Section 24, Township 82, Range 25 west of the 6th meridian Peace River District Except Plans 21821	47.73
258	Field 1; Field 1a	Southwest 1/4 of Section 24, Township 82, Range 25 west of the 6th meridian Peace River District Except Plans 30367 and 21821	57.44



Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
4. Orthophotos created from 1:40,000 photos taken Sept. 10th 2007
5. Property boundary locations are best available but should be considered approximate. Property information is a combination of surveyed data representing BC Hydro's current ownership records and ICIS data. Property data is current as of October 22, 2015.

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Legend

- Mitigation Lands
- Fields
- Reservoir

1:9,000

0 300 m

BC Hydro

Figure 1. Rutledge Property Mitigation Fields
Terrestrial Ecosystem Mapping for Fields 1 and 2 of the Rutledge Mitigation Lands

Date	Dec 31, 2015	DWG NO	1016-C14-07083	R 0

Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals.

Path: X:\ArcGISProjects\Environment\Plants\Field_1-2_TEM_Mapping_Rutledge_Parcels_For_MapNum_B7981_1016_C14_07083.mxd

1.1 Management Plan Objectives

This document outlines how the Property will be managed to protect UWR on the south-facing native grassland slopes, maintain and enhance values for non-wetland migratory birds, species at risk and maintain agricultural production on the main forage fields above Hwy 97. This document is intended to be a high-level guidance document that will be amended as needed based on monitoring of the effects of agricultural activities on the Property and further studies on the use of the Property by non-wetland migratory birds and species at risk. Management objectives and results will be reviewed annually with the leaseholder and refined as and when needed.

Management of the Property will aid in fulfilling various conditions attached to the Project's environmental certification as stated in the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC; Schedule B). These include:

- **FDS Condition 10.1 and 10.2**: addressing potential effects of the Project on non-wetland migratory bird habitat
- **FDS Condition16.1 and 16.2**: addressing potential effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants
- **EAC Condition 4**: addressing provision of riparian habitat and bank stabilization
- **EAC Condition 16**: Implement various mitigation and compensation measures and describe in the Vegetation and Wildlife Mitigation and Monitoring Plan.
- **EAC Condition 21**: Survey songbirds and ground-nesting raptors populations during construction and operations
- **EAC Condition 24**: The EAC Holder must identify and maintain suitable lands for ungulate winter range on BC Hydro-owned lands.

This management plan is a living document which will be amended as needed based on Property monitoring, further studies, and refinement of management objectives.

1.2 Ungulate Winter Range Biological Justification / Supporting Rationale

The term "ungulate winter range" means an area that is identified as being necessary for the winter survival of an ungulate species. UWR objectives need to consider key life requisites including thermal cover, security cover and forage sources as well as potential risk factors such as road access, and conflicts with other user groups (e.g., range management).

1.2.1 Biological Justification / Supporting Rationale

The Peace River valley supports healthy populations of moose (*Alces alces americanus*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) that have value to Indigenous people for cultural uses, spirituality and sustenance harvest, and resident hunters and Guide Outfitters for harvest and tourism value. These ungulates are considered a high priority for conservation management. UWRs in the Peace River Valley were partly inundated by the flooding of the Project's reservoir, reducing the availability of winter range for these species. Therefore, the protection of new UWRs helps to uphold EAC Condition 24 to ensure there is adequate winter range for these species and their winter survival. While the provincial management goal for these species is to ensure Indigenous harvest first, resident

harvest second and to maintain viable populations, the setting aside of land as UWR that already has high ungulate value helps to attain this goal. The biological criteria that were applied in the selection of this UWR as an offset included snow interception (thermal cover of forested habitat and south-facing slopes), security cover (screening/protection from predators/hunters) and forage production (quality and quantity).

1.2.2 Conservation Status / Priority

Moose, elk, mule deer and white-tailed deer are provincially yellow-listed[1] but are not ranked by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and none of these species are listed under the federal *Species at Risk Act* (SARA) Schedules 1-3 (Canada 2024).

1.2.3 Expected Conservation Achievements /Outcome

The proposed UWR U-9-007 (NPL-015) is 3,217 ha in size and overlaps Farrell Creek on the north of the Property. The proposed UWR was impacted by reservoir inundation along Farrell Creek, so the protection of this Property will serve to offset 208 ha of winter range lost through reservoir fill for elk, mule deer and moose. The Rutledge Property and management plan will provide a habitat anchor for the proposed UWR increasing the effectiveness and value of the proposed UWR if it becomes a legal designation.

The *Forest and Range Practices Act – Government Action Regulation* section 9 enables the Minister to develop and apply a general wildlife measure for a specified area (e.g. UWR) to protect or conserve that species. This document will provide General Wildlife Measures (GWMs) specifying how the Property can be managed to maintain value for these ungulates (largely tied to its use as agricultural land) by providing monitoring of measures used over time. These measures will be consistent with the recommendations in the *Compendium of Wildlife Guidelines for Industrial Operation Projects in the North Area, British Columbia* (MFLNRO 2014).

As per Section 9 of the Government Action Regulation as enabled by section 149.1 of the *Forest and Range Practices Act*, the Minister responsible for the *Wildlife Act* may by order establish GWMs for this UWR. It is expected that the agricultural use of the Property will be maintained as it provides an intrinsic winter range value to the ungulates using this area.

1.3 Consultation on Plan

Consultation with agencies regarding the development and implementation of this plan is outlined below:

- December, 2015 draft plan sent to Environment Canada (Christie and McIntosh 2015)
- December, 2015 draft plan sent to and Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO) (Christie and McIntosh 2015)
- January 2024 – July 2025 draft plan reviewed by Dan Webster with Eco-Web Ecological Consulting Ltd. to update for resubmittal.
- June 2025 – discussion with local resident and new leaseholder Travis Winnicky on ungulate use of the area and strategies to keep ungulates off the highway.

[1] Red-list = Endangered or Threatened; Blue-list = Vulnerable or Special Concern; Yellow-List = Not At Risk

2.0 PROPERTY BACKGROUND

2.1 Agriculture

2.1.1 Soils

The Rutledge Property is located along the west side of Farrell Creek at the confluence with the Peace River, about 12 km northeast of Hudson's Hope, at an elevation between 440-600 m above sea level (asl). Highway 29 bisects the Property and Farrell Creek Road lies along the western boundary. A deep, glacial drainage gully transects the easterly boundary of Lot 258 and southwest boundary of Lot 257 (Figure 1).

The Branham (BR)-Clayhurst (CY) soils unit occupies the upper hayfields of the gently to moderately sloping, south-facing terraces dominantly on the north side of Hwy 29 (BC Soil Survey 1986). Branham soils are classified as Orthic Eutric Brunisols. They are well drained and have developed on calcareous, sandy to silty, colluvial fan and glacio-fluvial terrace deposits. Generally, the BR-CY unit contains about 40% Clayhurst soils, which are classified as Eluviated Eutric Brunisols developed on gravelly, sandy glacio-fluvial deposits. Clayhurst soils are well to rapidly drained and weakly calcareous.

2.1.2 Climate Capability for Agriculture

Fields 1 and 2 (Figure 1) are mapped within unimproved (non-irrigated) climatic capability rating Class 2G, with the "G" limitation denoting growing degree-days (GDD) of about 1,240. The freeze-free period (FFP) is generally less than 90 days. May to September precipitation is about 225-230 millimetres (mm), and the climatic moisture deficit is about 130 mm/year. The climatic capability rating does not improve with irrigation, due to the G limitation, although crop production would be increased with supplemental irrigation in some years when drought periods occur during the growing season (BC Ministry of Environment 1983, BC Hydro 2012a,2012b, 2013).

2.1.3 Land Capability for Agriculture

The BR-CY soil map units, occupying Fields 1 and 2, have high capability for agriculture and can support a fairly wide range of crops.

Based on the July 2014 and August 2022 site visits, Fields 1 and 2 appear to be dominantly BR soils, with an agricultural capability of Class 2[2] due to climatic capability restrictions. The British Columbia (BC) Land Inventory (BCLI 1979) rates these fields as Class 2 with a combination of minor limitations (Class 2X[3]). The capability would not improve to Class 1[4] with irrigation due to the on-going GDD (G) climatic limitation. The BCLI mapping predates the published soils mapping referred to above and does not reflect the component (~40%) of CY soils mapped as occurring within these units.

[2] Class 2 soils have moderate limitations on crop production or may require moderate conservation practices

[3] Subclass X indicates the soil has a limitation resulting from a minimum of two adverse characteristics

[4] Class 1 soils do not have significant limitations for crop production

Limited field observations to date noted that Branham soils mixed with patches of gravelly, sandy CY soils. Gravelly, sandy CY soils are rated as agricultural capability Class 4[5] due to low moisture holding capacity and low fertility. The agricultural capability of the CY component would improve one class (to Class 3[6]) with irrigation and other management improvements (fertilization, increased organic matter). These improvements would also increase forage production levels.

2.1.4 Crop Suitability

Fields 1 and 2 are suitable for all the hay and grain crops grown in the Peace Region, with the Class 2C[7] climate limiting the range of other crops, including vegetables and fruits, which could be grown commercially without irrigation. The climatic moisture deficit (~130 mm) limits the amount of forage that could be produced (i.e., cut hay would be limited to one or possibly two crops per year, with the potential for additional aftermath grazing). The fine textured (BR) soils of Fields 1 and 2 may mitigate the climatic soil moisture deficit to some extent, and both the range of cropping alternatives and production levels should be better on the fine textured areas of these fields, compared to the coarser textured (CY) soil pockets which would require irrigation to achieve higher production levels.

Soil and moisture conditions observed during the July 2014 and August 2022 site visits indicate that without irrigation, a single cut of hay can be harvested from the fields in most years. Actual harvested hay yields are unknown but likely in the 3-4 tonnes/ha (1.5 – 2 t/ac) range based on production estimates for Class 2-3 lands in a Class 3A[8] climate area. Forage yields would improve with irrigation, and it is possible that two or even three cuts of hay could be taken in some years.

2.1.5 Summary of Past Use

The subject lands are part of the historic Rutledge Farm, and the upper and lower terrace fields have historically been used for forage and grain production, including cut hay and (likely) canola, oats and/or wheat. The Property has been leased to a Peace River Valley farm operator for the past several years and the hayfields are grown as an alfalfa, timothy, tall fescue mix, commonly done in the Peace River Valley. None of the fields have been or are currently irrigated.

2.1.6 Noxious Weeds

An inventory of noxious weed presence on the Property was conducted in 2015 and the results will be provided to the leaseholder for incorporation into their weed management program (see Appendix I – 2015 Noxious Weed Survey). Seven noxious weeds were documented within the Property: annual sow thistle (S*onchus oleraceus)*, perennial sow thistle (*Sonchus arvensis),* Canada thistle (*Cirsium arvense),* common tansy (*Tanacetum vulgare),* oxeye daisy (*Leucanthemum vulgare),* scentless chamomile (*Matricaria maritime),* and wild oat (*Avena fatua*). Common tansy is listed as a "Category A" = high priority for eradication and containment species by the Peace River Regional District (PRRD 2016). Canada thistle, oxeye daisy, and scentless chamomile are all listed as "Category B" = medium priority for eradication and containment (PRRD

[5] Class 4 soils have severe restrictions that limits the range of crops that can be grown or require special conservation practices

[6] Class 3 soils have moderately severe restrictions that limits the range of crops that can be grown or require special conservation practices

[7] Subclass C indicates adverse climate limitations

[8] A climate area 3A indicates areas where the minimum winter temperatures reach -35°C to -37.2°C

2016). Annual sow thistle and perennial sow thistle are only rated for education and awareness (PRRD 2016). Control of the noxious weeds is the responsibility of the leaseholder.

2.2 Infrastructure on Site

2.2.1 Access

The Property is located about 12 km northeast of Hudson's Hope. Highway 29 bisects the Property, and the Farrell Creek Road lies along the eastern boundary. Field 1 is accessed via a short driveway at the intersection of Hwy 29 and Farrell Creek Road; Field 2 is accessed via a gate and short gravel driveway off Hwy 29. There are no buildings on the Property south or north of Hwy 29.

2.2.2 Water and Fencing

There are no irrigation improvements on the Property north of Hwy 29. The fields north of Hwy 29 are not currently fenced, but the leaseholder has plans to install a fence for cattle.

2.3 Vegetation Resources on the Property

2.3.1 Ecosystems Present

Terrestrial Ecosystem Mapping (TEM) was completed for the Property as part of the Site C Environmental Assessment (Hilton *et al.* 2013a). Thirteen ecosystems (habitats) were mapped on the Property (Figure 2). Table 2 summarizes the amount of each ecosystem mapped within the Property (Hilton *et al*. 2013a). The grasslands mapped as Fuzzy-spiked Wildrye – Wolf willow (WW) are considered a sensitive ecological community[9] since these grasslands occur on steep, erodible slopes which may be adversely impacted by grazing or road construction (Hilton *et al.* 2013a). None-of the ecosystems on the Property are classified as at risk (Hilton *et al.* 2013a).

[9] Sensitive ecological communities are groups of plants, animals and other organisms that interact together in a particular unique habitat and may be at risk, or vulnerable to development as identified by the Sensitive Ecosystem Inventory. Protection for sensitive ecological communities may fall under the Forest and Range Practices Act (FRPA) and the Government Actions Regulation (GAR) provides a mechanism to manage and conserve these ecological communities.

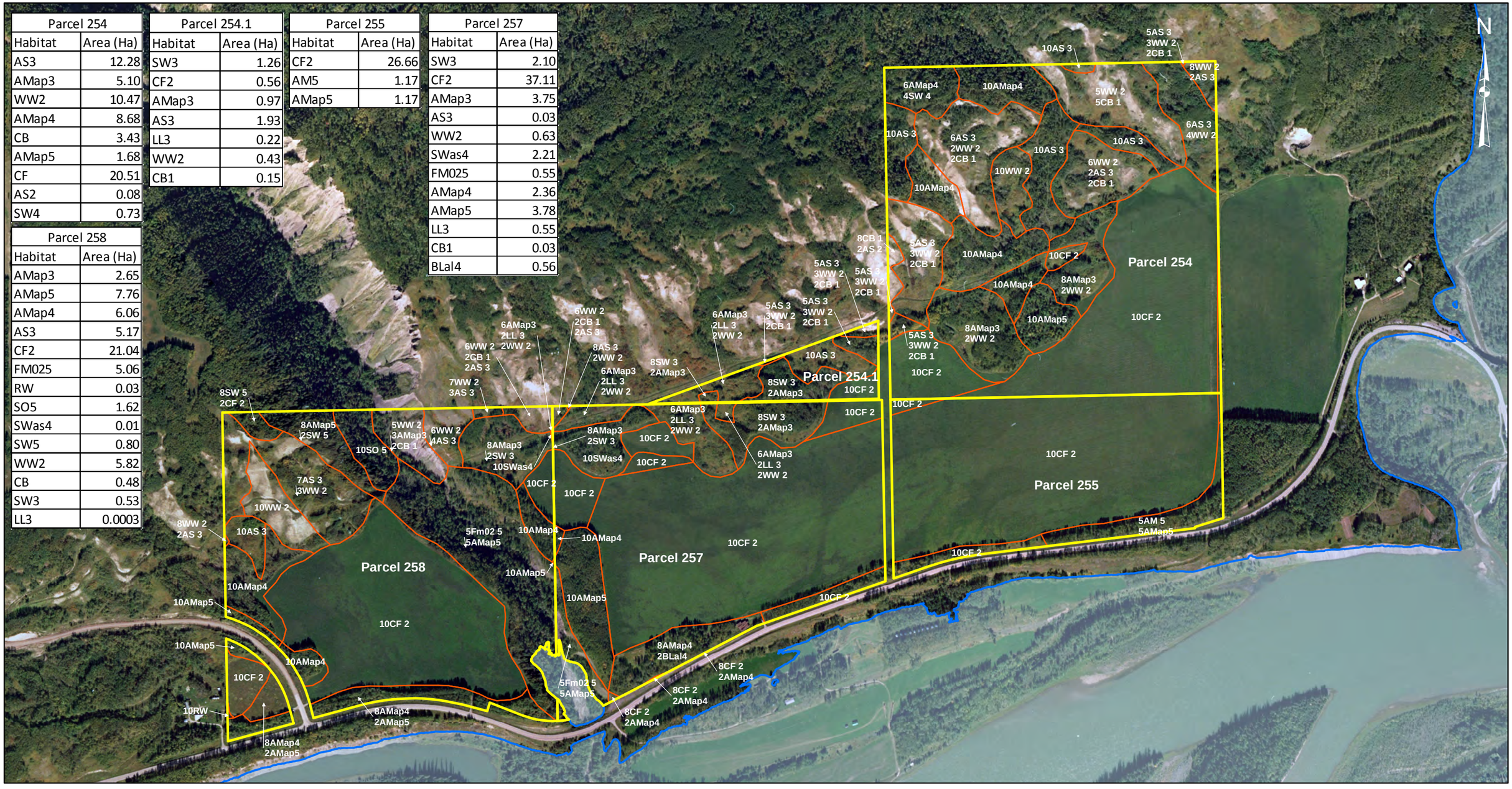
Parcel 254	
Habitat	Area (Ha)
AS3	12.28
AMap3	5.10
WW2	10.47
AMap4	8.68
CB	3.43
AMap5	1.68
CF	20.51
AS2	0.08
SW4	0.73

Parcel 254.1	
Habitat	Area (Ha)
SW3	1.26
CF2	0.56
AMap3	0.97
AS3	1.93
LL3	0.22
WW2	0.43
CB1	0.15

Parcel 255	
Habitat	Area (Ha)
CF2	26.66
AM5	1.17
AMap5	1.17

Parcel 257	
Habitat	Area (Ha)
SW3	2.10
CF2	37.11
AMap3	3.75
AS3	0.03
WW2	0.63
SWas4	2.21
FM025	0.55
AMap4	2.36
AMap5	3.78
LL3	0.55
CB1	0.03
BLal4	0.56

Parcel 258	
Habitat	Area (Ha)
AMap3	2.65
AMap5	7.76
AMap4	6.06
AS3	5.17
CF2	21.04
FM025	5.06
RW	0.03
SO5	1.62
SWas4	0.01
SW5	0.80
WW2	5.82
CB	0.48
SW3	0.53
LL3	0.0003



Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
4. Orthophotos created from 1:40,000 photos taken Sept. 10th 2007
5. Property boundary locations are best available but should be considered approximate. Property information is a combination of surveyed data representing BC Hydro's current ownership records and ICIS data. Property data is current as of October 22, 2015.

Legend

- TEM Mapping
- Property - BCH
- Reservoir

1:9,000 0 300 m

BC Hydro

Figure 2. Ecosystems on the Rutledge Property. Parcels 245, 254.1, 255, 257 & 258 and Terrestrial Ecosystem Mapping with Calculations of Area (ha) within Parcel

Date	Jan 04, 2016	DWG NO	1016-C14-B7991	R 1

© BC Hydro 2015 - all rights reserved. This map is for information purposes only and accuracy is not guaranteed.

Construction of the Site C Clean Energy Project is subject to required regulatory and permitting approvals.

Path: X:\ArcGISProjects\Environment\Plants\TEM_Rutledge_Parcels_and_Hwy29_Realign_1016_C14_B7991.mxd

Table 2. Habitats mapped within the Rutledge Property

TEM Habitat	TEM Code	Structural Stage	Area (ha)
White Spruce/Trembling Aspen-Creamy Peavine (seral Association)	AMap	3	12.47
	AMap	4	17.10
	AMap	5	15.13
White Spruce/Trembling Aspen-Step Moss	AM	5	1.17
White Spruce/Trembling Aspen-Soopolallie	AS	2	0.08
	AS	3	19.41
White Spruce-Wildrye-Peavine	SW	3	3.89
	SW	4	0.73
	SW	5	0.8
White Spruce-Soopolallie (seral association)	SWas	4	2.22
Black cottonwood/White Spruce-Red-osier dogwood	FM02	5	6.36
Fuzzy-spiked Wildrye – Wolf Willow	WW	2	17.53
Cutbank	CB	1	4.09
Cultivated field (including pastures)	CF	2	104.27
Rural	RW		0.03
White Spruce-Currant-Oak fern	SO	5	1.62
Lodgepole pine - Lingonberry - Velvet-leaved blueberry	LL	3	0.77
Subalpine Fir/Trembling Aspen-Labrador tea	BLal	4	0.56

2.3.2 Rare Plants

Inventories for rare plants were not conducted in this area during baseline surveys. Rare plant surveys were conducted within the Hwy 29 realignment corridor in 2015, during which two rare (red and blue-listed) vascular plant species and two rare lichens (blue-listed) were documented (Table 3; Hilton *et al.* 2013a) on BC Hydro's Rutledge property. An additional 14 rare plants may occur within portions of the Property not surveyed based on the habitats present (Table 3). Rare plant surveys were conducted annually through 2023 and a pre-construction rare plant survey report was completed (EcoLogic and Tetra Tech 2024). During the years in which they were conducted, the findings of the rare plant surveys were included in the annual Vegetation and Wildlife Management and Monitoring Plan reports submitted to regulatory agencies and are available through the BC Hydro Site C website at: https://www.sitecproject.com/document-library/environmental-and-socio-economic-plans-and-reports.

Table 3. Rare plants potentially occurring on the Rutledge Property

Common Name	Taxon	BC List[10]	Documented on the Property (Y/N)
VASCULAR PLANTS			
Herriot's sage	*Artemisia herriotii*	Red	
spike-oat	*Avenula hookeri*	Blue	
plains reedgrass	*Calamagrostis montanensis*	Blue	Yes
Torrey's sedge	*Carex torreyi*	Blue	
dry-land sedge	*Carex xerantica*	Blue	
tawny paintbrush	*Castilleja miniata* var. *fulva*	Red	Yes
Drummond's thistle	*Cirsium drummondii*	Blue	
old man's whiskers	*Geum triflorum* var. *triflorum*	Red	
Davis' locoweed	*Oxytropis campestris* var. *davisii*	Blue	
slender penstemon	*Penstemon gracilis*	Red	
Drummond's campion	*Silene drummondii* var. *drummondii*	Blue	
slender wedgegrass	*Sphenopholis intermedia*	Blue	
LICHENS			
protracted tarpaper	*Collema multipartitum*	Red	
peppered pelt	*Peltigera evansiana*	Red	
immaculate rosette	*Physcia stellaris*	Blue	Yes
threadbare ribbon	*Ramalina sinensis*	Blue	Yes
snow-white dimple	*Squamarina lentigera*	Red	

2.4 Vegetation Management

2.4.1 Protection of south-facing grassland and forested slopes

To protect the habitat values within the UWR and to support ground-nesting raptors, no livestock grazing will be permitted on the forested and old field habitat portions of the Property.

The management regime for Fields 1 and 2 will retain the suitability and availability of the adjacent south-facing grassland slopes for ungulate use in winter, late fall and early spring and maintain the suitability and availability of the Dry Creek ravine for birds, bats and amphibians.

Prescribed burns are used in the Peace Region to rejuvenate grasslands and increase their value and suitability for ungulates so have been identified here as an ecologically compatible activity for use on this Property. BC Hydro will work with the Ministry of Forests (MOF) to determine if prescribed burns under appropriate conditions are a suitable management tool for the south-facing grassland slopes above Field 2. From there, a prescribed fire burn plan should be developed by BC Hydro. Prescribed fire burn plans are broken down into three project phases, planning, execution, and post-burn analysis. The planning phase would require BC Hydro to engage with MOF and other stakeholders to set objectives and monitoring and outline technical

[10] Based on conservation status rank, each species is assigned to the red, blue or yellow list to help set conservation priorities under FRPA and a simplified view of the status of BC's species and ecosystems.

and operational delivery. Burning on these steep slopes would require specific conditions, namely a spring snow load where there is still snow present down low and at the top of the valley to prevent the fire from spreading and to have a lower intensity burn. Approvals can take up to two years to put in place so will require careful planning on BC Hydro's part (see https://prescribedfire.ca/plan-a-burn/). Based on this timing and uncertainty BC Hydro and the leaseholder may consider other methods, such as light discing and seeding as contingency methods to be managed by the leaseholder.

2.4.2 Creation of Old field habitats

Fields 1a, 2a, 2b and 2c (Figure 1), will be fenced off from Fields 1 and 2 managed to provide old field-grassland habitat. Vegetation height within these areas will be 0.3 to 2.1 metres (m) with the objective of providing breeding habitat for Short-eared Owl (*Asio flammeus*), Northern Harrier (*Circus hudsonius*), Sharp-tailed Grouse (*Tympanuchus phasianellus*) and Common Nighthawk (*Chordeiles minor*). Vegetation within the old field areas will be maintained through periodic mowing outside of the breeding bird window on a rotational basis such that at least one area is always maintained in old field status within the Property (i.e., one old field is mowed every four years). BC Hydro will ensure that the mowing activity is supervised by qualified professionals to ensure the protection of bird nesting, small mammal dens and other animals using the habitat.

3.0 WILDLIFE MANAGEMENT OBJECTIVES

Management of the Property will aid in fulfilling the conditions outlined in Section 1.1 above.

3.1 Target species

Management of the Property will target maintaining, creating and managing habitat (breeding, feeding, migration and winter) for:

- non-wetland migratory birds identified as species of conservation concern for Bird Conservation Region 6 by Environment Canada (2013)
- species at risk documented in similar habitats in the Project area
- ground nesting raptors (Northern Harrier, Short-eared Owl)
- ungulate winter range for elk, deer and moose

Should additional species of conservation concern for Bird Conservation Region 6 or species at risk be documented on the Property, the management plan will be reviewed and revised as required. Table 4 summarizes the species expected to occur on the Property based on habitat availability and occurrences documented in the baseline data (Hilton *et al*. 2013b,c,d,e, Hilton and Simpson 2013, Simpson *et al.* 2013).

Table 4. Avian species expected to occur in each habitat type in the Rutledge Property

Species	Scientific Name	Status in Area	Distribution of each species within habitats occurring on the Rutledge Property													
			AM	AM:ap	AS	BL:al	CB	CF	Fm02	LL	RO	RW	SO	SW	SW:as	WW
Non-wetland migratory bird species of conservation concern for BCR 6																
Alder Flycatcher	*Empidonax alnorum*	mb														
American Kestrel	*Falco sparverius*	mb						X								X
American Three-toed Woodpecker	*Picoides dorsalis*	mb	X	X		X			X				X			
Baltimore Oriole	*Icterus galbula*	mb	X			X			X			X				
Bank Swallow	*Riparia riparia*	mb					X									
Barn Swallow	*Hirundo rustica*	mb										X				
Bay-breasted Warbler	*Setophaga castanea*	mb	X						X				X			
Black-billed Magpie	*Pica hudsonia*	y			X			X				X				X
Blackpoll Warbler	*Setophaga striata*	mb	X										X			
Black-throated Green Warbler	*Setophaga virens*	mb	X	X		X			X				X			
Bohemian Waxwing	*Bombycilla garrulus*	y	X	X					X				X	X	X	
Boreal Chickadee	*Poecile hudsonicus*	y	X	X		X			X				X			
Brown Creeper	*Certhia americana*	mb	X										X			
Canada Warbler	*Cardellina canadensis*	mb	X	X									X	X		
Cape May Warbler	*Setophaga tigrina*	mb	X						X				X	X		
Clay-colored Sparrow	*Spizella pallida*	mb			X			X								X
Common Nighthawk	*Chordeiles minor*	mb						X				X				X
Common Yellowthroat	*Geothlypis trichas*	mb														
Connecticut Warbler	*Oporornis agilis*	mb	X							X				X		
Eastern Phoebe	*Sayornis phoebe*	mb						X				X				X
Le Conte's Sparrow	*Ammodramus leconteii*	mb						X								X
Least Flycatcher	*Empidonax minimus*	mb	X	X		X			X			X	X			
Mourning Warbler	*Geothlypis philadelphia*	mb		X		X			X	X			X	X	X	
Nelson's Sparrow	*Ammospiza nelsoni*	mb														

Species	Scientific Name	Status in Area	Distribution of each species within habitats occurring on the Rutledge Property													
			AM	AM:ap	AS	BL:al	CB	CF	Fm02	LL	RO	RW	SO	SW	SW:as	WW
Northern Flicker	*Colaptes auratus*	mb	X	X	X	X			X	X			X	X	X	
Northern Shrike	*Lanius borealis*	mb			X			X				X				X
Olive-sided Flycatcher	*Contopus cooperi*	mb							X							
Pileated Woodpecker	*Dryocopus pileatus*	y	X	X					X				X			
Sharp-tailed Grouse	*Tympanuchus phasianellus*	y	X	X	X	X		X	X	X			X	X	X	X
Western Tanager	*Piranga ludoviciana*	mb	X							X				X		
Western Wood-Pewee	*Contopus sordidulus*	mb	X						X	X			X	X		
White-throated Sparrow	*Zonotrichia albicollis*	mb			X			X				X				X
White-winged Crossbill	*Loxia leucoptera*	y	X							X			X	X		
Yellow-bellied Sapsucker	*Sphyrapicus varius*	mb	X	X									X	X	X	
Greater Yellowlegs	*Tringa melanoleuca*	mb														
Killdeer	*Charadrius vociferus*	mb						X				X				
Upland Sandpiper	*Bartramia longicauda*	mb						X				X				X
Other non-wetland migratory birds present within the Project Area																
American Pipit	*Anthus rubescens*	mb	X					X			X					
American Redstart	*Setophaga ruticilla*	mb	X	X		X		X	X	X			X	X	X	X
American Robin	*Turdus migratorius*	mb	X	X	X	X		X	X	X		X	X	X	X	X
Black and White Warbler	*Mniotilta varia*	mb	X	X		X		X	X	X			X	X	X	
Black-capped Chickadee	*Poecile atricapillus*	y	X		X			X	X	X		X	X	X		
Blue-headed Vireo	*Vireo solitarius*	mb	X					X	X	X			X	X		
Calliope hummingbird	*Selasphorus calliope*	mb														
Cassin's vireo	*Spizella passerina*	mb											X			
Cedar Waxwing	*Bombycilla cedrorum*	mb	X		X			X	X	X		X	X	X		
Chipping Sparrow	*Spizella passerina*	mb	X	X		X		X	X	X		X	X	X	X	X
Cliff Swallow	*Petrochelidon pyrrhonota*	mb					b				X					
Common Grackle	*Quiscalus quiscula*	y	X	X	X	X		X	X	X			X	X	X	X

Species	Scientific Name	Status in Area	Distribution of each species within habitats occurring on the Rutledge Property												
			AM	AM:ap	AS	BL:al	CB	CF	Fm02	LL	RO	RW	SO	SW	SW:as	WW
Dark-eyed Junco	*Junco hyemalis*	y	X	X	X	X				X			X	X	X	
Dusky Flycatcher	*Empidonax oberholseri*	mb	X	X		X				X			X	X		
Eastern Kingbird	*Tyrannus tyrannus*	mb	X	X	X								X			
Evening Grosbeak	*Coccothraustes vespertinus*	y	X	X					X				X	X	X	
Fox sparrow	*Passerella iliaca*	mb	X	X	X	X		X	X	X		X		X	X	X
Golden-crowned Kinglet	*Regulus satrapa*	mb	X					X	X	X			X	X		
Grey Catbird	*Dumetella carolinensis*	mb	X													X
Grey Crowned Rosy Finch	*Leucosticte tephrocotis*	mb					X				X	X				
Hairy Woodpecker	*Leuconotopicus villosus*	mb	X					X	X	X			X	X		
Hammond's Flycatcher	*Empidonax hammondii*	mb	X	X					X				X	X	X	
Hermit Thrush	*Catharus guttatus*	mb	X		X		X	X	X	X			X	X		X
House Sparrow	*Passer domesticus*	y						X				X				
Lincoln's Sparrow	*Melospiza lincolnii*	mb	X	X	X	X		X	X	X		X	X	X	X	X
Magnolia Warbler	*Setophaga magnolia*	mb	X	X	X	X			X	X			X	X		
Northern House Wren	*Troglodytes aedon*	mb	X	X	X			X		X		X		X	X	X
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	mb					X	X								X
Orange-crowned Warbler	*Leiothlypis celata*	mb	X	X	X	X	X	X	X	X		X	X	X	X	X
Ovenbird	*Seiurus aurocapilla*	mb	X	X		X		X	X	X			X	X	X	X
Pacific Wren	*Troglodytes pacificus*	mb														
Pacific Slope Flycatcher	*Empidonax difficilis*	mb	X		X				X	X			X	X		
Pine Siskin	*Spinus pinus*	mb	X		X		X	X	X	X		X	X	X		X
Purple Finch	*Haemorhous purpureus*	mb	X		X		X	X	X	X		X	X	X		X
Red Crossbill	*Loxia curvirostra*	mb	X										X	X		
Red-breasted Nuthatch	*Sitta canadensis*	y	X		X	X				X			X	X		

Species	Scientific Name	Status in Area	Distribution of each species within habitats occurring on the Rutledge Property												
			AM	AM:ap	AS	BL:al	CB	CF	Fm02	LL	RO	RW	SO	SW	SW:as	WW
Red-eyed Vireo	*Vireo olivaceus*	mb		X	X	X	X	X	X			X	X		X	X
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	mb	X	X	X	X	X	X	X	X			X	X	X	X
Ruby-crowned Kinglet	*Corthylio calendula*	mb	X					X	X	X			X	X		
Ruby-throated Hummingbird	*Archilochus colubris*	mb	X	X												
Savannah Sparrow	*Passerculus sandwichensis*	mb	X	X	X	X		X	X			X	X	X	X	
Says Phoebe	*Sayornis saya*	mb	X	X												
Song Sparrow	*Melospiza melodia*	mb	X	X	X		X	X	X				X	X	X	X
Swainson's Thrush	*Catharus ustulatus*	mb	X	X	X	X	X	X	X	X		X	X	X	X	X
Tennessee Warbler	*Leiothlypis peregrina*	mb	X	X	X	X		X	X	X		X	X	X	X	
Townsend's Solitaire	*Myadestes townsendi*	mb	X	X					X	X	X			X	X	X
Varied Thrush	*Ixoreus naevius*	mb	X	X		X		X	X				X	X	X	
Vesper Sparrow	*Pooecetes gramineus*	mb		X	X			X				X			X	X
Violet-green Swallow	*Tachycineta thalassina*	mb	X	X	X		X	X						X	X	
Warbling Vireo	*Vireo gilvus*	mb	X	X	X	X	X	X	X	X			X	X		X
White-breasted Nuthatch	*Sitta carolinensis*	y		X					X						X	
White-crowned Sparrow	*Zonotrichia leucophrys*	mb	X	X	X			X		X				X	X	
Winter Wren	*Troglodytes hiemalis*		X	X		X								X	X	
Yellow-rumped Warbler	*Setophaga coronata*	mb	X	X	X	X	X	X	X	X		X	X	X	X	

mb=migrant, breeds in Project areas; y=year-round resident breeds in Project areas; X=habitats used for breeding and/or migration

AM: White spruce/Trembling Aspen – Step moss

AMap: White spruce/Trembling Aspen – Creamy Peavine

AS: White spruce/Trembling Aspen – Soopolallie

SW: White Spruce – Wildrye – Peavine

SWas: White Spruce – Wildrye – Peavine

SO: White spruce – currant – oak fern

FM02: Black cottonwood/White Spruce – Red osier dogwood

WW: Fuzzy-spiked wildrye – Wolf willow

LL: Lodgepole pine – lingonberry – velvet-leaved blueberry

BLal: Subalpine fir/trembling aspen – Labrador tea

CF: Cultivated Field

RW: Rural

CB: Cutbank

3.2 Wildlife Management Activities

Management for non-wetland migratory birds, species at risk and ungulates will be achieved through:

- Establishing and maintaining old field habitats within Fields 1a, 2a, 2b and 2c (Figure 1) to provide nesting habitat for Short-eared Owl and Northern Harrier as described in Section 2.4.2 above.
- Installing fencing around the perimeter of Fields 1 and 2. The objective of the fencing is two-fold to contain any livestock grazing within the cultivated field areas and allow wildlife access to the hills while preventing access from trespassing/poaching from Hwy 29.
    - The fence configuration will be 5-strand wire. The top and bottom wires may be smooth. The middle three wires will be barbed. The lower and top smooth wires can be raised to facilitate ungulate passage as described in the BC Agricultural Fencing Handbook (Ministry of Agriculture Food and Fisheries 2002).
    - No trespassing/hunting signage will be placed along the Hwy 29 fence.
- Existing fencing will be removed in conjunction with installation of the new fencing.
- Protecting the forested habitat along and adjacent to Dry Creek from additional disturbance
    - fencing will be used to divide the area of cultivated field from the forested habitat
    - this part of the Property will not be included in the lease and the leaseholder will not be allowed to access or use this area
- Protecting native grassland and early seral habitats from additional disturbance
    - this part of the Property will not be included in the lease and the leaseholder will not be allowed to access or use this area
    - conducting, as required, prescribed burns of grassland habitats (steep south-facing slopes) to rejuvenate native grassland and early seral habitats and maintain and enhance their value as ungulate winter range

3.2.2 Ungulate Winter Range - Winter Ecology and Habitat Requirements – Biological Rationale

The biological rationale provided for below is intended to cover elk, mule deer and moose, which are species currently protected by UWR U-9-007. The components of winter ecology and habitat requirements include thermal cover, winter forage, interspersion of thermal cover and foraging areas, and access management and human disturbance, as outlined in *Establishing Ungulate Winter Range Objectives – Omineca Region* (Triton 2002).

Thermal Cover

The forested portions of the Property have the capacity to intercept snow and provide both thermal cover and accessible forage, which are the primary habitat variables influencing ungulate winter habitat selection in this part of northern BC (Triton 2002). Snow depth greatly influences elk distribution with a large selection to open south-facing slopes and forested habitats with good snow interception. Elk movements can be restricted by snow depths of 40-50 cm (Triton 2002). Along the Peace reach elk use open shrub/grassland communities and deciduous/mixed stands, along with south-facing slopes and cultivated fields such as those present on the Property (Bachmeyer 1994). Snow depths > 40 cm restrict deer movement and cover shrub forage, so

having the forested portion and the south-facing slopes on the Property are important aspects to elk and deer survival during the winter months. Moose are physically adapted to deeper snow conditions but are known to select for areas under 40 cm and will move out of an area when depths exceed 70-90 cm. Moose will spend most of their time feeding in open areas such as the agricultural fields, south-facing slopes and old fields, but if snow depths increase the forest cover becomes an important part of this Property. The forested areas have a crown closure of ~60% which will help maintain snow interception so not clearing these areas is an important part of this Plan.

Winter Forage

Elk are primarily grazers with 90% of their diet coming from grass species (Triton 2002). In the winter they tend to shift to mixed grasses and shrubs such as those occurring on south-facing slopes, old fields, and forested habitat on the Property. Mule deer browse a wider array of habitats from forested areas, agricultural fields and during the later winter, south-facing slopes. Maintaining this diversity of habitats on the Property through active burning of the south-facing slopes, creation and maintenance of old field habitat and preventing logging of the forested habitat builds durability into this winter range for deer.

The availability of forage is an important component of moose winter habitat selection as they need to consume large quantities of high-quality browse for their survival. Moose will therefore select foraging areas high in shrub species (i.e. willow, aspen, Balsam poplar, red osier-dogwood, Saskatoon, highbush cranberry, prickly rose and gooseberry. These species are well represented on the Property on the south-facing slopes, forested areas and old field habitat.

Interspersion of Thermal Cover and Foraging Areas

For elk and mule deer the interspersion of forest cover and openings is a desirable management objective for a UWR. Elk and deer require a minimum of 20% forest retention in age class ≥ 80 years with a minimum forage requirement of 15% or ≤20 years old (Mowat *et al*. 2002). Crown closure in the retained forested areas should be maintained at ≥50%. Elk prefer to stay close to escape/thermal cover at the forest edges so most of their foraging typically occurs within 200 m of available cover. The Property has Fields 1 and 2 as primarily agriculturally cultivated fields, but will also have Fields 1a, and 2a,b,c as old field habitat. The old fields and much of the main cultivated fields have adjacent forest cover that will meet these conditions.

Moose winter range objectives will require up to 10% of the area left as forest cover > 60 years old and at least 10% of the area available for forage (i.e. early seral shrub habitat < 20 years old). The creation and maintenance of old fields will provide the <20-year-old habitat and retention of the existing intermediate 80-100-year-old forest will provide the cover.

Access Management and Human Disturbance

For all the species involved, roads decrease the value of the habitat in a zone up to 100 m from the road. The main road here is Hwy 29 which runs along the south boundary of the Property adjacent to the cultivated field habitat. This provides a good buffer to the forested and old field habitat towards the middle of the Property and the south-facing slopes to the north. It is therefore recommended that no new roads be built on the Property for the current agricultural uses or potential future industrial use. Increased road access can increase hunter access and reduce ungulate densities. Since the Property is private land, this can be managed by BC Hydro within

the UWR. Currently there are no roads near the south-facing slopes, with Farrell Creek Road to the west being the closest. Highway 29 has a 400 m no hunting/shooting restriction along it. Discussions with the leaseholder who is a long-term resident of the area, indicates that there is a history of people ignoring these setbacks and actively trespassing and hunting on the Property. The Property should be fenced and posted for no hunting and enforced the leaseholder.

Animal – vehicle mortality along Hwy 29 was an issue before reservoir fill. With the filling of the reservoir in the fall of 2024, many elk, deer, and moose have become resident on the north side. While animals tend to avoid highways, the creation of the reservoir causes increased crossings and incidents in this area. Animals can access under the bridge, so cattle fencing will encourage use of this area for water. Discussions with the leaseholder suggested that placing a water source (water well, lined dugout) at the base of the hill should keep more of the ungulates back from the highway, reducing this source of mortality.

3.3 Ungulate Winter Range Objectives

Based on the discussion above, Table 5 (Triton 2002) presents proposed objectives to manage elk, mule deer and moose winter range in this UWR.

Table 5. Ungulate Winter Range Objectives for Elk, Mule Deer and Moose

Objectives	Assumptions	Measures
Maintaining 10—40% shrub cover of preferred deciduous forage species.	• Provides winter forage for elk, deer and moose.	• Create and maintain old field habitats with a 4-year rotational mowing schedule.
Maintaining at least 15% of the area in high suitability foraging habitat - grazing/ browsing habitat (grasses and shrubs)	• Elk and deer require a higher quantity of early seral habitat for winter forage. • Elk and deer will make use of agricultural species during winter grazing.	• Enhance forage productivity through prescribed burns. • Creation and maintenance of old field habitat. • Continued use and maintenance of the agricultural fields.
Maintain the intermediate age class (80-100 years) forest on the Property for thermal cover.	• Maintains available thermal cover by having a diversity of forest cover habitat.	• No logging or clearing in forested areas of the Property.
No new road or access development and no recreational use of the Property.	• Roads and human disturbance and noise reduce habitat effectiveness. • Road activity will displace animals and result in increase vehicle mortality.	• No new roads • No hunting or other recreational uses permitted during the winter season. • Place warning signs along Highway 29 to warn motorists of ungulate presence.
Reduce animal/vehicle mortalities along Hwy 29	• Reservoir filling may push ungulates to the highway increasing wildlife collision mortalities. A water source may keep animals from the highway	• Barbed wire fencing along Hwy 29 (allows animals to cross under the culvert). • Place a water source in field 2a at the base of the hill.

4.0 AGRICULTURAL MANAGEMENT OBJECTIVES

The objectives of field management are to maintain agricultural production within the areas of cultivated field habitat on the lower terrace adjacent to the reservoir and Hwy 29, create additional wildlife habitat within the old fields, and protect and maintain wildlife habitats within the Property. The overall agricultural management objective is to maintain and enhance forage production within Fields 1 and 2 on the upper terrace above realigned Hwy 29.

Retain and improve existing grain and hay production on Fields 1 and 2. Establish and maintain areas of old field habitat on the upper plateau. No livestock grazing is proposed on the old fields and the cultivated fields should be fenced prior to grazing these areas.

4.1 Field Management

Typically, Peace River hayfields and pastures are operated on an 8-10 year rotation designed to maintain optimal forage production levels – a greenfeed crop (such as oats) for up to 2 years, hay for up to 6 years, and pasture for up to 2 years.

Fields 1 and 2 have good alfalfa, timothy, and tall fescue stands and should not require immediate renovation, but would benefit from regular fertilizing, addition of organic matter (e.g., manure or green-manuring[11]) and perhaps scarification and over-seeding.

The proposed cultivation, weed treatment, fertilizing and seeding specifications for Fields 1 and 2 will be reviewed annually with the leaseholder.

Field 1a, 2a, 2b and 2c will be managed to provide old field-grassland habitat as discussed in Section 2.4.2 above.

4.2 Grazing Rotation

The primary use of the main fields will be crop and hay production, with grazing of crop residue following crop removal and rotational grazing of the cultivated field areas. Continuous grazing can lead to overgrazing resulting in increased weed growth and soil damage, while rotational grazing, helps to maintain the quality and longevity of the forage stand. Rotational grazing entails more intensive field management where the field is rested for several weeks or months, following a period of grazing for several days or weeks. The optimal number of livestock is placed in the field and distributed evenly throughout the field by salting[12] and water placement to ensure even grazing pressure over the entire field. The management decision on when to start grazing, end grazing, and then re-graze a field, is based on several factors, including the density and height of the grass/legume cover and ground (soil) conditions.

No grazing will occur in the old field and forested habitat on the Property and livestock will only be permitted once fencing is established.

Crop fields (Fields 1 and 2): A grazing rotation during the five-month period of mid-May through to mid-October will be followed to intensively manage Fields 1 and 2 only. This will generally entail

[11] Green-manuring is cultivating plants specifically to enrich the soil. This may involve planting legumes or grasses to till into the soil to increase soil organic matter and soil nitrogen for future crops.

[12] Salting is providing salt and minerals to livestock through salt blocks, loose salt, or lick tubs.

a period of short-term intensive grazing, followed by several weeks of rest, followed by an additional short grazing period The timing of the start of the grazing period will be dependent on crop removal timing and adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder.

The exact rotation schedule will be based on seasonal monitoring. Individual field specific rotations will be determined in consultation with the Property leaseholder on an annual basis. Implementation of this rotational system will require intensive management during the grazing season, including regular field maintenance (e.g., rejuvenation) and timely movement of cattle between fields, by the leaseholder.

4.3 Weed Management Plan

The leaseholder will be responsible for developing a weed management plan. BC Hydro will review and provide advice on the leaseholder's weed management plan. The following provides a summary of historic noxious weeds noted at the Rutledge Property (see details in Appendix I).

- In July 2015 an initial weed survey was performed and species identified during the walkthrough included annual sow thistle, creeping thistle, common tansy, oxeye daisy, perennial sow thistle, scentless chamomile and wild oats.
- The site was surveyed twice more in 2015, later in July and in September. Most of the weed occurrences were on the lower portion of the Property that is now flooded by the reservoir. Weed species identified within Fields 1 and 2 included creeping thistle, annual sow thistle, perennial sow thistle and wild oat.
- No weed surveys have been conducted since 2015. During two site visits in April and July of 2025, the presence of perennial sow thistle and wild oats were observed, however these site visits did not constitute a full weed survey.

5.0 ADDITIONAL REQUIREMENTS AND/OR RECOMMENDATIONS

- Create and maintain old field habitats.
- Enhance forage productivity through prescribed burns.
- No logging or clearing in forested areas of the Property.
- No polypropylene twine or wire is to be used for bailing hay on site. Only biodegradable twine to be used
- Hunting will not be permitted on the Property during the winter months, other than predator control.
- No recreational use of the Property will be allowed in the winter months.
- No access development other than that required to manage the cultivated fields will be allowed
- Cattle fencing to be established along Hwy 29 along with no hunting/trespassing signs. Fencing should allow access to the water under the Dry Creek bridge.
- Explore a water source within Field 2a to provide an alternative source of water (e.g., water well with a basin, lined dugout, or alternate).
- Honeybee hives (apiculture) will be allowed

6.0 MONITORING AND FOLLOW-UP TO MANAGEMENT OF PROPERTY

6.1 Lease holder record keeping requirements

At a minimum the leaseholder will keep annual records of the following:

- Crops grown including date of planting, fields planted and harvest
- Cattle grazed including number, date in, date out, locations.
- Weed treatment(s) including area treated, date of treatment, chemicals applied, rate of application, treatment efficacy and plans for following year's treatment
- List of any written hunting permissions (name and phone number) issued by the leaseholder including a record of legal harvest (date, number, species, sex).
- Wildlife observations, including any issues with wildlife
- Fencing requiring repairs (dates, locations, particularly if damage likely caused by wildlife)
- Wildlife carcasses including locations and dates
- Active raptor nests
- Carnivore (bear, coyote, fisher) dens

6.2 Monitoring by BCH

BC Hydro will conduct the following surveys and monitoring observations on the Property as per the federal and provincial approval conditions:

- Breeding bird surveys (see Sections 7.1.1.2-A and 7.2.7 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Survey of ground-nesting raptors (2016-2017) (see Section 78.9.5.1 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Surveys of migrating birds (e.g., March-April and September)
- Monitoring of general Property conditions will be completed annually (TBD)

6.3 Annual Meetings to Discuss/Update Management Plans

A schedule should be determined in consultation with leaseholder. BC Hydro suggests having these annual meetings in April each year, with potential follow up meetings in October if required.

7.0 SUMMARY OF UNGULATE WINTER RANGE MANAGEMENT

The Property has excellent historical winter range use by elk, deer, and moose. Agricultural activity has enhanced forage opportunities for wildlife in this area and maintenance of agricultural use is important for this value. Ungulate winter range values are enhanced by maintaining 10-40% shrub cover of deciduous forage species in old fields and surrounding hillsides with at least 15% of the area as high suitability foraging habitat - grazing/browsing habitat (grasses and shrubs). The intermediate age class (80-100 year) forest within the Property provides thermal cover. Grazing will be managed to rotational grazing on the crop fields to ensure forage levels will be maintained for ungulate winter use. To further prevent winter disturbance to ungulates, no new road or access development and no recreational use of the Property in the winter months will ensure its suitability as winter range. Along the south boundary of Fields 1 and 2 adjacent to Hwy 29, a cattle fence should be installed to reduce trespassing and ungulate access to Hwy 29. Additionally, to reduce animal-vehicle mortalities and promote public safety, a water source should be installed in Field 2A to keep ungulates away from the highway.

8.0 REFERENCES

Backmeyer, R. 1994. Peace Arm Elk Study. Peace Williston Wildlife Compensation Program. BC. Environment.

BC Hydro. 2011. Agricultural Slope Classification, Maps 31 and 32.

BC Hydro. 2012a. Site C Clean Energy Project – Agricultural Assessment Supporting documentation.

BC Hydro. 2012b. Land Capability for Agriculture, Maps 11 and 12 of 25.

BC Hydro. 2013. Site C Clean Energy Project - Environmental Impact Statement, Volume 3: Economic and Land and Resource Use Effects Assessment, Section 20: Agriculture.

BC Ministry of Environment. 1983. Climatology Unit, Climate Capability for Agriculture, 1:100,000 NTS Sheet 94A/SW.

BC Ministry of Environment and Ministry of Agriculture and Food. 1983. MOE Manual 1, RAB Technical Paper #1, Land Capability Classification for Agriculture in BC.

BC Ministry of Environment, Ecosystems Branch. Accessed May 27, 2014. Proposed Ungulate Winter Range: https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do;jsessionid=EBF0A28F93729E7F771EE670CC4CC9CB.node2

BC Soil Survey. 1986. Agriculture Canada - Soils of the Fort St. John-Dawson Creek area, British Columbia, Report No. 42.

Canada. 2024. Accessed on the Internet at: https://laws.justice.gc.ca/eng/acts/s-15.3/page-10.html#h-435647

Christie, P., K.A. McIntosh. 2015. Site C Clean Energy Project, Rutledge Property Management Plan DRAFT.

EcoLogic Consultants Ltd. and Tetra Tech Canada Inc. (EcoLogic and Tetra Tech). 2024. Experimental Rare Plant Translocation Program 2023 Annual Report. Prepared for BC Hydro, Burnaby, BC.

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 6: Boreal Taiga Plains.

Hilton, S., L. Andrusiak, R. Krichbaum, L. Simpson, and C. Bjork. 2013a. Part 1 Vegetation and Ecological Communities. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and C. Guppy. 2013b. Part 2 Butterflies and Dragonflies. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and L. Andrusiak. 2013c. Part 6 Raptors. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Andrusiak, L. Simpson, and M. Sarell. 2013d. Part 3 Amphibians and Reptiles. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, L. Andrusiak, and C. Albrecht. 2013e. Part 4 Migratory Birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S. and L. Simpson. 2013. Part 5 Non-migratory birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Klohn Crippen Berger Ltd. and SNC-Lavalin Inc. 2009. Peace River Development Site C Project. Technical Memorandum No. 04. Task 27: Engineering Support for the Stage 2 Cost Estimate. Environmental Mitigation and Compensation Measures. Draft Report.

Mowat, G., R.G. D'Eon, G. Woods, M. Panian, K.G. Poole, R. Serrouya and J. Wierzchowski. 2002. West Kootenay Ungulate Winter Range Mapping. DRAFT Prepared for: B.C. Ministry of Water, Land, and Air Protection, Fish and Wildlife Division Kootenay Region, Nelson, BC.

Ministry of Agriculture Food and Fisheries. 2002. BC Agricultural Fencing Handbook. Accessed online Feb 7, 2025, at: https://peaceforage.bc.ca/wp-content/uploads/2021/07/BC_Agriculture_Fencing_Handbook.pdf

Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). 2014. A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance. Accessed online at: https://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12121

Peace River Regional District (PRRD). 2016. Profile of Invasive Plant Species within the Peace River Regional District, Dawson Creek, BC 98 pgs.

Simpson K., T.K. Simpson, L. Simpson, L. Andrusiak, S. Hilton, M. Kellner, K. Klafki, I. Mattson and A. Creagh. 2013. Part 7 Mammals. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Triton Environmental Consultants (Triton). 2002. Establishing Ungulate Winter Range Objectives – Omineca Region Prepared for Ministry of Water, Land and Air Protection, Environmental Stewardship Division, Omineca Region, Prince George, BC.

Appendix I – 2015 Noxious Weed Survey

LANDS AT DRY CREEK

Site Visit and Consultation

Field Inspection Results

This property, located at Dry Creek, was added to the Peace River Valley Noxious Weed Mitigation Program in early 2015. The objective of the 2015 program was to inventory noxious weed infestations within the property.

The initial weed inventory survey was performed in July to identify the areas and extend of the noxious weed populations on site. Species found during the initial walkthrough were annual sow thistle, Canada thistle, common tansy, oxeye daisy, perennial sow thistle, scentless chamomile and wild oats. The property was visited twice more during the 2015 season to document the presence and extent of noxious weed infestations.

Perennial sow thistle as seen during the initial weed visit in July.

Annual sow thistle as seen during the initial visit in July.

Canada thistle as seen during the initial weed assessment in July.

Common Tansy as seen during a survey in September.

Noxious Weeds Present

annual sow thistle – *Sonchus oleraceus*
Canada thistle – *Cirsium arvense*
common tansy – *Tanacetum vulgare*
oxeye daisy – *Leucanthemum vulgare*
perennial sow thistle – *Sonchus arvensis*
scentless chamomile – *Matricaria maritima*
wild oats – *Avena fatua*

Area Uses

This area is used mainly for agricultural purposes.

Residential Considerations for Weed Control

There are no residential considerations in this area.

Industrial Considerations for Weed Control

There is currently no industrial activity in this area.

Riparian Considerations

The Peace River, Dry Creek and Farrell Creek are present and will need to be considered when treatment is undertaken in areas adjacent to them.

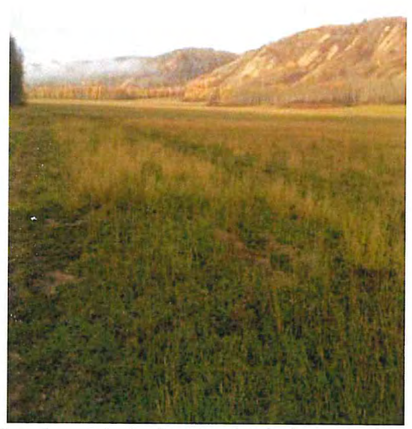
An overview of the Peace River.

Scentless chamomile on the bank of the Peace River as seen during a survey in September.

Canada thistle as seen during the final inventory visit in October.

Common tansy as seen at the final inventory visit in October.

Wild oats as seen at the final inventory visit in October.



Overview of the lands at Dry Creek during the final inventory visit in October.

Table 17 – 2015 Activity Summary for Lands at Dry Creek

Land Parcel	Baseline Survey / Walkthrough	Mechanical Treatment	Herbicide Application	Post treatment Inspection	Final Weed Audit
Lands at Dry Creek	July 21	-	-	-	-
	July 22	-	-	-	-
	Sept. 1	-	-	-	-
	-	-	-	-	Oct. 7&8

Map Notes:
1. Datum: NAD83
2. Projection: BC Albers
3. Base Data: Province of B.C.
4. Orthophotos: created from 1:15,000 photos taken 2011.

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Legend

Weed Location - Points
- Annual Sow Thistle
- Bull Thistle
- Canada Thistle
- Common Tansy
- Dalmation Toadflax
- Diffuse Knapweed
- Night-Flowering Catchfly

Weed Location - Points
- Oxeye Daisy
- Perennial Sow Thistle
- Rare Plant
- Scentless Chamomile
- Wild Oats
- Yellow Clematis
- Yellow Hawkweed

Weed Location - Polygons
- Annual Sow Thistle
- Bull Thistle
- Canada Thistle
- Dalmation Toadflax
- Perennial Sow Thistle
- Scentless Chamomile
- Wild Oats
- Yellow Clematis

Water Features

Drill Sites

Cadastral Parcel Boundaries

Roads-TRIM Data

CONFIDENTIAL DOCUMENT FOR PLANNING PURPOSES

1:5000

0 50 100 150 200 m

BC hydro | PATHFINDER ENDEAVOURS LTD

SITE C CLEAN ENERGY PROJECT

Site C Leased Lands
Lands At Dry Creek
2015 Weed Location Map

Date	Dec 14, 2015	DWG NO	1016-C14-07045-21	R0

Appendix 9. Wilder Creek Management Plan 2025 Update

SITE C CLEAN ENERGY PROJECT

WILDER CREEK PROPERTY MANAGEMENT PLAN V3.0

Prepared by:

Paul Christie, P.Ag., R.P.Bio. - Talisman Land Resource Consultants Inc.

and K. Anré McIntosh, P.Ag., R.P.Bio., PMP – BC Hydro

Updated in 2025 by:

Dan Webster, P.Ag., R.P.Bio., P.Biol. – Eco-Web Ecological Consulting Ltd.

Reviewed by Brent M. Matsuda, R.P.Bio. – BC Hydro

Version 3.0

March 2026

EXECUTIVE SUMMARY

BC Hydro owns ten land parcels, totalling approximately 536.4 hectares that will be retained and managed to provide habitat for rare plants and wildlife such as ungulates, ground-nesting raptors, and non-wetland migratory birds. Collectively these properties are referred to as the Wilder Property (the Property). The Property was purchased by BC Hydro in 1977, and was part of the historic Peace River ranch, encompassing both native rangeland and cultivated lands. The Property is located about 7 km southeast of Bear Flats and 16 kms west of Fort St. John, on the north bank of the Peace River between the confluences of Cache Creek and Wilder Creek with the Peace River, at an elevation between 419-785m above sea level.

The Property is located on the north bank of the Peace River and is comprised of gently sloping river terraces which back onto steep, warm (south) aspect valley wall slopes. The cultivated Property terraces occur within the provincial Agricultural Land Reserve (ALR). The uncultivated slopes are not in the ALR, they have been identified as candidate ungulate winter range by the Ministry of Environment (now Ministry of Water, Land, and Resource Stewardship) although they have not been officially designated as UWR under the *Forest and Range Practices Act*.

This management plan (the Plan) has been prepared to add this UWR as compensation for the reduction of ungulate winter habitat resulting from the Site C Clean Energy Project (the Project) and subsequent filling of the Site C reservoir. This document outlines how the Property will be managed to maintain current agricultural production on the lower terraces adjacent to the reservoir while protecting the ungulate winter range on the steep, south-facing native grassland slopes.

Management of the Property will aid in fulfilling various conditions attached to the Project's environmental certification as stated in the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC; Schedule B). These include:

- **FDS Condition 10.1 and 10.2**: addressing potential effects of the Project on non-wetland migratory bird habitat
- **FDS Condition16.1 and 16.2**: addressing potential effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants
- **EAC Condition 4**: addressing provision of riparian habitat and bank stabilization
- **EAC Condition 16**: Implement various mitigation and compensation measures and describe in the Vegetation and Wildlife Mitigation and Monitoring Plan.
- **EAC Condition 21**: Survey songbirds and ground-nesting raptors populations during construction and operations
- **EAC Condition 24**: The EAC Holder must identify and maintain suitable lands for ungulate winter range on BC Hydro-owned lands.

This document is intended to be a high-level guidance document that will be amended as needed based on monitoring of the effects of agricultural activities on the Property and further studies assessing wildlife use of the Property by ground-nesting raptors, non-wetland migratory birds, and species at risk. Management objectives and results will be reviewed annually with the leaseholder and refined as and when needed.

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List of Acronyms

ALR - Agriculture Land Reserve

asl - above sea level

BC - British Columbia

BCCF - BC Conservation Foundation

BCLI - BC Land Inventory

BR - Branham soil unit

cm - centimeter

CY - Clayhurst soil unit

EAC - Environmental Approval Certificate

FDS - Federal Decision Statement

FFP - freeze free period

FRPA – Forest and Range Practices Act

GDD - Growing Degree Days

GWM - General Wildlife Measure

ha - hectare

Hwy - Highway

km - kilometer

m - meter

mm - millimetre

MFLNRO - Ministry of Forests, Lands, Natural Resource Operations and Rural Development

MOF - Ministry of Forests

PRRD - Peace River Regional District

SARA - Species At Risk Act

t/ac – ton / acre

t/ha – tonnes / hectare

TEM - Terrestrial Ecosystem Mapping

UWR - Ungulate Winter Range

WW –Fuzzy-Spiked Wildrye – Wolf Willow ecological community

Wilder Creek Property Management Plan

1.0 INTRODUCTION

BC Hydro owns ten land parcels (48, 50, 52, 53, 54, 55, 56, 57, 60 and 62) totalling 536.4 hectares (ha) between the confluences of Cache Creek and Wilder Creek (Figure 1). Collectively these properties are referred to as the Wilder Creek Properties (the Property). The legal descriptions of the ten parcels comprising the Property are summarized in Table 1.

The Property is located about 7 km southeast of Bear Flats and 16 kms west of Fort St. John, on the north bank of the Peace River. It lies between the confluences of Cache Creek and Wilder Creek with the Peace River, at an elevation between 419-785m above sea level (asl).

The Property, purchased by BC Hydro in 1977, was part of a historic Peace River ranch, encompassing both native rangeland and cultivated lands used for the production of forage, oilseed, and grains. The Property is located on the north bank of the Peace River and is comprised of gently sloping river terraces which back onto steep, warm (south) aspect valley wall slopes. Upon reservoir fill for the Site C Clean Energy Project (Project), 40.4 ha of the lower terrace (Figure 2) was flooded creating a shallow area of water <3m deep (Klohn and SNC 2009). The cultivated Property terraces occur within the provincial Agricultural Land Reserve (ALR). While the uncultivated slopes are not in the ALR, they have been identified as providing ungulate winter range (UWR) by the Ministry of Environment although they have not been officially designated as such under the *Forest and Range Practices Act*. This property management plan (Plan) proposes to add these areas as UWR's based on the reduction in ungulate winter habitat resulting from filling the Site C reservoir.

The Property has been identified as a location where retention and management by BC Hydro, for the life of the Project, will be used to mitigate the loss of vegetation and ecological resources and their associated values as wildlife habitat.

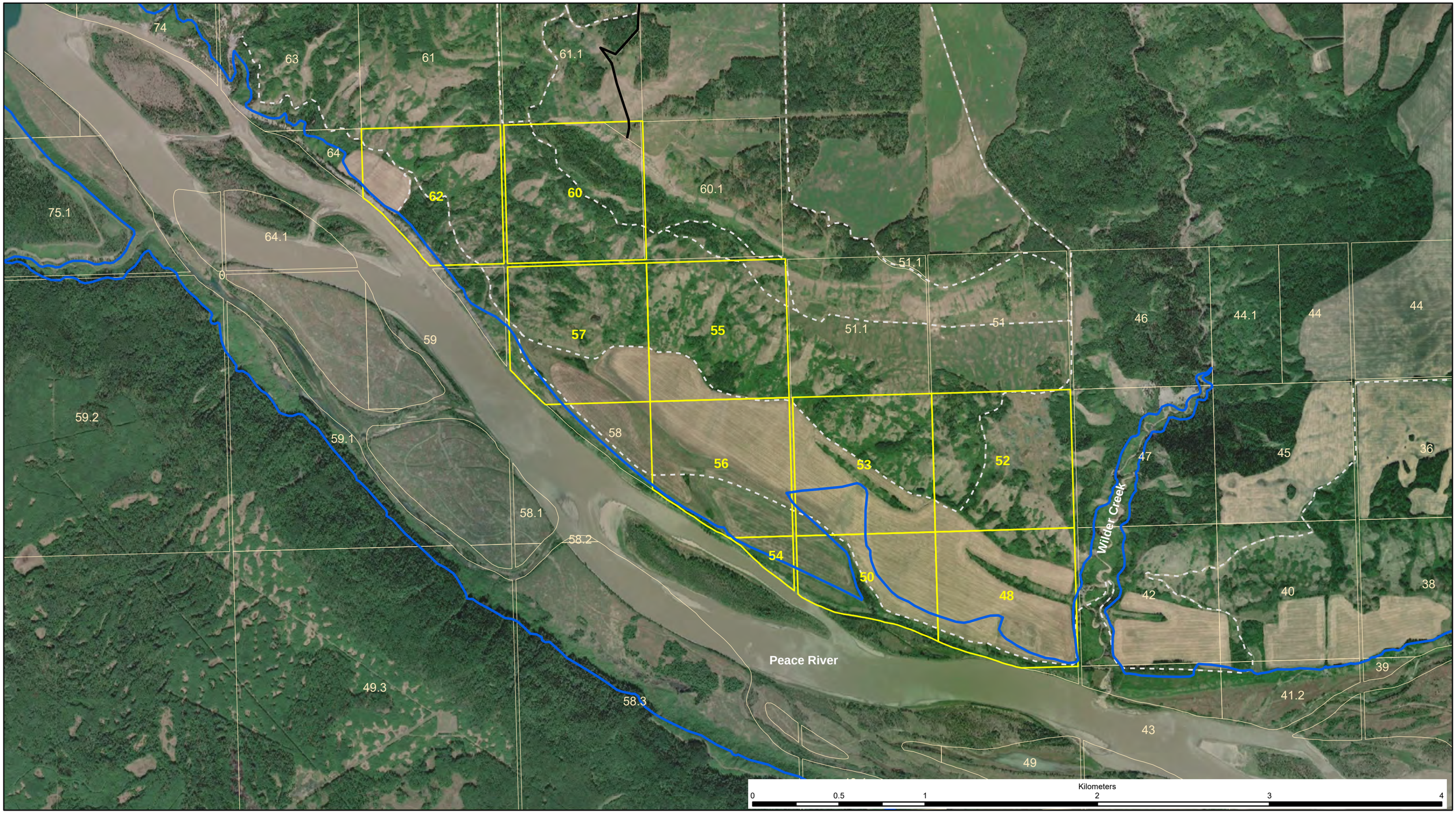
The current and potential value of the Property as wildlife habitat is a reflection of past agricultural management practices. An understanding of this past use is summarized herein and will be used to guide the development of this long-term Plan.

1.1 Plan Objectives

This Plan outlines how the Property will be managed to maintain current agricultural production on the lower terraces adjacent to the reservoir while protecting the ungulate winter range on the steep, south-facing native grassland slopes. Objectives also include the protection and enhancement of the shoreline and sensitive ecosystems by maximizing the value of the shallow, flooded area habitats for non-wetland migratory birds (e.g., ground-nesting raptors) and species at risk on the upland and riparian slopes. It is intended to be a high-level guidance document that will be amended as needed based on monitoring of the effects of agricultural activities on the Property and studies on the use of the Property by non-wetland migratory birds and species at risk. Management objectives and results will be reviewed annually with the leaseholder and adjusted when and as needed.

Table 1. Legal descriptions of Wilder Creek Parcels

No.	Parcel No.	Legal description	Area (ha)
1	48	Parcel A (25107M) of the northeast 1/4 of Section 28, Township 83, Range 20, west of the 6th meridian Peace River District	61.14
2	50	Part of the northwest 1/4 of Section 28, Township 83, Range 20, west of the 6th meridian Peace River District lying north of the left bank of the Peace River	39.76
3	52	Southeast 1/4 of Section 33, Township 83, Range 20, west of the 6th meridian Peace River District	64.86
4	53	Southwest 1/4 of Section 33, Township 83, Range 20, west of the 6th meridian Peace River District	64.89
5	54	Fractional Legal Subdivision 16 of Section 29, Township 83, Range 20, west of the 6th meridian Peace River District	5.94
6	55	Northeast 1/4 of Section 32, Township 83, Range 20, west of the 6th meridian Peace River District	64.91
7	56	Fractional southeast 1/4 of Section 32, Township 83, Range 20, west of the 6th meridian Peace River District	58.78
8	57	Fractional northwest 1/4 of Section 32, Township 83, Range 20, west of the 6th meridian Peace River District	62.91
9	60	Fractional southwest ¼ of Section 5, Township 84, Range 20, west of the 6th meridian Peace River District	51.12
10	62	Fractional southeast ¼ of Section 6, Township 84, Range 20, west of the 6th meridian Peace River District	62.09



Potential Mitigation Properties Field Map

Figure 1. Wilder Creek Lands

BC HYDRO

Date:	June 25, 2025	R.2
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:20,000	

- Proposed Mitigation Parcels
- Property Boundaries
- Roads
- Trail
- Proposed Resevoir

Eco-Web Ecological Consulting Ltd.

8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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Management of the Property will aid in fulfilling various conditions attached to the Project's regulatory conditions as stated in the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC; Schedule B). These include:

- **FDS Condition 10.1 and 10.2**: addressing potential effects of the Project on non-wetland migratory bird habitat
- **FDS Condition16.1 and 16.2**: addressing potential effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants
- **EAC Condition 4**: addressing provision of riparian habitat and bank stabilization
- **EAC Condition 16**: Implement various mitigation and compensation measures and describe in the Vegetation and Wildlife Mitigation and Monitoring Plan.
- **EAC Condition 24**: The EAC Holder must identify and maintain suitable lands for ungulate winter range on BC Hydro-owned lands.

This Plan is a living document which will be amended as needed based on Property monitoring, future studies, and refinement of management objectives.

1.2 Ungulate Winter Range Biological Justification / Supporting Rationale

The term ungulate winter range means an area that is identified as being necessary for the winter survival of an ungulate species. UWR objectives need to consider key life requisites including thermal cover, security cover and forage sources as well as potential risk factors such as road access, and conflicts with other user groups (e.g., range management).

1.2.1 Biological Justification / Supporting Rationale

The Peace River valley supports healthy populations of moose (*Alces alces americanus*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) that have value to Indigenous people for cultural uses, spirituality and sustenance harvest, to resident hunters and Guide Outfitters for harvest and for tourism value. These ungulates are considered a high priority for conservation management. The current UWR's in the Peace River Valley were partly inundated by the flooding of the Project's reservoir, reducing the availability of winter range for these species. Therefore, the protection and creation of new UWRs helps to uphold EAC condition 24 to ensure there is adequate winter range for these species and their winter survival. While the provincial management goal for these species prioritizes Indigenous harvest first, resident harvest second, and to maintain viable populations, the designation of land as UWR that has high ungulate habitat value helps to achieve this goal. The biological criteria that were applied in the selection of this UWR includes snow interception (thermal cover of forested habitat and south-facing slopes), security cover (screening/protection from predators/hunters) and forage production (quality and quantity).

1.2.2 Conservation Status / Priority

Moose, elk, mule deer, and white-tailed deer are provincially yellow-listed[1] and are not ranked under the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC). None of these species are listed under the federal *Species at Risk Act* (Canada 2024).

1.2.3 Expected Conservation Achievements /Outcome

This proposed UWR U-9-007 (NPL-026) is in draft and proposes to manage for elk, mule deer, and moose. It overlaps Wilder Creek and the south-facing Peace slopes to Bear Flats, which overlaps onto the Wilder Property. This 1980 ha proposed UWR was impacted by inundation of the reservoir along Wilder Creek and 40.4 ha of the lower flats, so the protection of this Property will offset 536.4 ha for winter range lost through reservoir filling.

This document provides General Wildlife Measures (GWMs) that specify how the Property can be managed to maintain value to ungulates (largely tied to its use as agricultural land) by providing monitoring measures over time. These measures will be consistent with the recommendations in the *Compendium of Wildlife Guidelines for Industrial Operation Projects in the North Area, British Columbia* (MFLNRO 2014). As per Section 9 of the Government Action Regulation as enabled by Section 149.1 of the *Forest and Range Practices Act,* the Minister responsible for the *Wildlife Act* may by order establish the GWMs for this UWR. It is expected that the agricultural use of the Property will be maintained as it provides intrinsic winter range value for ungulates using this area.

2.0 CONSULTATION ON PLAN

Consultation with agencies regarding the development and implementation of this Plan is summarized below:

- July 30, 2015 draft plan sent to Environment Canada (Christie and McIntosh 2015)
- September 10, 2015 draft plan sent to and Ministry of Forests, Lands, and Natural Resource Operations (MFLNRO) (Christie and McIntosh 2015)
- September 21, 2015 tour of property and review of management plan with Environment Canada, Canadian Wildlife Service and MFLNRO
- October 28, 2015 comments on plan received from MFLNRO
- January 2024 – July 2025 draft plan reviewed by Dan Webster with Eco-Web Ecological Consulting Ltd. to update for resubmittal.

3.0 PROPERTY BACKGROUND

3.1 Agriculture

3.1.1 Soils

Attachie (AH) soils occupy the northerly portion of the Property along steep, actively eroding, south-facing valley slopes, above the floodplain of the Peace River (BC Soil Survey 1986). Attachie soils have developed on undifferentiated colluvial materials, including loamy tills mixed with shale and sandstone, and may also have a thin covering of glaciofluvial gravels, sands and

[1] Red-list = Endangered or Threatened; Blue-list = Vulnerable or Special Concern; Yellow-List = Not At Risk

silts, as well as loess. Attachie soils are classified as Regosols (young, poorly developed soils) and lithic (shallow to bedrock) Chernozemic soils developed under native grass and shrub vegetation. Due to instability and steep irregular topography, agricultural and forestry uses are severely limited on the AH unit. In some areas, the open slopes have the capacity to support limited domestic grazing.

Taylor (TY) soils occur over the southerly portion of the Property, along the gently to moderately sloping terraces of the north bank of the Peace River at elevations between 400 and 500 m. Taylor soils are classified as Rego Black Chernozems developed on clay textured colluvial (fan) deposits, underlain by variable glaciofluvial deposits. Taylor soils are moderately well to well drained, slowly pervious, and have a subhumid moisture regime. In their native condition, the soils generally have a well developed Ah horizon that overlies clay loam C horizons and usually one or more buried Ah horizon(s). Taylor soils are often associated with Branham soils, classified as Orthic Eutric Brunisols developed on sandy and silty, calcareous, colluvial fan and glaciofluvial terrace materials. Inclusions of Regosols and Rego Dark Gray Chernozems commonly occur with Taylor and Branham map units.

A detailed soil survey has not been conducted on the Property. The following notes are based on limited field observations to date (refer to Figure 2):

- Soils in the southwestern field (Field 1) have a shallow (15-20 cm) cultivated (Ap) layer of dark brown loam overlying very gravelly and stony, rounded glaciofluvial deposits. This unit is rapidly drained, with low moisture holding capacity. Several large rock piles occur along the inner margin of the field.
- The soils of the middle fields (Fields 2a and 2b) have a clay loam Ap horizon (surface plough layer), generally without gravel but likely including sparse rocks in the top 50 cm. There are several large rock piles in the southeast corner that presumably came from previous landowners picking rocks in this field to improve the agricultural capability by reducing the stoniness of the field.
- The southwest portion of Parcel 62 contains some developed farmland and Dark Gray Luvisolic Judah map unit soils were observed in these areas. This soil produces a fairly good wheat crop along the lower bench below the Old Hope Road. The remainder of the area was steep topography or old slides but is suitable for grazing as it produces significant grass and shrubs.
- Rockland soils, while not assessed, are present along a steep cliff at the north end of parcel 60.

3.1.2 Climate Capability for Agriculture

The lower terraces of the Property, including all of Fields 1, 2a and 2b, are mapped within unimproved (non-irrigated) Climate Capability for Agriculture Class 3A[2], with the “A” limitation denoting a climatic moisture deficit of about 132 mm/year (BC Hydro 2012a and 2013). May to September precipitation is about 230 mm. With irrigation the climatic capability rating improves

[2] Class 3 soils have moderately severe restrictions that limits the range of crops that can be grown or require special conservation practices

to Class 2G[3] to Class 1GF[4], with the "G" limitation denoting growing degree-days (GDD) of about 1,241 and the "F" limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season (Cheeseman 1983). The freeze-free period (FFP) averages 91 days. The steeper upper slopes of the area are mapped as Climate Capability for Agriculture Class 2G, with the additional "G" limitation denoting that there is insufficient accumulation of heat units above 5°C during the growing season and the GDD is on average 1241 (Station 4 Bear Flat) and FFP of 91 days (BC Hydro 2012a and 2013).

3.1.3 Land Capability for Agriculture

The Attachie map units, occupying the escarpment slopes, have very low agricultural capability (Class 6 and 7) due to steep irregular slopes and instability, which limit agricultural use to non-intensive grazing (BC Hydro 2011).

The Taylor soil map units, occupying the river terraces where Fields 1, 2a, 2b and 4 are located, have high capability for agriculture and are capable of supporting a fairly wide range of crops. The detailed Land Capability for Agriculture mapping compiled by BC Hydro (2012b) rates Field 1 as 60% Class 3 with topography and/or stoniness limitations[5], and 40% Class 2 with stoniness limitations. The Class 3 areas improve with irrigation to Class 2, with ongoing stoniness limitations while the Class 2 areas would not improve with irrigation due to the on-going GDD climatic limitation (Figure 3). Fields 2a and 2b are rated as dominantly Class 2, with soil structure (D) or aridity (A) limitations and would not improve to Class 1with irrigation due to the on-going GDD climatic limitation (BC Hydro 2012a). The agricultural capability maps prepared for the EIS show these fields as improved Class 1. This classification is not supported by the updated climatic data and capability classification which reflects improved Class 2 due to growing degree days of 1241 in the Bear Flats area.

Based on the July 2015 site visit, Field 1 is dominantly Class 4 with on-going stoniness and low moisture-holding capacity. This rating will not improve with irrigation due to the shallow depth to excessive gravels and stones, although forage production would benefit from irrigation. Fields 2a and 2b are dominantly Class 2, with soil structure limitations due to the fine (clay) textures. The small field in Parcel 62 investigated in August of 2022 is Class 4C with soil structure limitations due to the fine (clay) textures (Webster 2022).

3.1.4 Crop Suitability

Fields 2a and 2b are suitable for all the hay and grain crops grown in the Peace Region, with the Class 3A climate limiting the range of other crops, such as vegetables, that could be commercially grown without irrigation. The climatic moisture deficit (~132 mm at Bear Flats) limits the amount of forage that could be produced (i.e., cut hay would be limited to one or possibly two crops per

---

[3] Class 2 soils have moderate limitations on crop production or may require moderate conservation practices

[4] Class 1 soils do not have significant limitations for crop production

[5] Subclass P = stoniness – excess cobble, rock or gravel in the soil profile which impacts agricultural practices and limits the ability of the land to produce crops.

year, with the potential for additional aftermath grazing). The fine textured soils of Fields 2a and 2b mitigate the climatic soil moisture deficit to some extent, and both the range of cropping alternatives and production levels should be better on the fine textured areas of these fields, compared to the coarser textured Field 1 which would require irrigation to achieve higher production levels. Field 4 is a small field in Parcel 62, and it is suitable for growing any of the hay and grain crops in the Peace Region, with the Class 3A climate limiting the range of other crops, such as vegetables, which could be grown commercially without irrigation. The 2022 field investigation noted that the wheat crop was fair, with moderate height and some bare areas.

Soil and moisture conditions observed during the July 2015 and August 2022 site visits, indicate that a single cut of hay can be taken from the fields in most years. Fields 2a and 2b may yield a second cut in some years due to inherently higher moisture holding capacity and higher fertility. Actual harvested hay yields are unknown but likely in the 3-4 tonne/ha (1.5 – 2 t/ac) range based on production estimates for Class 2-3 lands in a Class 3A climate area. Forage yields would improve with irrigation, and it is possible that three cuts of hay could be harvested in some years by doing this.

3.1.5 Summary of Past Use

The subject lands have historically been used for forage and grain production including cut hay and canola, as well as periodically oats and/or wheat. Alfalfa seed has also been produced on Fields 2a and 2b. Historically, operators have raised cattle and horses, with the hayfields grazed by cattle following forage harvesting. Livestock have been placed on the fields and the adjacent hillside from about mid-September to mid-November. Discussions with the leaseholder, Blaine Meek, indicated that he grazes the area on a two-year rotation and did not graze it in 2022. In 2014, Field 2 was treated for noxious weeds, cultivated and left fallow in preparation for planting canola in the spring of 2015. Records of crop management were not available beyond this and will need to be integrated into future leaseholder agreements. Field 1 is a relatively recently created field that has been planted to a grass/legume (clover) hay crop.

The Old Hope Road traverses the lower portion of this area and remains as a low-grade road, although reservoir flooding has blocked it off and access is restricted to the north. The lower bench has been fenced and cultivated for growing crops. The steep grassy upper slopes in Parcel 62 are used for some grazing and the upper, rough pasture has been previously grazed by domestic bison in the past. The steep slide dominated slopes in Parcel 60 have also seen some levels of non-intensive grazing. The fence line runs at an angle through Parcel 62 towards private land at the top of the hill.

3.1.6 Noxious Weeds

The leaseholder has been managing noxious weeds in the cultivated portions of the Property. Minor infestations of Canada (now creeping) thistle (*Cirsium arvense*), and dandelion (*Taraxacum* spp.) were observed in Fields 1, 2a and 2b during the field reconnaissance in 2015 and 2022. In 2022 some minor infestations of wild buckwheat (*Fallopia convolvulus*), shepherd's purse (*Capsella bursa-pastoris*), lamb's quarter (*Chenopodium album*) and annual sow thistle (*Sonchus oleraceus*) were also noted in these lower areas and along the Old Hope Road (Webster 2022). On the steep upper slopes, minor infestations of meadow goat's beard (*Tragopogon pratensis*)

were present on the south facing grassy slopes. In and around the water features, creeping thistle was present in large quantities. In 2008, night-flowering catchfly (*Silene noctiflora*) was documented on the Property. Night-flowering catchfly is a Category B - Medium Priority for Eradication and Containment rated weed by the Peace River Regional District (PRRD) and can be controlled by persistent shallow cultivation and spraying with herbicides (PRRD 2022). Night-flowering catchfly is an annual herb 75 or 80 cm in height, sticky in texture with nocturnally blooming white flowers, that form into yellowish-brown fruit capsules (PRRD 2022). A noxious weed inventory was conducted in 2015, with results indicating the presence of annual sow thistle, creeping thistle, Dalmatian toadflax (*Linaria dalmatica*), night-flowering catchfly and scentless chamomile (*Tripleurospermum inodorum*) (see Figure 3). Noxious weed information will be provided to the leaseholder for incorporation into their weed management program.

3.2 Infrastructure on Site

3.2.1 Access

The original access via the Old Hope Road is no longer passable due to reservoir flooding. Access is via an all-weather gravel road travelling southeast from Highway 29, through the Shaman Buffalo Ranch, then a poorly-graded bare soil track cutting through an escarpment gully to the metal gate located along the north side of Field 2. The track through the gully has slumped (at UTM Z10 618260E, 6234211N) which will continue to erode if no corrective measures are taken. Access around and through Fields 1, 2a and 2b is via poorly-graded farm tracks.

3.2.2 Water

There are four water sources for livestock on the property:

- A dugout located in the pasture, upland area of Parcel 52 near the eastern Property boundary.
- A small wetland located mid-escarpment within Parcel 57 near the western boundary of the Property.
- A dugout located in the bush pasture, upland area of Parcel 60 near the centre of the west boundary of the parcel. This dug out is fed by a drainage swale that runs off to the southwest towards the Peace River.
- An overgrown wetland located just above the steep drop down to the Peace River in the southern end of Parcel 62.

There are no known excavated or drilled wells on the Property.

3.2.3 Fencing

The Property fields are fenced and cross-fenced with 4-strand barbed wire on split-fence posts. The fence also extends from the height of land in the northeast corner of Parcel 62 to the southwest down to a gate across the Old Hope Road. Much of the fencing is in disrepair and requires replacement. The fence runs down towards the river, then around the wheat field (Filed 4) at the west edge of Parcel 62. Portions of the fence have been upgraded to wildlife game fence (10 foot square wire) although this is incomplete, and the fencing was down in places. The main access gate along the northern edge of Field 2 is metal and field gates are barbed slip wire.

Field 2a

Field 3

Field 1

Wilder Creek

Old Field

Field 2b

Peace River

Kilometers

0 0.5 1 2 3 4

Figure 2. Wilder Creek Property field numbers and ungulate winter range locations

BC HYDRO

Date:	June 24, 2025	R.1
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:20,000	

- Wilder Creek BCH Lands
- Draft UWR U-9-007 (NPL-026)
- Proposed Resevoir
- Field 1: 46.6 ha
- Field 2a: 57.0 ha
- Field 2b: 54.4 ha
- Field 3: 16.4 ha
- Old Field: 7.7 ha

Eco-Web Ecological Consulting Ltd.

8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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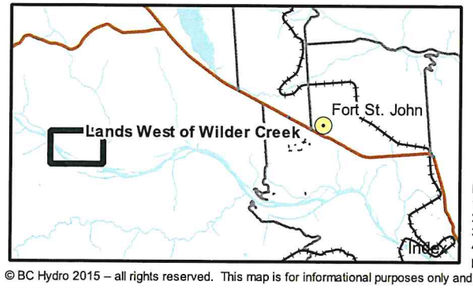

Map Notes:
1. Datum: NAD83
2. Projection: BC Albers
3. Base Data: Province of B.C.
4. Orthophotos: created from 1:15,000 photos taken 2011.

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Legend

Weed Location - Points
- Annual Sow Thistle
- Bull Thistle
- Canada Thistle
- Common Tansy
- Dalmation Toadflax
- Diffuse Knapweed
- Night-Flowering Catchfly

Weed Location - Points
- Oxeye Daisy
- Perennial Sow Thistle
- Rare Plant
- Scentless Chamomile
- Wild Oats
- Yellow Clematis
- Yellow Hawkweed

Weed Location - Polygons
- Annual Sow Thistle
- Bull Thistle
- Canada Thistle
- Dalmation Toadflax
- Perennial Sow Thistle
- Scentless Chamomile
- Wild Oats
- Yellow Clematis

Water Features

Drill Sites

Cadastral Parcel Boundaries

Roads-TRIM Data

CONFIDENTIAL DOCUMENT FOR PLANNING PURPOSES

1:10000

0 100 200 300 400 m

BC hydro | PATHFINDER ENDEAVOURS LTD

SITE C CLEAN ENERGY PROJECT

Figure 3

Site C Leased Lands West of Wilder Creek 2015 Weed Location Map

Date	Dec 14, 2015	DWG NO	1016-C14-07045-22	R0

3.3 Baseline Vegetation Resources on the Property

3.3.1 Ecosystems Present

Terrestrial Ecosystem Mapping (TEM) was completed for the Property as part of the Site C Environmental Assessment (Hilton *et al.* 2013a). Seven ecosystems (habitats) were mapped on the Property (Figure 4). Table 2 summarizes the amount of each ecosystem mapped within the Property. The grasslands mapped as Fuzzy-spiked Wildrye-Wolf Willow (WW) are classified as a sensitive ecological community (Hilton *et al.* 2013). None-of the ecosystems on the Property are classified as at risk (Hilton *et al.* 2013).

Table 2. Habitats mapped within the Wilder Creek Properties (Hilton *et al*. 2013).

Habitat	TEM Code	Structural Stage	Area (ha)
Trembling Aspen-Creamy Peavine	AM:ap	3	4.06
Trembling Aspen-Creamy Peavine	AM:ap	4	11.56
Trembling Aspen-Creamy Peavine	AM:ap	5	45.87
White Spruce-Aspen-Step moss	AM	4	19.05
White Spruce-Trembling Aspen Soopolallie	AS	2	10.73
White Spruce-Trembling Aspen Soopolallie	AS	3	77.44
Cut bank	CB	1	35.01
Cultivated Field	CF	2	233.07
White Spruce-Wildrye-Peavine	SW	4	5.5
White Spruce-Wildrye-Peavine	SW	5	7.21
Fuzzy-spiked wildrye-Wolf Willow	WW	2	92.16
Fuzzy-spiked wildrye-Wolf Willow	WW	3	8.66

3.3.2 Rare Plants

Inventories for rare plants were not conducted in this area during baseline surveys. Habitats within the Property have the potential to support 23 species of rare plants documented during baseline surveys elsewhere in the Project footprint (Table 3; Hilton *et al.* 2013a). Rare plant surveys were conducted in non-cultivated parts of the Property during the Project construction phase between 2015 and 2022 to determine rare plant presence in the Property. In 2018, two occurrences of red-listed species Canada ricegrass (*Piptatheropsis canadensis*) and Gardner's sagebrush (*Atriplex gardneri* var. *gardneri*) were found adjacent to access roads in the Wilder Creek area and flagged, mapped, and photographed so they could be avoided which was confirmed in the 2019 follow up survey (Eagle Cap Consulting Ltd. 2022). During the years in which they were conducted, the findings of the rare plant surveys were included in the annual Vegetation and Wildlife Management and Monitoring Plan reports submitted to regulatory agencies and are available through the BC Hydro Site C website at: https://www.sitecproject.com/document-library/environmental-and-socio-economic-plans-and-reports.

Peace River

Wilder Creek

Kilometers
0 0.375 0.75 1.5 2.25 3

Wilder Creek BCH Lands & Terrestrial Ecosystem Mapping

BC HYDRO

Date:	June 25, 2025	R.1
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:20,000	

Proposed Mitigation Parcels
Terrestrial Ecosystem Mapping
Seral Forest
Proposed Resevoir

Figure 4. Habitats on the Wilder Creek Property.[

Eco-Web Ecological Consulting Ltd.
8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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Table 3. Rare plants potentially occurring on the Wilder Creek Property

(Hilton et al. 2013a, Eagle Cap Consulting Ltd. 2022)

Species	Expected habitat
Riverbank anemone (*Anemone virginiana* var. *cylindroidea*)	Upland areas in understory of open aspen forest or in mixed woodlands of aspen, balsam poplar and white spruce and occasionally in full sun with grasses and low shrubs, near fence lines and road shoulders.
Herriot's sage (*Artemisia herriotii*)	River shores, cut banks, slopes; areas of loosely-consolidated soils; moist to dry.
Gardner's sagebrush (*Atriplex gardneri* var. *gardneri*)	Dry grassy slopes; saline clay slopes
Plains reedgrass (*Calamagrostis montanensis*)	Dry grassland slopes, shrub flats, and in open forests
Tawny paintbrush (*Castilleja miniata* var. *fulva*)	Mesic open forests; bluffs
Tender sedge (*Carex tenera*)	Mesic to dry meadows, shorelines, and open forests
Torrey's sedge (*Carex torreyi*)	Grassland; mesic to moist meadows and shrubland; moist woods
Dry-land sedge (*Carex xerantica*)	Dry grasslands and hillsides, open forests, and rock outcrops
Drummond's thistle *(Cirsium drummondii*)	Dry to moist soils of pastures, meadows, forest openings, prairies, and roadsides
Peace daisy (*Erigeron pacalis*)	Grassland opening near low shrubs and mixed woodland.
Old-man's whiskers (*Geum triflorum* var. *triflorum*)	Dry to mesic grasslands, meadows, rocky slopes and open forests
Spike-oat (*Avenula hookeri*)	Mesic to dry open slopes, meadows, and forest clearings
Colorado rush (*Juncus confusus*)	Moist steppe and montane habitats such as open grasslands, meadows, stream banks, and woods
Fennel-leaved desert-parsley (*Lomatium foeniculaceum* var. *foeniculaceum*)	Dry slopes, prairies, and grasslands
Davis' oxytrope (*Oxytropis campestris* var. *davisii*)	River shores, mesic to dry meadows, gravel bars, forest openings
Slender penstemon (*Penstemon gracilis*)	Mesic to dry plains and grasslands
persistent-sepal yellow-cress (*Rorippa calycina*)	River shorelines
Arkansas rose (*Rosa arkansana*)	Prairies and grasslands, thickets, and woodlands
Little bluestem (*Schizachyrium scoparium*)	Mesic to dry grasslands, shrublands, open woods, rocky slopes, and canyons
Rock selaginella (*Selaginella rupestris*)	Rock outcrops and grassy ridges
Drummond's campion (*Silene drummondii* var. *drummondii*)	Dry shrubland, meadows, and woodland openings

Species	Expected habitat
Slender wedgegrass (*Sphenopholis intermedia*)	Moist habitats such as shorelines, streambanks, meadows, ponds, etc.
Purple-stemmed aster (*Symphyotrichum puniceum* var. *puniceum*)	Various wetlands; shoreline

3.4 Vegetation Management

3.4.1 Protection of South-Facing Grassland and Forested Slopes

Management of agricultural lands on the lower terrace will retain the suitability and availability of the adjacent steep south-facing grassland slopes for ungulate use in winter, late fall and early spring. No livestock grazing will be permitted in grassland or forested habitats. Fences will be installed around the fields to contain any livestock grazing within the cultivated areas.

Prescribed burns are used in the Peace Region to rejuvenate grasslands and increase their value and suitability for ungulates so have been identified here as an ecologically compatible activity for use on this Property. BC Hydro will work with the Ministry of Forests (MOF) to determine if prescribed burns under appropriate conditions are a suitable management tool for the south-facing grassland slopes above Fields 2a and 2b. From there, a prescribed fire burn plan should be developed by BC Hydro. Prescribed fire burn plans are broken down into three project phases, planning, execution, and post-burn analysis. The planning phase would require BC Hydro to engage with MOF and other stakeholders to set objectives and monitoring and outline technical and operational delivery. Burning on these steep slopes would require specific conditions, namely a spring snow load where there is still snow present down low and at the top of the valley to prevent the fire from spreading and to have a lower intensity burn. Approvals can take up to two years to put in place so will require careful planning on BC Hydro's part (see https://prescribedfire.ca/plan-a-burn/). Based on this timing and uncertainty BC Hydro and the leaseholder may consider other methods, such as light discing and seeding as contingency methods to be managed by the leaseholder.

3.4.2 Creation of Old Field Habitats

The old field habitats on the plateau and lower terrace (Parcel 52 uplands and old field; Figure 2) will be fenced off from Fields 2a and 2b to provide old field-grassland habitat. Vegetation within the old field areas will be maintained through periodic mowing, outside of the breeding bird window, on a rotational basis such that at least one area is maintained in old field status within the Property at all times (i.e., one old field mowed every four years). Mowing activity should be supervised by qualified professionals to ensure the protection of bird nesting, small mammal dens and other animals using the habitat.

3.4.3 Riparian Vegetation Plantings

A 15-metre riparian vegetation zone will be established along the edge of the reservoir in parcels 57, 58, 56, 54, 53, 50 and 48 though planting of native shrubs and trees outside the five-year

beach line. The five-year beach line is the predicted extent of shoreline retreat at the maximum normal reservoir level five years after impoundment (EIS, Volume 2 Appendix B, Part 2).

The objective of establishing a 15 m riparian vegetation zone is to replace deciduous and coniferous riparian vegetation lost due to reservoir fill. A mix of live staked Balsam poplar (*Populus balsamifera*) (70%), willow (*Salix* spp.) (20%) and red-osier dogwood (*Cornus sericea*) (10%) will be planted at densities of 4,000 stems/ha (BC Hydro 2023). This was slightly altered from the EAC Condition 4, with poplar increased 10% and willow reduced 10% by the Project's qualified professionals (BC Hydro 2023). The timeline to conduct this work following consultation with First Nations and government will be in 2028 (BC Hydro 2023). In the long term, the vegetation within this zone is expected to provide protection against additional shoreline erosion and provide riparian habitat with the attributes needed to support rare plants, non-wetland migratory birds and species at risk.

4.0 WILDLIFE OBJECTIVES

Except for butterfly surveys, baseline wildlife surveys were not conducted at Wilder Creek. Baseline data was consulted from elsewhere in the Project footprint to determine which species would be expected to use the Property based on the habitats present.

Management of the Property will aid in fulfilling the conditions outlined in Section 1.1 above.

4.1 Target Species

Management of the Property will target maintaining, creating and managing habitat (breeding, feeding, migration and winter) for:

- non-wetland migratory birds identified as species of conservation concern for Bird Conservation Region 6 by Environment Canada (2013)
- species at risk documented in similar habitats in the project area
- ungulate winter range for elk, deer and moose

Should additional species of conservation concern for Bird Conservation Region 6 or species at risk be documented on the Property during monitoring surveys this Plan will be reviewed and revised as required.

Table 4 below summarizes the species expected to occur on the Wilder Creek lands based on their habitat preferences and occurrences documented in the baseline data elsewhere in the Project footprint (Hilton *et al*. 2013b,c,d, Hilton and Simpson 2013).

Table 4. Wildlife species expected to occur on the Wilder Creek lands (M=migrant breeder, R=resident, F=feeding).

From Hilton *et al*. (2013b,c,d) and Hilton and Simpson (2013).

Species	Scientific Name	BCCF[6] Priority	Habitat										
			AM3	AM4	AM5	AS2	AS3	CB	CF	SW4	SW5	WW2	WW3
Non-wetland migratory birds of Conservation Concern Region 6													
American Kestrel	*Falco sparverius*	2							M			M	
American Three-toed Woodpecker	*Picoides dorsalis*	6			R								
Baltimore Oriole	*Icterus galbula*	2		M	M								
Bank Swallow	*Riparia riparia*	5						M					
Black-billed Magpie	*Pica hudsonia*	6					R		R			R	R
Blackpoll Warbler	*Setophaga striata*	5		M	M								
Bohemian Waxwing	*Bombycilla garrulus*	6			R						R		
Boreal Chickadee	*Poecile hudsonicus*	5			R								
Boreal Owl	*Aegolius funereus*				R						R		
Clay-colored sparrow	*Spizella pallida*	4				M	M		M			M	M
Eastern Phoebe	*Sayornis phoebe*	4							M			M	M
Great Gray Owl	*Strix nebulosa*				R						R		
Killdeer	*Charadrius vociferus*	2							M				
Least Flycatcher	*Empidonax minimus*	6		M	M								
Mourning Warbler	*Geothlypis philadelphia*	2	M	M						M			
Northern Flicker	*Colaptes auratus*	6			M						M		
American Goshawk	*Astur atricapillus*	3			M						M		
Northern Harrier	*Circus hudsonius*	2							M			M	
Northern Shrike	*Lanius borealis*	4				R	R		R				
Pileated Woodpecker	*Dryocopus pileatus*				R								
Sharp-tailed Grouse	*Tympanuchus phasianellus*	2	R	R	R				R	R	R	R	R
Western Tanager	*Piranga ludoviciana*	6			M						M		
Western Wood-Pewee	*Contopus sordidulus*	2			M						M		
White-throated Sparrow	*Zonotrichia albicollis*	5				M	M		M			M	M
White-winged Crossbill	*Loxia leucoptera*	5			R						R		

[6] BCCF = BC Conservation Foundation

Species	Scientific Name	BCCF[6] Priority	Habitat										
			AM3	AM4	AM5	AS2	AS3	CB	CF	SW4	SW5	WW2	WW3
Yellow-bellied Sapsucker	*Sphyrapicus varius*	6		R	R					R	R		
Other non-wetland migratory birds													
American Redstart	*Setophaga ruticilla*	6		M	M					M	M		
American Robin	*Turdus migratorius*	6	M	M	M		M		M	M	M		
Black capped Chickadee	*Poecile atricapillus*	6			R		R				R		
Cedar Waxwing	*Bombycilla cedrorum*	6	M	M	M		M			M	M		
Chipping Sparrow	*Spizella passerina*	5	M	M	M		M		M	M	M		M
Common Yellowthroat	*Geothlypis trichas*	5							M				
Dark-eyed Junco	*Junco hyemalis*	5	R	R	R		R			R	R		R
Golden-crowned Kinglet	*Regulus satrapa*	5								M	M		
Great Horned Owl	*Bubo virginianus*				R						R		
Least Flycatcher	*Empidonax minimus*	6	M	M	M		M			M	M		M
Northern Saw-whet Owl	*Aegolius acadicus*				R						R		
Purple Finch	*Haemorhous purpureus*	2			M						M		
Red-breasted Nuthatch	*Sitta canadensis*	5		M	M					M	M		
Red-eyed Vireo	*Vireo olivaceus*	2	M	M	M		M			M	M		
Ruby-crowned Kinglet	*Corthylio calendula*	6			M						M		
Tennessee Warbler	*Leiothlypis peregrina*	5	M				M			M		M	M
Warbling Vireo	*Vireo gilvus*	6	M	M	M		M			M	M		
White-throated Sparrow	*Zonotrichia albicollis*	5	M	M	M		M			M	M		
Yellow-rumped Warbler	*Setophaga coronata*	5	M	M	M		M			M	M		
Yellow Warbler	*Setophaga petechia*	2	M	M	M		M		M	M	M		
Species at Risk													
Alberta Arctic	*Oeneis alberta*											M	M
Aphrodite Fritillary	*Speyeria aphrodite*		M	M	M		M					M	M
Arctic Blue	*Agriades glandon*					M	M					M	M
Arctic Skipper	*Carterocephalus mandan*		M	M	M				M	M	M	M	M
Assiniboine Skipper	*Hesperia assiniboia*		M	M	M	M	M		M			M	M
Common Ringlet	*Coenonympha california*					M	M		M			M	M

Species	Scientific Name	BCCF[6] Priority	Habitat										
			AM3	AM4	AM5	AS2	AS3	CB	CF	SW4	SW5	WW2	WW3
Common Woodnymph	*Cercyonis pegala nephele*		M	M	M	M	M		M	M	M	M	M
Coral Hairstreak	*Satyrium titus titus*								M				
Great Spangled Fritillary	*Speyeria cybele pseudocarpenteri*		M	M	M	M	M					M	M
Old World Swallowtail	*Papilio machaon pikei*											M	M
Striped Hairstreak	*Satyrium liparops*											M	M
Tawny Crescent	*Phyciodes batesii*		M	M	M	M	M			M	M	M	M
Uhler's Arctic	*Oeneis uhleri*					M	M					M	M
Black-throated Green Warbler	*Setophaga virens*	1			M								
Broad-winged Hawk	*Buteo platypterus*	4			M						M		
Canada Warbler	*Cardellina canadensis*	2		M	M					M	M		
Cape-may Warbler*	*Setophaga tigrina*												
Cackling Goose	*Branta hutchinsii*	4							M				
Common Nighthawk	*Chordeiles minor*	2										M	M
Connecticut Warbler	*Oporornis agilis*	2			M						M		
Le Conte's Sparrow	*Ammospiza leconteii*	4							M			M	M
Olive-sided Flycatcher*	*Contopus cooperi*												
Rusty Blackbird*	*Euphagus carolinus*												
Short-eared Owl	*Asio flammeus*	2							R			R	R
Upland Sandpiper	*Bartramia longicauda*	1							M			M	
Winter Wren	*Troglodytes hiemalis*				M					M	M		
Eastern red bat	*Lasiurus borealis*		F	F	F	F	F	F	F	F	F	F	F
Northern long-eared myotis	*Myotis septentrionalis*	2	F	F	F	F	F	F	F	F	F	F	F
Ungulates													
Elk	*Cervus elaphus*	5	R	R	R	R	R	R	R	R	R	R	R
Mule deer	*Odocoileus hemionus*	6	R	R	R	R	R	R	R	R	R	R	R
Moose	*Alces alces*		R	R	R	R	R	R	R	R	R	R	R

*Expected to occur after reservoir inundation and establishment of old forests within the Property

4.2 Management Activities

Management for non-wetland migratory birds, species at risk and ungulates will be achieved through:

- Installing fencing around the perimeter of Fields 1, 2a and 2b. The objective of the fencing is to contain any livestock grazing within the cultivated field areas and allow wildlife access to the hills.
    - The inside fence configuration will be 5-strand wire. The top and bottom wires will be smooth. The middle three wires will be barbed. The lower and top smooth wires will be raised to facilitate ungulate passage (the proposed fencing is described in the BC Agricultural Fencing Handbook (Ministry of Agriculture Food and Fisheries 2002).
    - Existing fencing will be removed in conjunction with installation of the new fencing.
- Installing split rail fencing along the northern Property boundary of Parcel 52 to demark the beginning of the old field habitat (former rough pasture) area.
- Establishing and maintaining old field habitats on the plateau and lower terrace (Parcel 52 uplands and old field; Figure 2).
- Establishing large trees along the edge of fields and within current forested areas.
- Enhancing values of the steep riparian ravine and gully slopes to non-wetland migratory birds by planting native, woody species (trees and shrubs).
- Installing posts and nest boxes suitable for American Kestrel, swallows, waterfowl and other cavity-nesting species along fence lines at the edge of cultivated fields and within the 15 m riparian vegetation zone.
- Conducting prescribed burns of grassland habitats (steep south-facing slopes) to rejuvenate native grassland and early seral habitats and maintain and enhance their value as ungulate winter range

4.2.1 Ungulate Winter Range - Winter Ecology and Habitat Requirements – Biological Rationale

A biological rationale is provided below for elk, mule deer, and moose which are the species currently protected by this proposed UWR U-9-007. The components of winter ecology and habitat requirements include thermal cover, winter forage, interspersion of thermal cover and foraging areas, and to manage access and human disturbance, as outlined in “Establishing Ungulate Winter Range Objectives – Omineca Region” (Triton 2002).

Thermal Cover

The forested portions of the Property have the capacity to intercept snow and provide both thermal cover and accessible forage, which are the primary habitat variables influencing ungulate winter habitat selection in this part of northern BC (Triton 2002). Snow depth greatly influences elk distribution with a large selection to open south-facing slopes and forested habitats with good snow interception. Elk movements can be restricted by snow depths of 40-50 cm (Triton 2002). Along the Peace reach, elk use open shrub/grassland communities and deciduous/mixed stands, along with south-facing slopes and cultivated fields such as those represented on the Property

(Bachmeyer 1994). Snow depths >40 cm restrict deer movement and bury shrub forage, so having the forested portion and the south-facing slopes on the Property are important aspects to elk and deer survival during the winter months. Moose are physically adapted to deeper snow conditions but are known to select for areas under 40 cm and will move out of an area when depths exceed 70-90 cm. Moose will spend most of their time feeding in open areas such as the agricultural fields, south-facing slopes and old fields, but if snow depths increase, then forest cover becomes an important part of this Property. The forested areas have a crown closure of 60-65% which will help maintain snow interception so maintain the canopy is an important part of this Plan.

Winter Forage

Elk are primarily grazers with 90% of their diet coming from grass species (Triton 2002). In the winter they tend to shift to mixed grasses and shrubs such as those found on the south-facing slopes, old fields, and forested habitat on the Property. Mule deer browse a wider array of habitats from forested areas, agricultural fields and during the later winter, south-facing slopes. Maintaining this diversity of habitats on the Property through active burning of the south-facing slopes, creation and maintenance of old field habitat and preventing logging of the forested habitat builds durability of this winter range for deer.

The availability of forage is an important component of moose winter habitat selection as they need to consume large quantities of high-quality browse for their survival. Moose will therefore select foraging areas high in shrub species such as willow, Balsam poplar, red osier-dogwood, aspen (*Populus tremuloides)*, Saskatoon berry (*Amelanchier* spp.), highbush-cranberry (*Viburnum edule*), prickly rose (*Rosa acicularis*), and gooseberry (*Ribes* spp.). These species are well-represented on the Property on the south-facing slopes, forested areas, and old field habitat.

Interspersion of Thermal Cover and Foraging Areas

For elk and mule deer the interspersion of forest cover and openings is a desirable management objective for a UWR. Elk and deer require a minimum of 20% forest retention in age class ≥ 80 years with a minimum forage requirement of 15% or ≤20 years old (Mowat *et al*. 2002). Crown closure in the retained forested areas should be maintained at ≥50%. Elk prefer to stay close to escape/thermal cover at the forest edges so most of their foraging typically occurs within 200 m of available cover. The Property has fields 1, 2a and 2b as primarily agriculturally cultivated fields, but will also have fields 3 and the old field habitat. The old fields and much of the main cultivated fields have some adjacent forest cover in the slope ravines that will meet these conditions.

Moose winter range objectives will require up to 10% of the area left in forest cover >60 years old and at least 10% of the area available for forage (i.e., early seral shrub habitat <20 years old). The creation and maintenance of the old fields will provide the <20-year-old habitat and retention of the existing intermediate (80-100 years old) forest will provide the cover.

Access Management and Human Disturbance

For all the species involved, roads decrease the value of the habitat in a zone up to 100 m from the road. There are no main roads into this Property, just two old farm trails used to access the

agricultural fields. One trail comes down from the Shaman Bison Farm to the north. The other old farm trail was historically part of the old Hope Road to Hudson's Hope but is not longer accessible to the public. It is therefore recommended that no new roads be incorporated into the Property for the existing agricultural uses or potential future industrial use. Since the Property is private land, this can be managed by BC Hydro within the UWR. Currently there are some low-grade agricultural farm trails from the top side to the dry south-facing slopes. Increased road access can increase hunter success, and reduce ungulate densities, so the Property should be posted for no hunting and enforced by BC Hydro and/or the leaseholder.

4.3 Ungulate Winter Range Objectives

Based on the above suitable characteristics of the proposed UWR area, the objectives in Table 5 are proposed to manage elk, mule deer, and moose winter range. These objectives will be monitored by terms in the leaseholder agreement and monitoring by BC Hydro or their contractor (see Section 8.0).

Table 5 – Ungulate Winter Range Objectives for elk, mule deer and moose

Objectives	Assumptions	Measures
Maintaining 10-40% shrub cover of preferred deciduous forage species.	• Provides winter forage for elk, deer and moose.	• Create and maintain old field habitats.
Maintaining at least 15% of the area in high suitability foraging habitat - grazing/ browsing habitat (grasses and shrubs)	• Elk and deer require a higher quantity of early seral habitat for winter forage. • Elk and deer will supplement agricultural species for winter grazing.	• Enhance forage productivity through prescribed burns. • Creation and maintenance of old field habitat. • Continued use and maintenance of the agricultural fields.
Maintain the intermediate age class (80-100 years) forest within the Property for thermal cover.	• Maintains available thermal cover by having a diversity of forest cover habitat.	• No logging or clearing in forested areas of the Property.
No new road or access development and no recreational use of the Property.	• Roads and human disturbance and noise reduce habitat effectiveness. • Road activity will displace animals and result in increase vehicle mortality.	• No hunting or other recreational uses of the property permitted. • No new road development for agriculture or industry will be allowed on the property.

5.0 AGRICULTURAL MANAGEMENT OBJECTIVES

The objectives of field management are to maintain agricultural production within the areas of cultivated field habitat on the lower terrace adjacent to the reservoir, create additional wildlife habitat within cultivated fields, and protect and maintain wildlife habitats within the Property. This will be achieved through a program of field management that will include:

- Retain and improve existing grain and oilseed production on Fields 2a, 2b and 4;

- Retain and improve existing forage production on Field 1 and 3;
- Establish and maintain areas of old field habitat on the plateau (formerly rough pasture) and terrace (old field)
- Allow current level of livestock grazing in cultivated areas until reservoir filling completes;
- After reservoir fill and fencing is installed, allow pasture use and aftermath grazing of crop residue by cattle only on the actively cultivated areas of Fields 2a and 2b.
- Encourage more intensive agricultural crop production (e.g., alfalfa seed, vegetables) post--reservoir fill, particularly if irrigation water becomes available.

5.1 Field Management

Typically, Peace River hayfields and pastures require renovation every 5-8 years to maintain optimal forage production levels. Field 1 has been recently cultivated and seeded and should not require renovation for a few years, but would benefit from regular fertilizing, addition of organic matter (manure or green maturing) and perhaps scarification and over-seeding.

Field 2 was being alternately cropped for forage and oil seed production by the previous leaseholder. In 2014 it was prepared for planting to a canola crop in 2015. In 2022 a wheat crop was documented in Fields 2 and 4 (Webster 2022).

The proposed cultivation, weed treatment, fertilizing, and seeding specifications will be reviewed for each field with the leaseholder annually.

5.2 Grazing Rotation

The primary use of the main fields will be crop production, with grazing of crop residue following crop removal and rotational grazing of the old field areas. Continuous grazing can lead to overgrazing resulting in increased weed growth and soil damage, while rotational grazing, helps to maintain the quality and longevity of the forage stand. Rotational grazing entails more intensive field management where the field is rested for several weeks or months following a period of grazing for several days or weeks. The optimal number of livestock is placed in the field and distributed evenly throughout the field by salting and water placement to ensure even grazing pressure over the entire field. The management decision on when to start grazing, end grazing, and then re-graze a field, is based on several factors, including the density and height of the grass/legume cover and ground (soil) conditions. The property to the north contains a bison farm and it was noted that bison grazing is not compatible with this site's use as an UWR.

Rotational grazing is used to manage native (natural) forested and grassland ranges and improved fields on the Property. For native ranges, the period of use is generally rotated annually between the earlier and later grazing season to achieve optimal forage health and production levels. Early spring grazing by cattle increases the palatability of the forage for ungulates, while the later fall grazing helps to rejuvenate the forage yield the following year.

Two general rotation patterns are proposed for management of cultivated fields on the Property:

Old Field (Fields 1 and 3): For "old field habitats" a simple rotation of predominantly light, later season grazing (August to mid-September – 1.5 months) in one year, will be followed by earlier,

light spring (late-May to end of June – 1 month) grazing the following year if growing conditions are conducive to this. In years with limited spring growth, grazing would be held off to late season grazing. The interval (e.g., every second or third year) with which the fields would be grazed in the spring would be based on actual field conditions. Grazing of the hillside and forested areas will not be permitted.

Crop fields (Fields 2a, 2b and 4): A post-crop residue grazing rotation from September to mid-October will be followed for intensively managing crop fields. This will generally entail a period of short-term intensive grazing following crop removal. The timing of the start of the grazing period will be dependent on crop removal timing and adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder.

The exact rotation schedule will be based on seasonal monitoring. Individual field specific rotations will be determined in consultation with the Property leaseholder on an annual basis. Implementation of this rotational system will require intensive management during the grazing season, including regular field maintenance (e.g., rejuvenation) and timely movement of cattle between fields, by the leaseholder.

6.0 DETAILED MANAGEMENT PLAN

6.1 Priority Site Works

6.1.1 Access

The access road entering the Property from the north through Field 3 requires improvement. Stabilizing works are required where the track is slumping in the gully. Additional site visits may be required to develop a strategy to restore the road with the leaseholder. Access from the east and west are now impeded by reservoir filling.

6.1.2 Fencing

Ungulate-friendly fencing should be installed along the perimeter of Fields 1, 2a, 2b and 4 as described in Section 3.2 to restrict cattle use to the cultivated fields. Now that reservoir filling has completed, split-rail fencing should be installed along the northern boundary of Parcel 52 at the entrance to the Property.

6.1.3 Cattle Watering

The dugout located in Parcel 52 is longer be available for livestock watering. If livestock use is to continue on Fields 1, 2a, 2b and 4, options for providing water will need to be developed. Livestock may be able to access the reservoir, or new dugouts may be required. Discussions should be held with the leaseholder to assess the need for livestock watering facilities on the Property.

6.2 Field Improvements

6.2.1 Field Management

Field 1 (46.6 ha) adjacent to the Peace River is currently only used for forage crops because the soils are coarse (sandy) textured and shallow, overlying gravels and stones (Figure 2). Field 2 (57 ha) and Field 4 (7.6 Ha) are used to produce forage and oilseed (canola) crops.

Two management regimes will be implemented in these fields:

- Maintain long term forage production in Field 1
- Maintain intensive crop production on Field 2 (and post-flooding, Fields 2a and 2b) and Field 4
- Margins of Fields 1 and 2, where appropriate, will be managed under the leaseholder agreement to provide old field-grassland habitat. Vegetation height within these areas will be 0.3 to 2.1 meters with the objective of providing breeding habitat for Short-eared Owl (*Asio flammeus*), Northern Harrier (*Circus hudsonius*), Sharp-tailed Grouse (*Tympanuchus phasianellus*) and Common Nighthawk (*Chordeiles minor*).
    - Old field habitats will have a simple rotation of predominantly light, later season grazing (August to mid-September – 1.5 months) in one year, will be followed by earlier, light spring (late-May to end of June – 1 month) grazing the following year if growing conditions are conducive to this.
    - A post crop residue grazing rotation from September to mid-October will be followed for the intensively managed crop fields. This will generally entail a period of short-term intensive grazing following crop removal. The timing of the start of the grazing period will be dependent on crop removal timing and adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder.

6.2.2 Weed Management Plan

The leaseholder will be responsible for developing a weed management plan. BC Hydro will review and provide advice on the leaseholder's weed management plan. The following provides a summary of historical noxious weeds noted at the Property.

- As previously discussed in Section 3.1.6, night-flowering catchfly has been documented on the Property which is a Category B - Medium Priority for Eradication and Containment rated weed by PRRD. It can be controlled by persistent shallow cultivation and herbicide application (PRRD 2022).
- Minor infestations of creeping thistle and dandelion were recorded during the brief Property visit in 2014 (Christie and McIntosh 2015).
- A noxious weed survey was conducted in 2015, and the results indicated the presence of annual sow thistle, creeping thistle, dalmatian toadflax, night-flowering catchfly and scentless chamomile (see Figure 3).
- In 2022 some minor infestations of wild buckwheat, shepherd's purse, lamb's quarter and annual sow thistle were noted in the lower field areas and along the Old Hope Road

(Webster 2022). On the steep upper slopes, minor infestations of meadow goat's beard were present on the south-facing grassy slopes. In and around the water features, creeping thistle was present in large quantities.

The PRRD provides guidance on identifying and managing invasive plants within the Peace region that can be used by the leaseholder to develop a weed management plan. The PRRD document can be accessed at: PRRD Invasive Plant Program Strategic Plan and Profile 2025 (PRRD 2025). The "Site C Invasive Weed Mitigation & Adaptive Management Plan" can also be referenced in plan development and implementation (BC Hydro 2017).

7.0 ADDITIONAL REQUIREMENTS AND/OR RECOMMENDATIONS

- Create and maintain old field habitats.
- Enhance forage productivity through prescribed burns.
- No logging or clearing in forested areas of the Property.
- No polypropylene twine or wire to be used for any hay brought to site. Only biodegradable twine should be used.
- Based upon the private land setting of the Property, no hunting signage will be established on the fences and the leaseholder will not permit unauthorized hunters on the Property without written consent**.**
- No recreational use of the Property will be allowed in the winter months.
- No access development other than that required to manage the cultivated fields will be allowed
- Honeybees will be allowed

8.0 MONITORING AND FOLLOW-UP MANAGEMENT OF THE PROPERTY

8.1 Leaseholder record-keeping requirements

At a minimum the leaseholder will keep records of the following:

- Crops grown including date of planting and harvest
- Weed treatment(s) including area treated, date of treatment, chemicals applied, rate of application, treatment efficacy and plans for the following year's treatment
- List of any written hunting permissions (name, phone number, email address) issued by the leaseholder including a record of legal harvest (date, number, species, sex).
- Wildlife observations, including any issues with wildlife;
- Fencing requiring repairs (dates, locations, particularly if likely caused by wildlife)
- Wildlife carcasses including locations and dates
- Active raptor nests
- Carnivore (bear, coyote, fisher) dens

8.2 Monitoring by BCH

BC Hydro has conducted the following surveys and monitoring observations on the Property with some ongoing and some commencing with reservoir fill:

- Breeding bird surveys (see Sections 7.1.1.2-A and 7.2.7 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Ground nesting raptor surveys (see Section 78.9.5.1 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Ungulate habitat monitoring (See Section 7.11 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Monitoring of general Property conditions with the leaseholder as required (TBD).

8.3 Annual Meetings to Discuss/Update Management Plan

To be determined in consultation with leaseholder. BC Hydro suggests having these annual meetings in April each year, with potential follow up meetings in October if required.

9.0 SUMMARY OF UNGULATE WINTER RANGE MANAGEMENT

The Property has extensive historical winter range use by elk, deer and moose. The agricultural activity has enhanced forage opportunities for wildlife in this area and the maintenance of this agricultural use is important to this value. Ungulate winter range values are enhanced by maintaining 10-40% shrub cover of preferred deciduous forage species in the old fields and surrounding hillsides, at least 15% of the area in high suitability foraging habitat - grazing/browsing habitat (grasses and shrubs) and the intermediate age class (80-100 years) forest within the Property for thermal cover. Grazing will be managed to short term rotational grazing in the old field and post harvest residue grazing on the crop fields to ensure forage levels will be maintained for ungulate winter use. To further prevent winter disturbance to ungulates, no new road or access development and no recreational use of the Property in the winter months will ensure its ongoing suitability as winter range.

10.0 REFERENCES

Backmeyer, R. 1994. Peace Arm Elk Study. Peace Williston Wildlife Compensation Program. BC. Environment.

BC Hydro. 2023. Site C Project – Reservoir Riparian Planting. Internal file memo by Matthew Barnette, January 3, 2023.

BC Hydro. 2017. Site C Invasive Weed Mitigation & Adaptive Management Plan. Revision 6. Burnaby, BC, 58 pages.

BC Hydro. 2013. Site C Clean Energy Project - Environmental Impact Statement, Volume 3: Economic and Land and Resource Use Effects Assessment, Section 20: Agriculture.

BC Hydro. 2012a. Site C Clean Energy Project – Agricultural Assessment Supporting documentation.

BC Hydro. 2012b. Land Capability for Agriculture, Maps 11 and 12 of 25.

BC Hydro. 2011. Agricultural Slope Classification, Maps 31 and 32.

BC Soil Survey. 1986. Agriculture Canada - Soils of the fort St. John-Dawson Creek area, British Columbia, Report No. 42.

Canada. 2024. Accessed on the Internet at: https://laws.justice.gc.ca/eng/acts/s-15.3/page-10.html#h-435647

Cheeseman, G.E. 1983. RAB Technical Paper #1. Climatic Capability Classification for Agriculture in British Columbia. Climatology Unit, BC Ministry of Environment, Victoria, BC.

Christie, P., and K.A. McIntosh. 2015. Site C Clean Energy Project, Wilder Creek Property Management Plan DRAFT.

Eagle Cap Consulting Ltd. 2023. 2022 Annual Report. Pre-Construction Rare Plant Surveys Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 6: Boreal Taiga Plains.

Hilton, S., L. Andrusiak, R. Krichbaum, L. Simpson, and C. Bjork. 2013a. Part 1 Vegetation and Ecological Communities. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and C. Guppy. 2013b. Part 2 Butterflies and Dragonflies. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, L. Andrusiak, and C. Albrecht. 2013c. Part 4 Migratory Birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S. and L. Simpson. 2013. Part 5 Non-migratory birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and L. Andrusiak. 2013d. Part 6 Raptors. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Klohn Crippen Berger Ltd. and SNC-Lavalin Inc (Klohn and SNC). 2009. Peace River Development Site C Project. Technical Memorandum No. 04. Task 27: Engineering Support for the Stage 2 Cost Estimate. Environmental Mitigation and Compensation Measures. Draft Report.

Mowat, G, R.G. D'Eon, G. Woods, M. Panian, K.G. Poole, R. Serrouya, and J. Wierzchowski. 2002. West Kootenay Ungulate Winter Range Mapping. DRAFT Prepared for: B.C. Ministry of Water, Land, and Air Protection, Fish and Wildlife Division Kootenay Region, Nelson, BC

Ministry of Agriculture Food and Fisheries. 2002. BC Agricultural Fencing Handbook. Accessed online Feb 7 2025 at:

https://peaceforage.bc.ca/wp-content/uploads/2021/07/BC_Agriculture_Fencing_Handbook.pdf

Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). 2014. A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance. Accessed online at: https://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12121

Peace River Regional District (PRRD). 2022. Profile of Invasive Plant Species within the Peace River Regional District, Dawson Creek, BC 103 pgs.

Peace River Regional District (PRRD). 2025. Invasive Plant Program Strategic lan and Profile 2025, Dawson Creek, BC 31 pgs.

Triton Environmental Consultants (Triton). 2002. Establishing Ungulate Winter Range Objectives – Omineca Region Prepared for Ministry of Water, Land and Air Protection Environmental Stewardship Division, Omineca Region, Prince George, BC.

Webster, D. 2022. Site C Clean Energy Project – UWR Compensation Properties – Reconnaissance Level Soil, Vegetation, Wildlife Survey. Prepared by Eco-Web Ecological Consulting Ltd. for BC Hydro, Burnaby, BC 32 pages.

Appendix 10. Tompkins Management Plan 2025

SITE C CLEAN ENERGY PROJECT

TOMPKINS PROPERTY MANAGEMENT PLAN

Prepared by:

Dan Webster, P.Ag., R.P.Bio., P.Biol. – Eco-Web Ecological Consulting Ltd.

Michel Lavallée, R.P.Bio., A.Ag. – Eco-Web Ecological Consulting Ltd.

Reviewed by Brent M. Matsuda, R.P.Bio. – BC Hydro

Version 1.0

July 2025

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Tompkins Property Wildlife and Agricultural Management Plan

1.0 INTRODUCTION

BC Hydro owns eleven land Parcels (144, 145, 146, 147, 150.2, 151, 153, 159, 160, 192, 192.2) totalling 452.9 hectares (ha) between the confluence of the Halfway River and the Peace River Valley Lookout (Figure 1) in northeastern British Columbia (BC). Collectively these properties constitute the Tompkins Properties (the Property) with legal descriptions summarized in Table 1.

The Property was purchased by BC Hydro in 2017 as part of a historic Peace River ranch encompassing both native rangeland and cultivated lands used to produce forage, oilseed and grains. The lands are located along the north bank of the Peace River and comprise gently sloping river terraces which back onto steep, warm (south) aspect valley wall slopes. Upon reservoir fill resulting from the Site C Clean Energy Project (the Project), 216 ha of the lower Halfway River reach and low-lying terraces that made up the draft UWR U-9-007 (NPL-017) became submerged (Figure 2). The cultivated terraces occur within the provincial Agricultural Land Reserve (ALR). The un-cultivated slopes are not ALR but are recognized as ungulate winter range (UWR) by the BC Ministry of Water, Land and Resource Stewardship although they have not been officially designated as such under the *Forest and Range Practices Act*.

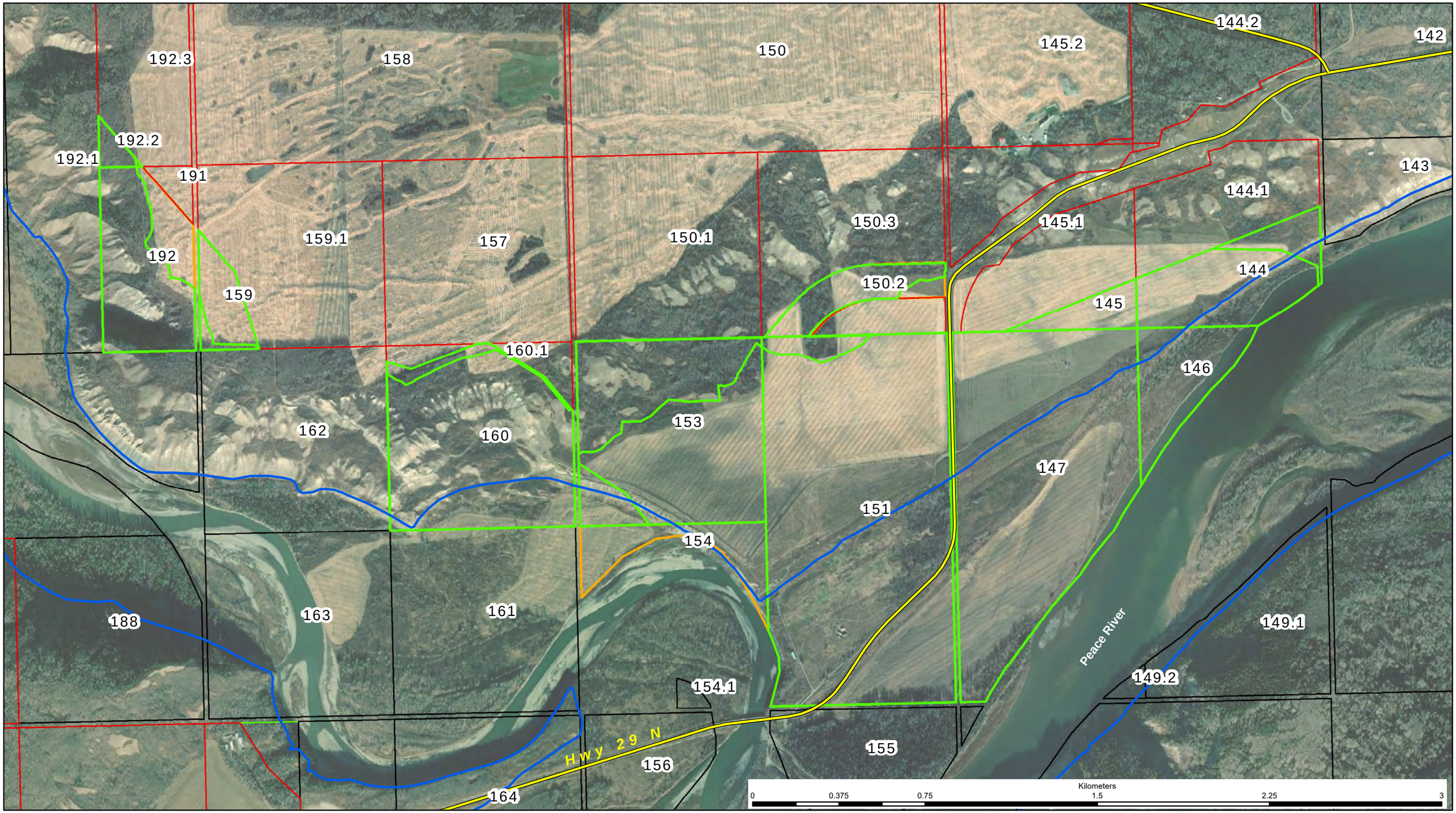
The designation of UWR refers to an area identified as providing habitat necessary for the winter needs of one or more ungulate species. The objectives of a UWR need to consider key life requisites including thermal cover, security cover, forage sources, and potential risk factors such as road access and conflicts with other user groups (e.g., range management). This management plan (the Plan) has been prepared to propose these areas as UWR's based on the reduction in ungulate winter habitat resulting from reservoir filling the Site C Clean Energy Project (the Project).

The Property has been identified as a location where retention and management by BC Hydro will be used to mitigate the loss of vegetation and ecological resources and associated values as wildlife habitat. These properties will be retained and managed to provide habitat for wildlife such as ungulates and non-wetland migratory birds.

The current and potential value of the Property as wildlife habitat is a reflection of past agricultural management practices. An understanding of this past use is summarized below and will be used to guide the development of this long-term Plan.

Table 1. Legal descriptions of Tompkins Properties.

Parcel No.	PID	Legal description	Area (ha)
144	014-657-520	That part of the southeast 1/4 of Section 33 Township 83 Range 22 west of the 6th Meridian Peace River District as shown on Plan 26887	27.06
145	014-657-511	That part of the southwest 1/4 of Section 33 Township 83 Range 22 west of the 6th Meridian Peace River District as shown on Plan 26887	6.27
146	014-654-202	Parcel A (J26234) of the northeast 1/4 of Section 28 Township 83 Range 22 west of the 6th Meridian Peace River District	17.95
147	014-654-199	Parcel B (P37272) of the west 1/2 of Section 28 Township 83 Range 22 west of the 6th Meridian Peace River District	97.62
150.2	014-657-538	That part of the southeast 1/4 of Section 32 Township 83 Range 22 west of the 6th Meridian Peace River District as shown on Plan 26887	11.71
151	014-654-211	The fractional east 1/2 of Section 29 Township 83 Range 22 west of the 6th Meridian Peace River District	129.11
153	014-654-181	The northwest 1/4 of Section 29 Township 83 Range 22 west of the 6th Meridian Peace River District	64.99
159	014-657-546	That part of the southwest 1/4 of Section 31 Township 83 Range 22 West of the 6th Meridian Peace River District as shown on Plan 26887	8.38
160	014-657-562	That part of the northeast 1/4 of Section 30 Township 83 Range 22 west of the 6th Meridian Peace River District as shown on Plan 26887	57.94
192	014-653-435	That part of the East 1/2 of the southeast 1/4 of Section 36 Township 83 Range 23 west of the 6th Meridian Peace River District as shown on Plan 26887	29.68
192.2	014-653-443	That part of the East 1/2 of the northeast 1/4 of Section 36 Township 83 Range 23 west of the 6th Meridian Peace River District as shown on Plan 26887	2.19
		TOTAL	452.9



Tompkins BCH Lands

BC HYDRO

Date:	September 29, 2025	R.1
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:15,000	

Roads/Access

Reservoir high water mark

Eco-Web Ecological Consulting Ltd.

8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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This document outlines how the Property will be managed to maintain current agricultural production, protect and enhance sensitive ecosystems, maximize the value of habitats for non-wetland migratory birds and species at risk on the upland and riparian slopes, protect and enhance the shoreline and maximize the habitat value of the shallow, flooded area. This document is intended to be a living, high-level guidance document that will be amended based on monitoring of the effects of agricultural activities on the Property and future studies of use by non-wetland migratory birds and species at risk. Management objectives and results will be reviewed annually with the leaseholder and refined as and when needed.

1.1 Plan objectives

This document outlines how the Property will be managed to protect UWR on the steep, south-facing native grassland slopes, maintain and enhance values for non-wetland migratory birds, species at risk and maintain agricultural production on the lower terraces adjacent to the reservoir.

Management of the Property will aid in fulfilling various conditions attached to the Project's environmental requirements outlined in the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC; Schedule B). These include:

- **FDS Condition 10.1 and 10.2**: addressing potential effects of the Project on non-wetland migratory bird habitat
- **FDS Condition16.1 and 16.2**: addressing potential effects of the Project on species at risk, at-risk and sensitive ecological communities and rare plants
- **EAC Condition 16**: Implement various mitigation and compensation measures and describe in the Vegetation and Wildlife Mitigation and Monitoring Plan.
- **EAC Condition 24**: The EAC Holder must identify and maintain suitable lands for ungulate winter range on BC Hydro-owned lands.

1.2 Ungulate Winter Range Biological Rationale and Conservation Status

The Peace River valley supports healthy populations of moose (*Alces alces americanus*), elk (*Cervus elaphus*), mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*) that have value to Indigenous people for cultural uses, spirituality and sustenance harvest, and to hunters and Guide Outfitters for harvest and for tourism. While these ungulates are considered a high priority for conservation management, they are provincially yellow-listed[1] and are not ranked under the federal Committee on the Status of Endangered Wildlife in Canada (COSEWIC[2]) nor are listed under the federal *Species at Risk Act* (Canada 2024).

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[1] **BC Species Rankings:**
Red List: Species are ranked as Critically Imperiled (S1) or Imperiled (S2).
Blue List: Species are ranked as Vulnerable (S3) or Apparently Secure (S4), but with some cause for concern.
Yellow List: Species are ranked as Secure (S5), or sometimes Apparently Secure (S4).

[2] **Committee on the Status of Endangered Wildlife in Canada (COSEWIC)** – The Species at Risk Act established COSEWIC in 2003 to report results to the Canadian government and public. Wildlife species designated by COSEWIC may qualify for legal protection and recovery under the Act. It is up to the government to legally protect those wildlife species designated by COSEWIC and the assessments do not take political, social or economic factors into account.

Moose, elk, mule deer, and white-tailed deer are provincially yellow-listed and are not ranked federally under COSEWIC. None of these species are listed under the federal *Species at Risk Act* (Canada 2024).

The current draft UWR's proposed in the Peace River Valley that were partly inundated by the flooding of the Project's reservoir reduced the availability of winter range habitat for these species. Therefore, the protection of new UWR's on private land helps to uphold EAC condition 24 to ensure there is adequate winter range for these species. The provincial management goal for these species prioritizes Indigenous harvest and then resident harvest while maintaining viable populations. Setting aside land that already has high ungulate value helps to attain this goal. The biological criteria applied in the selection of UWR includes snow interception (thermal cover of forested habitat and south-facing slopes), security cover (screening/protection from predators/hunters) and forage production (quality and quantity).

1.2.1 Expected Conservation Achievements / Outcome

Currently UWR U-9-007 (NPL-017) is in draft awaiting the contributions from BC Hydro. The intent of this UWR is to manage for elk, mule deer, and moose and it overlaps the confluence of the Halfway River and the south-facing Peace River slopes east to the former Watson Slough. This 930 ha draft UWR will be impacted by up to 216 ha through the inundation of the reservoir along the lower reach of the Halfway River and lower flats, so the protection of this property will act as an offset of 452.9 ha for winter range lost through reservoir filling.

This document provides General Wildlife Measures (GWMs) specifying how the Property can be managed to maintain value to ungulates (tied to its use as agricultural land) by outlining monitoring measures over time. These measures will be consistent with the recommendations in the *Compendium of Wildlife Guidelines for Industrial Operation Projects in the North Area, British Columbia* (MFLNRO 2014). As per Section 9 of the Government Action Regulation of the *Forest and Range Practices Act*, the Minister responsible for the BC *Wildlife Act* may by order establish GWMs for UWRs. It is expected that the agricultural use of the Property will be maintained as it provides intrinsic winter range value for ungulates in the area.

1.3 Consultation on Plan

Consultation with agencies regarding the development and implementation of this Plan is outlined below:

- August 2022: Reconnaissance Level Soil, Vegetation, Wildlife Survey completed on UWR Compensation Properties (Webster 2022)
- January 2024 – July 2025: Draft plan developed by Eco-Web Ecological Consulting Ltd.
- September 2025 – BC Hydro Lands confirmed that the land is currently leased to Thomas and Thelma Ostero on a 5 year agricultural lease with BC Hydro signed May 1 2024, and expires on December 31, 2029. There were no guidelines or management plans attached to the lease, so they are currently managing it as agricultural land. This will be updated with this plan at the time of lease renewal, or sooner if possible.
- September 2025 Tompkins Management Plan sent to Connie Chapman, Comptroller of Water Rights as per CWL 132990 and 132991 – Update on the Annual Report on Progress of Implementing the Schedule A Vegetation and Wildlife Program Plans

3.0 PROPERTY BACKGROUND

3.1 Agriculture

This section provides information collected in 2022 on the Property (Webster 2022) with further details presented in Appendix I.

3.1.1 Soils

The Tompkins property occurs between the confluence of the Halfway River and the Peace River Valley Lookout between 462-648 m above sea level (asl). In August of 2022 an agricultural assessment of the proposed UWR properties was conducted summarizing a reconnaissance level survey for soil, vegetation, and incidental wildlife observations (Webster 2022). The parcels were mapped against the existing soil survey soil map units (BC Soil Survey 1986) and ground truthed for verification (Webster 2022). The BC Soil Survey (1986) provides predicative mapping of soil types across the Peace region that can guide agricultural management across the wider landscape.

A breakdown of the soil types following the BC Soil Survey (1986) observed within the Property is provided below.

Lynx (LY) map units are dominated by Brunisolic Gray Luvisols on loamy glaciofluvial materials. Lynx soils were found on parcels 159, 160, 192, and 192.2 typically at the top of the slopes on the upland fields. The variable sandy and silty sediments from which the Lynx soils formed are strongly calcareous and variable in thickness. Lynx soils are well drained, moderately pervious, and have a humid water regime. The most common soil in the map units are Brunisolic Gray Luvisols with brown sandy loam Bm and Ae horizons, and a thin loamy Bt horizon overlying a calcareous Ck horizon[3] about 30 cm from the surface.

Attachie (AH) map unit soils were found in most of the parcels including 192.2, 192, 160, 153, 144. Attachie soils are typically found along the very steep, erodible, south facing slopes above the floodplain of the Peace River and its tributaries. Attachie soils consist of undifferentiated colluvial materials at the base of the steep slopes comprised of loamy tills, shale and sandstone, with layers of glaciofluvial gravels, sands and silts along with sedimentary deposits of windborne

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[3] From Canadian System of Soil Classification 3rd Edition (Soil Classification Working Group 1998)

A horizons form at the soil surface in the zone of eluviation of materials in solution, providing the accumulation of organic matter. Accumulation of organic matter darkens the surface soil (Ah), while the eluviation of organic matter lightens the soil color usually in the upper part of the solum (Ae).

B horizons are have organic matter and increased clay content, with the development of soil structure and often a colour change is noted. In B horizons, accumulated organic matter (Bh) provides darker colours, while clay accumulation is indicated by finer soil textures (Bt). Soil structure developed in B horizons includes prismatic or columnar units with coatings or stainings and significant amounts of exchangeable sodium (Bn) and other changes of structure (Bm) from that of the parent material. Colour changes due to oxidation of iron and structural changes (Bm), and mottling and gleying (Bg) provide horizon variations.

C horizons are the parent material and are unaffected by the processes affecting the A and B horizons, except processes such as gleying (Cg), the accumulation of salts (Cca, Ck).

loess. As a result, Attachie soils were found to be highly variable within the Peace valley with drastically different soil profiles even within the same parcel. Attachie soils are divided into Regosols on the unstable surfaces that are poorly developed and rapidly draining and Chernozemic soils that have developed under native grass and shrub vegetation and are more well-drained. Both were noted during this assessment, however the Chernozemic soils dominated most accessible areas. Due to instability and steep irregular topography, agricultural and forestry uses are severely limited on the AH unit. The open grassy slopes have the capacity to support limited domestic grazing if not too steep or erosion prone. This was noted as a historical practice in most areas with few landowners actively grazing these slopes.

Branham (BR) map units are confined to that part of the Peace River valley extending from the Peace Canyon Dam downstream to near the confluence of Cache Creek and the Peace River. Dominant soils are Orthic Eutric Brunisols on sandy and silty colluvial fan and terrace materials. Branham soils are well-drained and rapidly pervious and have a subhumid water regime. The Branham soil has a yellowish-brown sandy loam Bm horizon that directly overlies the gray, calcareous sandy or loamy parent material. The Branham soils contain moderate amounts of Regosolic soils that are poorly developed with silty and sandy textured Ah horizons that can restrict the range of crops that can be planted, but are still fairly arable. The growing of legumes and grass crops has been successful in some areas if cultivation is kept shallow due to a high concentration of lime within 30 cm of the surface.

Taylor (TY) soils were found in parcels 144, 150.2, and 151 in the cropland areas on intermediate terraces along the Peace valley and are mostly all cultivated. Taylor soils are classified as Rego Black Chernozems on clayey colluvial deposits, although most of those observed in the river valley being actively farmed were Orthic Black Chernozems with a thicker and more developed Bm horizon under the Ap. Taylor soils are moderately well to well drained, slowly pervious, and have a subhumid moisture regime. Taylor soils observed had not been plowed had a well-developed Ah horizon over the Bm and clay loam C horizon. The inclusions of Regosols and Rego Dark Gray Chernozems are associated with Taylor map units. Branham soils may make up to 20-40% of the map unit. Taylor soils are highly productive and crops of wheat, canola and peas were observed to be very healthy on these soils in the Peace valley.

Rockland (RK) map unit is used for those areas where bedrock outcrops at the surface and dominates the map unit. Most areas where Attachie soils were found had small components of Rockland soils. Soil pits were not completed on these areas due to the steepness of the topography. Rockland soils were noted in parcels 153, 160, and 192. Soil development is confined mainly to areas with more than 10 cm of soil material over consolidated rock. The consolidated component consists of undifferentiated, hardened bedrock that is mostly of sedimentary origin.

A detailed soil survey has not been carried out as part of the current work on the Property and the notes below are based on the reconnaissance level field survey conducted in 2022 (Webster 2022; refer to Appendix I for further soil details).

Parcels 144, 145, 146, and 147 are on the bottom bench above the Peace River overlapping a productive wheat field. The wheat field contains Taylor map unit soils while the slopes above and below are comprised of Eluviated Brown Chernozem and Attachie soils. While Branham and Rockland soils have also been documented here, they were not observed during the field

assessment. The agricultural crops create an attractant for ungulates, various bird species, and black bears (*Ursus americanus*). The surrounding slopes are rich in grasses, shrubs, and berries. Black bear, deer and moose tracks, scat and evidence of foraging were prevalent through the area. Large groups of mule deer have been observed in these fields and the adjacent slopes.

Parcels 150.2, 151, 153, and 160 are located mid-slope above the wide agricultural middle bench in the Peace valley. Seven potential soil map units overlap this area, including Taylor, Branham, and Lynx, to the undifferentiated colluvial materials of the Attachie soils on the steeper slopes. Rockland is also present but was not assessed due to the steepness of the topography and open bedrock. Some variations were noted in the Branham soils as well as the Attachie, where both Gleyed Cumulic Regosols and Eluviated Brown Chernozems were present. The portions of parcels 153 and 160 to be set aside for UWR represent steeper hillsides with forested and open grassland slopes with predominantly Attachie soils. The portions of parcels 150.2 and 151 overlap agricultural areas (pea fields) with some thick forest and are comprised of Taylor and Branham soils. Black bear, deer, moose and elk activity was high along the field edges as evidenced by tracks, scat, bedding areas, browse and foraging.

Parcels 159, 192, and 192.2 occur at the top of the Peace River valley above the adjacent Halfway River valley. This upland area is mostly farmland and contains a small amount of open aspen forest before dropping off steeply towards the Halfway River. Despite having five potential soil map units in the area, only two variations of the Lynx soil were identified between the juvenile aspen forest and the adjacent cropland. Attachie soils were evident on the steeper slopes but were not assessed due to topography. The Lynx soils in this area were fair, producing reasonable crops, but bare areas were noted in the pea field as these soils typically require fertilizer amendments to produce. The aspen forest areas had an open understory and supports a wide variety of ungulates and black bears as evidenced by the high volume of tracks, scat, and beds.

The portions of these parcels to be set aside for UWR includes the field edges, the open forest and the upper steep south facing slopes.

3.1.2 Climate Capability for Agriculture

Parcels 144, 145, 146, and 147

This low bench north of the Peace River is mapped as Climate Capability for Agriculture Class 3A, with the additional “A” limitation denoting that drought between May 1st and September 20th result in moisture deficiencies that limit plant growth and the GDD is on average 1204 (Station 1 Attachie Flat) with an FFP of 93 days (BC Hydro 2012a, BC Hydro 2013). With irrigation the climatic capability rating improves to Class 1GF, with the “F” limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season (Cheeseman 1983).

Parcels 150.2, 151, 153, 159, 160, 192, and 192.2

The upper field edges and open aspen forest of the parcels occur outside the reservoir study area and are mapped as Climate Capability for Agriculture Class 3G. The slopes of the Peace River Valley are Class 3G with the “G” limitation denoting an insufficient accumulation of heat units above 5^{o}C during the growing season. The growing degree days (GDD) in which the temperature

is above 5ºC is on average 1100 GDD at the upper field edges with a freeze free period (FFP) of 74 days and the GDD is 1251 on the valley slopes with a FFP of 93 days (Cheeseman 1983). The portions of the property over the slopes on west and south facing aspects are mapped as Class 2FG with the additional “F” limitation denoting that the minimum temperature is near freezing, adversely affecting plant growth during the growing season and the GDD is on average 1251 (Station 1 Attachie Mid) and FFP of 93 days (BC Hydro 2012a, BC Hydro 2013). With irrigation the climatic capability rating improves to Class 1GF, with the “F” limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season (Cheeseman 1983).

3.1.3 Land Capability for Agriculture

Parcels 159, 192, 192.2

The open aspen forest Lynx soils and the Attachie soils on the steep slopes have very low agricultural capability (Class 6:6T~4:7TR[4]) due to topographic restrictions on the steep slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing (BC Hydro 2012a). The field investigation noted that that there may have been historical grazing in this area, but currently the area is not fenced for this activity.

The Lynx soil map units, occupying the top of the valley field edges, have moderate capability for agriculture, Class 6:3T~4:4W and has limitations that require moderately intensive to special management practises without which can moderately to severely restrict the range of crops. These upper fields are rated as 60% Class 3 with topography limitations, and 40% Class 4 with topography and shallow bedrock limitations. The field investigation confirmed that much of the area occupied by the field is Class 3 and no topography or shallow bedrock limitations were noted in the plowed fields. This rating would not improve with irrigation due to the proximity to the steep slopes, but forage production would benefit from irrigation. It was noted that there were some wet areas in the field caused by shallow fine textured soils holding water and forming small wetlands.

Parcels 150.2, 151, 153, and 160

The Attachie soils on the steep slopes, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing (BC Hydro 2012b). The field investigation identified that historical grazing may have occurred in this area as there is an old fence line above the fields. The fence is in disrepair and cannot contain livestock, indicating no grazing in this area.

The Taylor and Branham soil map units occupying the edges of the field have good capability for agricultural Class 6:1~4:2X and can support a wide range of crops. The Agricultural Land Capability mapping denotes this transition lower in the field, but the field investigation noted that this transition occurs at the bush line. The fields are rated as 60% Class 1 and 40% Class 2 with

[4] Explanation of Land Capability terminology (BC MoE and MAF 1983), Class 6:6T-4:7TR refers to 60% of the area is class 6 with topographic limitations and 40% class 7 with topography and shallow bedrock. Modifiers: T=topography; R=shallow bedrock; W=excess water; X=multiple factors; A=soil moisture deficiency

multiple limitations. The agricultural capability maps show these fields as improved Class 1. The updated climatic data and capability classification suggests closer to Class 2 due to growing degree days of 1230 in the Attachie Low area. However, it was noted during the field investigation that pea crops in this area were very good, supporting the high Agricultural Land Capability.

Parcels 144, 145, 146, 147

The Attachie soils have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings which limit agricultural use to non-intensive grazing (BC Hydro 2012b). The field investigation identified that the area is used for grazing as the fence line surrounding the field is suitable to contain livestock, presumably to allow grazing after crop harvest.

The Taylor soil map units, occupying the field overlapped by this area, have good capability for agriculture, Class 6:1~4:2X and are capable of supporting a wide range of crops. The field is rated as 60% Class 1, and 40% Class 2 with multiple limitations. The agricultural capability maps indicate these fields as improved Class 1. The updated climatic data and capability classification indicates closer to improved Class 2 due to growing degree days of 1204 in the Attachie Flat area. It was noted during the field investigation that wheat crops in this field were thriving, supporting the high Agricultural Land Capability.

3.1.4 Crop Suitability

Parcel 159, 192, & 192.2

The steep slopes are not suitable for growing crops due to the topographical limitation and the open aspen forest would require logging and grubbing to potentially grow a hay crop, although even this would likely require additional improvements. The field edges were occupied with fair to good[5] pea crops and are suitable, with improvements (fertilizer), to grow several of the grain crops grown in the Peace Region and hay (evidence of previous hay included alfalfa, fescue, and clover). The Class 3G climate and Class 3-4 Land Capability will limit the range of many crops, which could be grown commercially without irrigation and intensive fertilization. The climatic moisture deficit (~245 mm at Attachie Mid) would allow for a fair to good amount of forage that could be produced (i.e., one or two hay crops per year, plus some grazing afterwards). Soil and moisture conditions observed during the field investigation confirm that with improvements crops can be produced (a fair pea crop was present) or 1-2 cuts of hay could be taken from the fields in most years.

Parcels 150.2, 151, 153, & 160

The steep escarpment slopes and open grassy slopes interspersed with mature thick understory aspen forest are not suitable for growing crops. These areas would require logging and grubbing to potentially grow a hay crop, and the steep topography and lack of stability would make this difficult without substantial improvements. The Class 2G climate and Class 6-7 Land Capability

[5] Crops rated based on professional opinion, as poor, fair or good. Poor = crops are below expectations for height, health and vigour; Fair = crops meet expected growing expectations based upon similar crops in the Peace region; Good = crops exceed growth expectations.

severely limit any crop production in these areas. The field edges were growing a very good pea crop and are suitable to grow most of the grain crops grown in the Peace Region. The Class 2G climate and Class 1-2 Land Capability at the field will allow for a wide range of crops, which could be grown commercially. The climatic moisture deficit (~220 mm at Attachie Low) would allow for plenty of forage that could be produced (i.e., two or even three hay crops per year, plus some grazing afterwards). Soil and moisture conditions observed during the field investigation confirmed that crops can be produced in the fields but not on the steeper valley slopes.

Parcels 144, 145, 146, & 147

The steeper undulating slopes and open grassy slopes are not suitable for growing crops due to access limitations for farming equipment. These areas would require clearing and grubbing to potentially grow a hay crop, and the steep topography and lack of stability would make this difficult without substantial improvements to the landscape. The Class 3A climate and Class 6-7 Land Capability severely limit any crop production in these areas. The field overlapping the parcels is growing a very good wheat crop and is suitable to grow most of the grain crops grown in the Peace Region. The Class 3A climate and Class 1-2 Land Capability at the field will allow for a wide range of crops, which could be grown commercially. The climatic moisture deficit (~148 mm at Attachie Low) limits the amount of forage that could be produced (i.e., cut hay would be limited to two crops per year with the potential for additional post-harvest grazing). The fine textured soils in this field mitigate the climatic soil moisture deficit to some extent and allow for a better range of cropping alternatives and production levels as was observed during the field investigation.

3.1.5 Summary of past use

Parcel 159, 192, & 192.2

The open aspen forest and slopes may have been historically grazed, although this was not observed during the site visit. The fields at the edge of the area have historically been used for forage and grain production including peas, wheat and hay. The lack of fencing indicates farm operators do not currently graze livestock on these fields following harvest.

Parcels 150.2, 151, 153, & 160

The steep escarpment slopes and open grassy slopes interspersed with mature, thick understory aspen forest have been historically grazed, although this was not observed and the fencing is in disrepair. The fields that the edge of the area overlaps have historically been used for grain production including peas, wheat, and canola. There is an old trail that connects the lower fields with the upper fields through Parcel 160. Cattle may have moved between the areas and the old fence in the middle portion of this area supports that grazing of cattle took place at one point in time. No evidence of current grazing was observed in the field.

Parcels 144, 145, 146, & 147

The steep open grassy slopes have been historically grazed, although there is now fencing in place to prevent cattle movement between the field and the slopes. The field portion may have been grazed after harvest as there is fencing in place to facilitate this. The field has historically been used for grain production, including peas, wheat, and canola. This area has been

sustainably farmed for generations and continues to produce excellent crops that provide a side benefit to the deer and black bears that occupy the river slopes.

3.1.6 Noxious Weeds

Parcel 159, 192, & 192.2

The leaseholder has been managing noxious weeds in the cultivated portions of the parcels presumably by spraying. Minor infestations of lamb's quarter (*Chenopodium album*) and shepherd's purse (*Capsella bursa-pastoris*) were observed along the field edges during the field investigation. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

Parcels 150.2, 151, 153, & 160

The leaseholder has been managing noxious weeds in the cultivated portions of the parcels presumably by spraying. Some minor and several larger infestations of creeping thistle (*Cirsium arvense*), lamb's quarter, meadow goat's beard (*Tragopogon pratensis*), yellow hawkweed (*Pilosella* spp.), stinkweed (*Thlaspi arvense*), (western) bluebur (*Lappula squarrosa*) and shepherd's purse were observed along the field edges during the field investigation. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

Parcels 144, 145, 146, & 147

The leaseholder has been managing noxious weeds in the cultivated portions of the parcels, presumably by spraying. The perimeter of the field contains several infestations of creeping thistle, lamb's quarter, meadow goat's beard, stinkweed, and (western) bluebur. It was noted during the field investigation that on the bench below these fields there is a major infestation of creeping thistle, perennial sow thistle (*Sonchus arvensis*) and (western) bluebur along the service road used by BC Hydro. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program. The noxious weeds on the lower bench are now flooded below the reservoir level.

3.2 Infrastructure on site

3.2.1 Access

The UWR area is 34-37 km west of Fort St. John located at the top of the Halfway River valley down to where the river flows into the Peace River and to the east along the Peace River valley. The area is accessed via a farm trail that turns off the new portion of Highway 29 immediately before the new Halfway River bridge. An all-weather gravel road traverses north from Highway 29 to access the lower fields. A low-grade dirt farm trail cut by a bulldozer runs up the valley slope at a 10-20% grade to access the fields at the top. This trail is accessible by light pickup or off-road vehicles under dry conditions, but the silty clay soils get very slippery with precipitation. The farm trail ascends to the top of the valley and runs alongside the existing agricultural fields to access the parcels. The parcels along the east end at the base of the valley are accessed off Highway 29 at the base of the steep hill coming down from the Peace View Lookout. The only

access is the edge of the farmed field, so while crop is on this field, access is via foot traffic, but once the crop is harvested, off-road vehicles could be used to access these parcels.

Parcel 144 is on its own and is accessed via a low-grade farm trail off Highway 29 across from the turnoff to the new Halfway Bridge. This low-grade farm trail runs ~800 m to the east along the fence line, where access is then along the field edge. When crop is growing on the field this allows for foot traffic only, but once the crop is harvested light vehicles could access Parcels 144, 145, 146 & 147.

3.2.2 Water

While there are some features that provide water at different times of the year, there are no livestock watering areas on the parcels. These sources include:

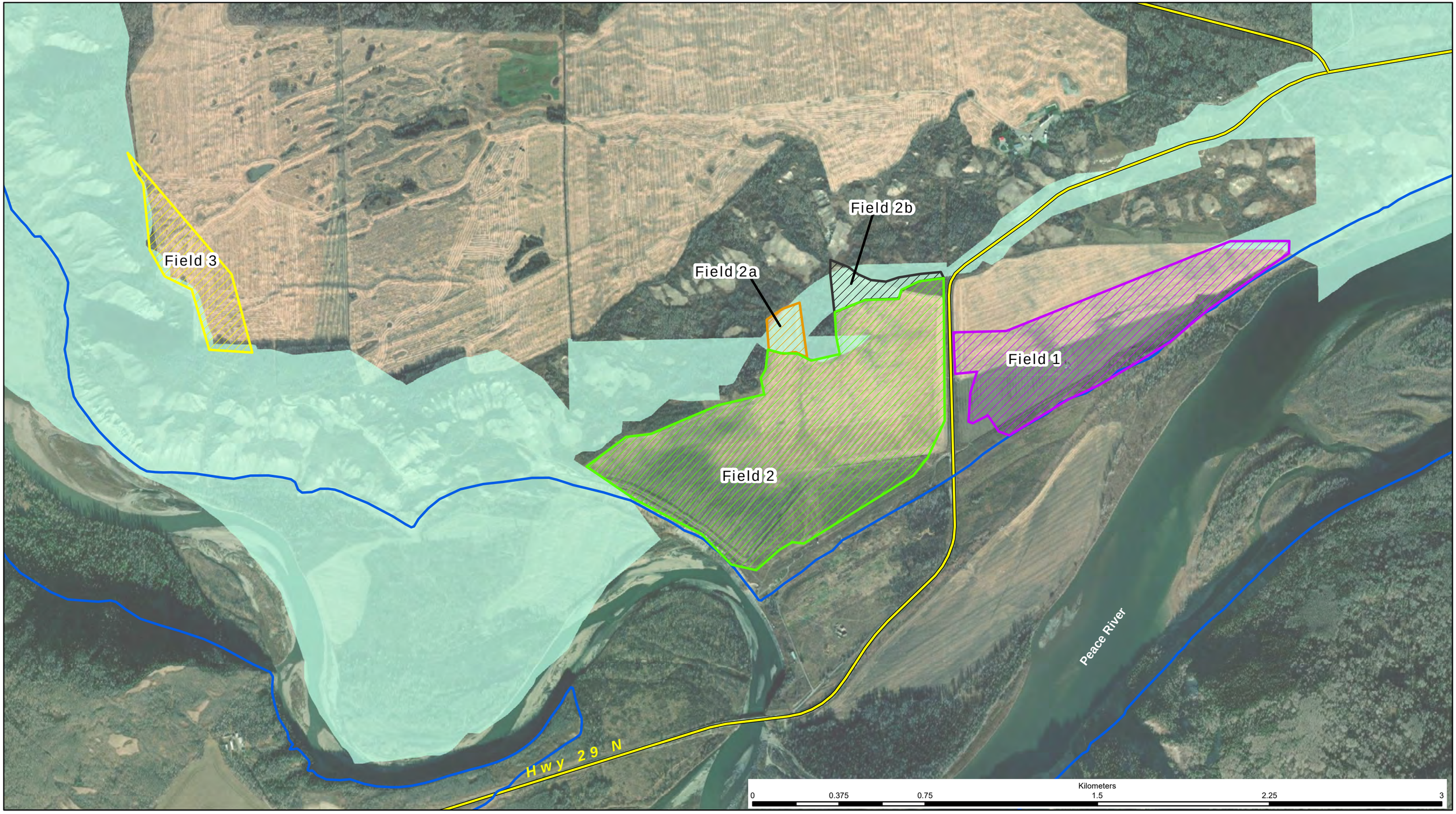
- There is a small non-classified wetland in the southwest corner of Parcel 159. This wetland is fed by a shallow drainage swale through the field that conveys surface water to the wetland during periods of high precipitation and spring snow melt.
- A drainage swale through the upper field in Parcel 159 runs across the midpoint of Parcel 192 carving a steep erosion gully down towards the Halfway River.
- Three drainage swales that run through the thick forested portions of the valley and out across the agricultural fields south to the Halfway River and the Peace River adjacent to Parcel 153. These drainages only convey water from heavy precipitation and snow melt and have no distinct channels.
- Within Parcel 144 there is a seasonal drainage that begins just below the viewpoint and runs down the Peace Valley slopes across the east end of the parcel. This drainage only conveys water from heavy precipitation and snow melt and has no distinct channel.

No water sources for livestock were observed within the parcels and there are no known dugout or drilled wells on the parcels (iMapBC 2022). The nearest water well is located ~1 km to the northwest at a private residence at the top of the Peace River Valley (iMapBC 2022).

3.2.3 Fencing

There is no current fencing on the upper fields. Old fencing may be present in some areas but nothing that would restrict livestock movement. There is an old fence line in disrepair that runs through the southern portion of Parcel 153, turning north and up the slopes of the Peace Valley. This fence will not contain livestock without repair. The eastern edge of Parcel 150.2 has a suitable four strand barb wire fence that runs to the north up the Peace Valley and bounds the south edge of the fields.

Parcels 144, 145, 146 & 147 fields are fenced in the north, west and east perimeter with four-strand barb wire on split fence posts. This fence is in good condition. Following harvest, cattle in this area can graze field remnants and have access to the reservoir to the south, although it is very steep along this edge to the reservoir.



Tompkins BCH Potential Mitigation Properties Field Map

BC HYDRO

Date:	September 29, 2025	R.0
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:15,000	

- Roads/Access
- Reservoir high water mark
- Draft UWR U-9-007 (NPL-017)
- Field 1
- Field 2b
- Field 2
- Feild 3
- Field 2a

Eco-Web Ecological Consulting Ltd.
8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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3.3 Baseline Vegetation Resources on the Property

3.3.1 Ecosystems Present

Terrestrial Ecosystem Mapping (TEM) was completed for the Property as part of the Site C Environmental Assessment (Hilton *et al.* 2013a). Seven ecosystems (habitats) were mapped on the Property (Figure 3). Parcels 153, 159, 160, 192, and 192.2 have TEM gaps with unmapped areas and the remainder of the parcels did not have TEM mapping available. Table 2 is made with the available information but has information gaps. Table 2 therefore summarizes the available amount of each ecosystem mapped within the Property distinguished by TEM code and Structural Stage. The grasslands mapped as Fuzzy-spiked Wildrye-Wolf Willow (WW) are classified as a sensitive ecological community (Hilton *et al.* 2013). None-of the ecosystems on the Property are classified as at risk (Hilton *et al.* 2013).

Table 2. Habitats mapped within the Tompkins Properties (Hilton *et al*. 2013).

Habitat	TEM Code	Structural Stage	Area (ha)
White Spruce-Aspen-Step moss	AM	5	17.77
White Spruce-Aspen-Step moss	AM	3	1.61
White Spruce-Trembling Aspen Soopolallie	AS	3	9.07
Cut bank	CB	1	3.17
Cultivated Field	CF	2	8.36
Gravel Bar	GB	1	0.99
Trembling Aspen - Soopolallie	SW:as	4	14.9
Trembling Aspen - Soopolallie	SW:as	3	2.53
Fuzzy-spiked wildrye-Wolf Willow	WW	3	1.13
Fuzzy-spiked wildrye-Wolf Willow	WW	2	26.71
Fuzzy-spiked wildrye-Wolf Willow	WW	1	1.11

3.3.2 Rare Plants

Inventories for rare plants were not conducted in this area during baseline surveys. Habitats within the Tompkins property have the potential to support 23 species of rare plants documented during baseline surveys (Table 3) (Hilton *et al.* 2013a).

Hwy 29 N

Peace River

Kilometers

0 0.375 0.75 1.5 2.25 3

Tompkins BCH Terrestrial Ecosystem Mapping

BC HYDRO

Date:	September 29, 2025	R.0
Datum:	NAD 83 UTM ZONE 10	
Licensee:	BC HYDRO	
Location:	BC Hydro Peace River Land Parcels	
Eco-Web File #:	E4-2342	
Drawn by:	Lee Waddell	
Scale:	1:15,000	

Roads/Access

Reservoir high water mark

Terrestrial Ecosystem Mapping

Seral Forest

Eco-Web Ecological Consulting Ltd.

8211 93rd Street
Fort St John, B.C. V1J 6X1
Phone: (250) 787-1110
Fax: (250) 787-1175

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Table 3. Rare plants potentially occurring on the Tompkins Property (Hilton *et al.* 2013a).

	Species	Expected habitat
1	Riverbank anemone (*Anemone virginiana* var. *cylindroidea*)	Upland areas in understory of open aspen forest or in mixed woodlands of aspen, balsam poplar, and white spruce and occasionally in open areas with full sun, grasses and low shrubs, near fence lines and road edges.
2	Herriot's sage (*Artemisia herriotii*)	River shores, cut banks, slopes; areas of loosely-consolidated soils; moist to dry.
3	Gardner's saltbrush (*Atriplex gardneri* var. *gardneri*)	Dry grassy slopes; saline clay slopes
4	Plains reedgrass (*Calamagrostis montanensis*)	Dry grassland slopes, shrub flats, and in open forests
5	Tawny paintbrush (*Castilleja miniata* var. *fulva*)	Mesic open forests; bluffs
6	Tender sedge (*Carex tenera*)	Mesic to dry meadows, shorelines, and open forests
7	Torrey's sedge (*Carex torreyi*)	Grassland; mesic to moist meadows and shrubland; moist woods
8	Dry-land sedge (*Carex xerantica*)	Dry grasslands and hillsides, open forests, and rock outcrops
9	Drummond's thistle *(Cirsium drummondii*)	Dry to moist soils of pastures, meadows, forest openings, prairies, and roadsides
10	Peace daisy (*Erigeron pacalis*)	Grassland opening near low shrubs and mixed woodland.
11	Old-man's whiskers (*Geum triflorum* var. *triflorum*)	Dry to mesic grasslands, meadows, rocky slopes, and open forests
12	Spike-oat (*Avenula hookeri*)	Mesic to dry open slopes, meadows, and forest clearings
13	Colorado rush (*Juncus confusus*)	Moist steppe and montane habitats such as open grasslands, meadows, stream banks, and woods
14	Fennel-leaved desert-parsley (*Lomatium foeniculaceum* var. *foeniculaceum*)	Dry slopes, prairies, and grasslands
15	Davis' oxytrope (*Oxytropis campestris* var. *davisii*)	River shores, mesic to dry meadows, gravel bars, forest openings
16	Slender penstemon (*Penstemon gracilis*)	Mesic to dry plains and grasslands
17	persistent-sepal yellow-cress (*Rorippa calycina*)	River shorelines
18	Arkansas rose (*Rosa arkansana*)	Prairies and grasslands, thickets, and woodlands
19	Little bluestem (*Schizachyrium scoparium*)	Mesic to dry grasslands, shrublands, open woods, rocky slopes, and canyons
20	Rock selaginella (*Selaginella rupestris*)	Rock outcrops and grassy ridges
21	Drummond's campion (*Silene drummondii* var. *drummondii*)	Dry shrubland, meadows, and woodland openings
22	Slender wedgegrass (*Sphenopholis intermedia*)	Moist habitats such as shorelines, streambanks, meadows, ponds, etc.

	Species	Expected habitat
23	Purple-stemmed aster (*Symphyotrichum puniceum* var. *puniceum*)	Wetlands; shoreline

3.4 Vegetation Management

3.4.1 Protection of south-facing grassland and forested slopes

Management of agricultural lands on the lower terrace will retain the suitability and availability of steep, south-facing grassland slopes for ungulate use in winter, late fall, and early spring. Fences should be installed around fields 1, 2a, and 2b prior to allowing livestock to graze the fields after harvest occurs

Prescribed burns are used in the Peace Region to rejuvenate grasslands and increase their value and suitability for ungulates. BC Hydro will work with the Ministry of Forests to determine if prescribed burns under appropriate conditions are a suitable management tool for the south-facing grassland slopes on the Property. A prescribed fire burn plan is recommended to be developed, which can take up to two years to implement (see https://prescribedfire.ca/plan-a-burn/).

3.4.2 Creation of Old field habitats

Portions of Field 2 should be converted into old field habitats as a transitional area between the hillside slopes, lower forest, and the crop field. The old field habitat created as Fields 2a and 2b should then be fenced off from Field 2 to provide old field-grassland habitat. Vegetation within the old field areas would be maintained through periodic mowing outside of the breeding bird window on a rotational basis such that at least one area is maintained in old field status within the Property at all times (i.e., one old field mowed every four years). Mowing activity by the leaseholder should be supervised by qualified professionals to ensure the protection of bird nesting, small mammal dens and other animals using the habitat.

4.0 WILDLIFE OBJECTIVES

Baseline wildlife surveys were not conducted on the Property. However, baseline data was consulted to determine which species are expected to use the Property based on the habitats present.

Management of the Property will aid in fulfilling the conditions outlined in Section 1.1 above.

4.1 Target species

Management of the Property will target maintaining, creating, and managing habitat (breeding, feeding, migration and winter) for:

- Non-wetland Migratory Birds identified as species of conservation concern for Bird Conservation Region 6 by Environment Canada (2013) – FDS Condition 10.1 and 10.2
- Species at Risk documented in similar habitats in the project area – FDS Condition 16.1 and 16,2

- Ungulate Winter Range for elk, deer, and moose – EAC Condition 24

Should additional species of conservation concern for Bird Conservation Region 6 or species at risk be documented on the Property during monitoring surveys, this management plan can be reviewed and revised as required.

Table 4 below summarizes the species expected on the Property based on habitat preferences and occurrences documented from baseline studies (Hilton *et al*. 2013b,c,d; Hilton and Simpson 2013).

Table 4. Wildlife species expected to occur on the Property (M = migrant breeder, R = resident, F = feeding).

Hilton *et al*. (2013b,c,d) and Hilton and Simpson (2013)

Species	Scientific Name	BCCF Priority	Habitat									
			AM3	AM5	AS3	CB	CF	SW:as4	SW:as5	WW1	WW2	WW3
Non-wetland migratory birds of Conservation Concern Region 6												
American Kestrel	*Falco sparverius*	2					M				M	
American Three-toed Woodpecker	*Picoides dorsalis*	6		R								
Baltimore Oriole	*Icterus galbula*	2		M								
Bank Swallow	*Riparia riparia*	5				M						
Black-billed Magpie	*Pica hudsonia*	6			R		R			R	R	R
Blackpoll Warbler	*Setophaga striata*	5		M								
Bohemian Waxwing	*Bombycilla garrulus*	6		R					R			
Boreal Chickadee	*Poecile hudsonicus*	5		R								
Boreal Owl	*Aegolius funereus*			R					R			
Clay-colored sparrow	*Spizella pallida*	4			M		M				M	M
Eastern Phoebe	*Sayornis phoebe*	4					M				M	M
Great Gray Owl	*Strix nebulosa*			R					R			
Killdeer	*Charadrius vociferus*	2					M					
Least Flycatcher	*Empidonax minimus*	6		M								
Mourning Warbler	*Geothlypis philadelphia*	2	M					M				
Northern Flicker	*Colaptes auratus*	6		M					M			
Northern Goshawk	*Astur atricapillus*	3		M					M			
Northern Harrier	*Circus hudsonius*	2					M				M	
Northern Shrike	*Lanius borealis*	4			R		R					
Pileated Woodpecker	*Dryocopus pileatus*			R								
Sharp-tailed Grouse	*Tympanuchus phasianellus*	2	R	R			R	R	R		R	R
Western Tanager	*Piranga ludoviciana*	6		M					M			
Western Wood-Pewee	*Contopus sordidulus*	2		M					M			
White-throated Sparrow	*Zonotrichia albicollis*	5			M		M				M	M

Species	Scientific Name	BCCF Priority	Habitat									
			AM3	AM5	AS3	CB	CF	SW:as4	SW:as5	WW1	WW2	WW3
White-winged Crossbill	*Loxia leucoptera*	5		R					R			
Yellow-bellied Sapsucker	*Sphyrapicus varius*	6		R				R	R			
Other non-wetland migratory birds												
American Redstart	*Setophaga ruticilla*	6		M				M	M			
American Robin	*Turdus migratorius*	6	M	M	M		M	M	M			
Black capped Chickadee	*Poecile atricapillus*	6		R	R				R			
Cedar Waxwing	*Bombycilla cedrorum*	6	M	M	M			M	M			
Chipping Sparrow	*Spizella passerina*	5	M	M	M		M	M	M			M
Common Yellowthroat	*Geothlypis trichas*	5					M					
Dark-eyed Junco	*Junco hyemalis*	5	R	R	R			R	R			R
Golden-crowned Kinglet	*Regulus satrapa*	5						M	M			
Great Horned Owl	*Bubo virginianus*			R					R			
Least Flycatcher	*Empidonax minimus*	6	M	M	M			M	M			M
Northern Saw-whet Owl	*Aegolius acadicus*			R					R			
Purple Finch	*Haemorhous purpureus*	2		M					M			
Red-breasted Nuthatch	*Sitta canadensis*	5		M				M	M			
Red-eyed Vireo	*Vireo olivaceus*	2	M	M	M			M	M			
Ruby-crowned Kinglet	*Corthylio calendula*	6		M					M			
Tennessee Warbler	*Leiothlypis peregrina*	5	M		M			M			M	M
Warbling Vireo	*Vireo gilvus*	6	M	M	M			M	M			
White-throated Sparrow	*Zonotrichia albicollis*	5	M	M	M			M	M			
Yellow-rumped Warbler	*Setophaga coronata*	5	M	M	M			M	M			
Yellow Warbler	*Setophaga petechia*	2	M	M	M		M	M	M			
Species at Risk												
Alberta Arctic	*Oeneis alberta*										M	M
Aphrodite Fritillary	*Speyeria aphrodite*		M	M	M						M	M
Arctic Blue	*Agriades glandon*				M						M	M
Arctic Skipper	*Carterocephalus mandan*		M	M			M	M	M		M	M
Assiniboine Skipper	*Hesperia assiniboia*		M	M	M		M				M	M
Common Ringlet	*Coenonympha california*				M		M				M	M
Common Woodnymph	*Cercyonis pegala nephele*		M	M	M		M	M	M		M	M
Coral Hairstreak	*Satyrium titus titus*						M					

Species	Scientific Name	BCCF Priority	Habitat									
			AM3	AM5	AS3	CB	CF	SW:as4	SW:as5	WW1	WW2	WW3
Great Spangled Fritillary	*Speyeria cybele pseudocarpenteri*		M	M	M						M	M
Old World Swallowtail	*Papilio machaon pikei*										M	M
Striped Hairstreak	*Satyrium liparops*										M	M
Tawny Crescent	*Phyciodes batesii*		M	M	M			M	M		M	M
Uhler's Arctic	*Oeneis uhleri*				M						M	M
Black-throated Green Warbler	*Setophaga virens*	1		M								
Broad-winged Hawk	*Buteo platypterus*	4		M					M			
Canada Warbler	*Cardellina canadensis*	2		M				M	M			
Cape-may Warbler*	*Setophaga tigrina*											
Cackling Goose	*Branta hutchinsii*	4					M					
Common Nighthawk	*Chordeiles minor*	2									M	M
Connecticut Warbler	*Oporornis agilis*	2		M					M			
Le Conte's Sparrow	*Ammospiza leconteii*	4					M				M	M
Olive-sided Flycatcher*	*Contopus cooperi*											
Rusty Blackbird*	*Euphagus carolinus*											
Short-eared Owl	*Asio flammeus*	2					R				R	R
Upland Sandpiper	*Bartramia longicauda*	1					M				M	
Winter Wren	*Troglodytes hiemalis*			M				M	M			
Eastern red bat	*Lasiurus borealis*		F	F	F	F	F	F	F		F	F
Northern long-eared myotis	*Myotis septentrionalis*	2	F	F	F	F	F	F	F		F	F
Ungulates												
Elk	*Cervus elaphus*	5	R	R	R	R	R	R	R	R	R	R
Mule deer	*Odocoileus hemionus*	6	R	R	R	R	R	R	R	R	R	R
Moose	*Alces alces*		R	R	R	R	R	R	R	R	R	R

*Expected to occur after reservoir inundation and establishment of old forests within the Property

4.2 Management Activities

Management for non-wetland migratory birds, species at risk and ungulates will be achieved through:

- Installing fencing around the perimeter of Fields 1, 2a and 2b to contain any livestock grazing within the cultivated field areas and allow wildlife access to the hills.
    - The inside fence configuration will be 5-strand wire. The top and bottom wires will be smooth. The middle three wires will be barbed. The lower and top smooth wires will be raised to facilitate ungulate passage. The proposed fencing is described in the BC Agricultural Fencing Handbook (Ministry of Agriculture Food and Fisheries 2002).
    - Existing fencing will be removed in conjunction with installation of the new fencing.
- Establishing large trees along the edge of fields and within current forested areas.
- Enhancing values of the steep riparian ravine and gully slopes for non-wetland migratory birds by planting native, woody species (trees and shrubs).
- Installing posts and nest boxes suitable for American Kestrel, swallows, waterfowl, and other cavity-nesting species along fence lines at the edge of cultivated fields and within the 15 m riparian vegetation zone.
- Conducting prescribed burns of grassland habitats (steep south-facing slopes) to rejuvenate native grassland and early seral habitats and maintain and enhance their value as ungulate winter range.

4.2.1 Ungulate Winter Range - Winter Ecology and Habitat Requirements – Biological Rationale

The biological rationale provided for below is intended to cover elk, mule deer and moose, the species currently protected by UWR U-9-007. The components of winter ecology and habitat requirements include thermal cover, winter forage, interspersion of thermal cover and foraging areas, and access management and human disturbance. This is outlined in “Establishing Ungulate Winter Range Objectives – Omineca Region” (Triton 2002).

Thermal Cover

The forested portions of the Property have the capacity to intercept snow and provide both thermal cover and accessible forage, which are the primary habitat variables influencing ungulate winter habitat selection in this part of northern BC (Triton 2002). Snow depth greatly influences elk distribution with a preference for open south-facing slopes and forested habitats with good snow interception. Elk movements can be restricted by snow depths of 40-50 cm (Triton 2002). Along the Peace River, elk use open shrub/grassland communities and deciduous/mixed stands, along with south-facing slopes and cultivated fields which occur on the Property (Bachmeyer 1994). Snow depths >40 cm restrict deer movement and bury shrub forage (Bachmeyer 1994), so having the forested portion and the south-facing slopes on the Property are important aspects to elk and deer survival during the winter months. Moose are physically adapted to deeper snow conditions but are known to select for areas under 40 cm and will move out of an area when depths exceed 70-90 cm (FNFN 2025). Moose will spend most of their time feeding in open areas such as

agricultural fields, wetlands, and south-facing slopes, but if snow depths increase, forest cover becomes more important. Forested areas have a crown closure of 60-65% which will help maintain this snow interception and not clearing these areas is an important part of this management plan.

Winter Forage

Elk are primarily grazers with 90% of their diet coming from grass species (Triton 2002). In the winter they tend to shift to mixed grasses and shrubs such as those found on the south-facing slopes and forested habitat on the Property. Mule deer browse a wider array of habitats from forested areas, agricultural fields and during the later winter, south-facing slopes. Maintaining this diversity of habitats on the Property through active burning of the south-facing slopes, creation and maintenance of old field habitat and preventing logging of the forested habitat builds durability of this winter range for deer.

The availability of forage is an important component of moose winter habitat selection as they need to consume large quantities of high-quality browse for their survival. Moose will therefore select foraging areas high in shrub species (e.g., willow, aspen, Balsam poplar, red osier-dogwood, Saskatoon, highbush cranberry, prickly rose, gooseberry). These species are well-represented on the Property on the south-facing slopes and forested areas.

Interspersion of Thermal Cover and Foraging Areas

For elk and mule deer the interspersion of forest cover and openings is a desirable management objective for a UWR. Elk and deer require a minimum of 20% forest retention in age class ≥ 80 years with a minimum forage requirement of 15% or ≤20 years old (Mowat 2002). Crown closure in the retained forested areas should be maintained at ≥50%. Elk prefer to stay close to escape/thermal cover at the forest edges so most of their foraging typically occurs within 200 m of available cover. The Property has fields 1, 2 and 3 as primarily agriculturally cultivated fields, while fields 2a and 2b will be set aside as old field habitat. The fields have adjacent forest cover up the slopes that will meet these conditions.

Moose winter range objectives will require up to 10% forest cover >60 years old and at least 10% of the area available for forage (i.e., early seral shrub habitat <20 years old). The creation and maintenance of the old fields (2a and 2b) will provide the <20-year-old habitat and retention of the existing intermediate (80-100 years old) forest will provide the necessary cover.

Access Management and Human Disturbance

For all the species involved, roads decrease the value of the habitat in a zone up to 100 m from the road. There are no main roads into this Property, just one farm trail used to access the agricultural fields north of the highway. It is recommended that no new roads be incorporated into the Property for existing agricultural uses or potential future industrial use. Since the Property is private land, this can be managed by BC Hydro within the UWR. Increased road access can increase hunter success, and reduce ungulate densities, so the Property should be posted for no hunting and enforced by BC Hydro and/or the leaseholder.

4.3 Ungulate Winter Range Objectives

Based on the above suitable characteristics of the proposed UWR area, the objectives in Table 5 are proposed to manage elk, mule deer, and moose winter range.

Table 5 – Ungulate Winter Range Objectives for elk, mule deer and moose[Error! Bookmark not defined.]

Objectives	Assumptions	Measures
Maintain 10-40% shrub cover of preferred deciduous forage species.	• Provides winter forage for elk, deer, and moose.	• Create and maintain old field habitats.
Maintaining at least 15% of the area in high suitability foraging habitat - grazing/ browsing habitat (grasses and shrubs)	• Elk and deer require a higher quantity of early seral habitat for winter forage. • Elk and deer will supplement agricultural species for winter grazing.	• Enhance forage productivity through prescribed burns. • Creation and maintenance of old field habitat. • Continued use and maintenance of the agricultural fields.
Maintain intermediate age class (80-100 years) forest for thermal cover.	• Maintains available thermal cover by providing a diversity of forest cover habitat.	• No logging or clearing in forested areas of the Property.
No new road or access development and no recreational use of the Property.	• Roads and human disturbance and noise reduce habitat effectiveness. • Road activity will displace animals and result in increased vehicle mortality.	• No hunting or other recreational uses of the property permitted. • No new road development for agriculture or industry should be allowed on the property.

5.0 MANAGEMENT OBJECTIVES: AGRICULTURE

The objectives of field management are to maintain agricultural production within the areas of cultivated field habitat, create additional wildlife habitat within cultivated fields, and protect and maintain wildlife habitats within the Property. Grazing by animals regulated under the *Animal Health Act – Game Farm Regulation* is incompatible with maintaining wildlife values. This will be achieved through a program of field management activities that include:

- Retain and improve existing grain and oilseed production on Fields 1, 2 and 3;
- Retain existing forage production on south-facing hillsides;
- Establish and maintain areas of old field habitat on the terrace of the hills (Fields 2a and 2b) and on the plateau (formerly rough pasture) ;
- Maintain current levels of livestock grazing in cultivated areas (Field 1 and 2);
- Once fencing is installed, allow pasture use and aftermath grazing[6] of crop residue by livestock only on the actively cultivated areas of Fields 1 and 2.
- Encourage more intensive agricultural crop production (e.g., alfalfa seed, vegetables) post--reservoir fill, particularly if irrigation water becomes available.

5.1 Field Management

Fields 1, 2 and 3 are used for growing a combination of cereal and forage crops. The fields are currently used for grain and oilseed production with wheat, canola, and peas forming the main rotation (Eco-Web 2022). The proposed cultivation, weed treatment, fertilizing, and seeding specifications will be reviewed for each field with the leaseholder annually.

Field 1 (46.6 ha) adjacent to the Peace River is currently only used for forage crops because the soils are coarse (sandy) textured and shallow, overlying gravels and stones (Figure 2). Field 2 (97.5 ha) is used to produce forage and oilseed (canola) crops. Field 2a (2.95 ha) and Field 2b (4.35 ha) will be developed into old field habitat as per Section 3.4.2.

Two management regimes will be implemented in these fields:

- Maintain long term forage production in Fields 1 and 3.
- Maintain intensive crop production on Field 2
- Create old field habitat in Fields 2a and 2b post-reservoir fill and manage for old field-grassland habitat. Vegetation height within these areas should be 0.3 to 2.1 m with the objective of providing breeding habitat for Short-eared Owl (*Asio flammeus*), Northern Harrier (*Circus hudsonius*), Sharp-tailed Grouse (*Tympanuchus phasianellus*) and Common Nighthawk (*Chordeiles minor*).
    - If growing conditions are conducive, old field habitats should have a simple rotation of predominantly light, late season grazing (August to mid-September; i.e., ~1.5

[6] Aftermath grazing = following crop removal and cultivation, placing livestock on the land to glean any remaining crop material

months) in one year followed by an earlier, light spring grazing (late-May to end of June: ~1 month) the following year.

- A post-crop residue grazing rotation from September to mid-October should be followed for the intensively managed crop fields. This will generally entail a period of short-term intensive grazing following crop removal. The timing of the start of the grazing period will be dependent on crop removal timing and adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder.

5.2 Grazing Rotation

The primary use of the main fields will be crop production, with aftermath grazing of crop residue following crop removal and potential rotational grazing of the old field areas. Continuous grazing can lead to overgrazing resulting in increased weed growth and soil damage, while rotational and aftermath grazing helps to maintain the quality and longevity of the forage stand. Rotational grazing entails more intensive field management where the field can rest for several weeks or months following a period of grazing for several days or weeks. The optimal number of livestock is placed in the field and distributed evenly throughout the field by salting and water placement to ensure even grazing pressure over the entire field. The management decision on when to start grazing, end grazing, and then re-graze a field, is based on several factors, including the density and height of the grass/legume cover and ground (soil) conditions.

Rotational grazing is used to manage both native (natural) forested and grassland ranges and improved fields such as occur within the Property. For native ranges, the period of use is generally rotated annually between the early and late grazing seasons to achieve optimal forage health and production levels. Early spring grazing by cattle increases the palatability of the forage for ungulates, while later fall grazing helps to rejuvenate the forage yield the following year.

A general rotation pattern is proposed for management of cultivated fields on the Property:

Crop fields (Fields 1, and 2): A post-crop residue aftermath grazing rotation from September to mid-October should be followed for the intensively managed crop fields. This will generally entail a period of short-term intensive grazing following crop removal. The timing of the start of the grazing period will be dependent on crop removal timing and adequate soil and grass conditions to support grazing. This will be determined annually by the leaseholder. Note that Field 3 was not included as there is no current fencing between the field, the forested areas, and the adjacent hillsides. If grazing is proposed by the leaseholder, then a fencing plan will need to be developed.

The exact rotation schedule will be based on seasonal monitoring. Individual field specific rotations will be determined in consultation with the Property leaseholder on an annual basis. Implementation of this rotational system will require intensive management during the grazing season, including regular field maintenance (e.g., rejuvenation) and timely movement of cattle between fields by the leaseholder.

Old Field (Fields 2a and 2b): For “old field habitats” a simple rotation of predominantly light, later season grazing (August to mid-September – 1.5 months) in one year, should be followed by earlier, light spring (late-May to end of June – 1 month) grazing the following year if growing

conditions are conducive to this and fencing is adequate to keep cattle off of the adjacent hillsides. In years with limited spring growth, grazing should be held off to late season grazing. The interval (e.g., every second or third year) with which the fields should be grazed in the spring should be based on actual field conditions. Grazing of the hillside and forested areas should not be permitted.

6.0 DETAILED MANAGEMENT PLAN

6.1 Priority Site Works

6.1.1 Access

The farm field access road is passable under dry conditions. The low-grade trail should be maintained for the current purpose to maintain field access while deterring recreational access to the fields. No industrial access should be permitted within the property without regulatory approval, i.e. if UWR status is applied, WLRS will be consulted on any industrial applications and the GWM's will provide access restrictions for future development.

6.1.2 Fencing

Ungulate-friendly barb wire fencing will be installed along the perimeter of Field 1, 2a, and 2b as described in Section 4.2 to restrict livestock use to the cultivated fields.

6.2 Field Improvements

Fields 1, 2 and 3 will receive cultivation, weed treatment, fertilizing, and seeding specifications should be reviewed for each field with the leaseholder annually. Fields 2a and 2b will be converted to old field habitat to create a transition between the hillside forest and the crop field. Field 2 is some of the only Class 1 and 2 agricultural capability land in the area, so will be retained for crop production. Field 1 may benefit from irrigation with reservoir fill and should be discussed with the leaseholder. Irrigation of Field 1 and 2 will improve the agricultural capability as per Section 3.2.1.

6.2.2 Weed management plan

The leaseholder will be responsible for developing a weed management plan. The leaseholder has been managing noxious weeds in the cultivated portions of the parcels presumably by spraying. The parcels were reviewed (Eco-Web 2022) but a noxious weed inventory was not conducted beyond the observations noted so the leaseholder will need to manage this through a weed management program. BC Hydro will review and provide advice on the leaseholder's weed management plan. The following provides a summary of historical noxious weeds noted at the Property:

- Parcels 159, 192, 192.2: Minor infestations of lamb's quarter (*Chenopodium album*) and shepherd's purse (*Capsella bursa-pastoris*) were observed along the field edges during the field investigation in 2022.
- Parcels 150.3, 151, 153, & 160: Some minor and several larger infestations of creeping thistle (*Cirsium arvense*), lamb's quarter, meadow goat's beard (*Tragopogon pratensis*), yellow hawkweed (*Pilosella* spp.), stinkweed (*Thlaspi arvense*), (western) bluebur

(*Lappula squarrosa*) and shepherd's purse were observed along the field edges during the 2022 field investigation.

- Parcels 144, 145, 146 & 147, the perimeter of the field contains several infestations of creeping thistle, lamb's quarter, meadow goat's beard, stinkweed , and (western) bluebur. During the 2022 field assessment, a major infestation of creeping thistle, perennial sow thistle (*Sonchus arvensis*) and (western) bluebur was observed on the bench below the fields along the service road used by BC Hydro. However, this area is now flooded by the reservoir.

The Peace River Regional District (PRRD) provides guidance on identifying and managing invasive plants within the Peace region that can be used by the leaseholder in developing a weed management plan. This can be accessed at: PRRD-Profile-of-Invasive-Plant-Species2022_2025-Web.pdf (PRRD 2022). In addition, BC Hydro's document "Site C Invasive Weed Mitigation & Adaptive Management Plan" can also be referenced (BC Hydro 2017).

7.0 ADDITIONAL REQUIREMENTS/RECOMMENDATIONS

- Create and maintain old field habitats.
- Enhance forage productivity through prescribed burns.
- No logging or clearing in forested areas of the Property.
- No polypropylene twine or wire is to be used for any hay brought on site. Only biodegradable twine should be used.
- Based on the private land setting of the Property, the leaseholder should not permit unauthorized hunters on the Property without written permission**.** No hunting signage should be placed accordingly on fences.
- Other than predator control, hunting should not be permitted on the Property during the winter months**.**
- No recreational use of the Property will be allowed in the winter months.
- No access development other than that required to manage the cultivated fields will be allowed.
- Honeybees will be encouraged.

8.0 MONITORING AND FOLLOW-UP MANAGEMENT OF THE PROPERTY

8.1 Leaseholder record-keeping requirements

At a minimum, the leaseholder will keep records of the following:

- Crops grown including date of planting and harvest
- Cattle grazed including number, date in, date out, locations.
- Weed treatment(s) including: area treated, date of treatment, chemicals applied, rate of application, treatment efficacy, and plans for the following year's treatment
- List of any written hunting permitted (name and phone number) issued by the leaseholder including a record of legal harvest (date, number, species, sex).
- Wildlife observations, including any issues with wildlife;
- Fencing requiring repairs (dates, locations, particularly if likely caused by wildlife)

- Wildlife mortalities including locations and dates
- Active raptor nests
- Carnivore (bear, coyote, fisher) dens

8.2 Monitoring by BCH

BC Hydro has conducted the following surveys and monitoring programs on and adjacent to the Property as per FDS and EAC Conditions during the Project's construction phase and continuing into Operations post-reservoir fill:

- Breeding bird surveys (see Sections 7.1.1.2-A and 7.2.7 of the *Vegetation and Wildlife Mitigation and Monitoring Plan [VWMMP]*)
- Ground nesting raptor surveys (see Section 78.9.5.1 of the *VWMMP*)
- Ungulate habitat monitoring (See Section 7.11 of the *Vegetation and Wildlife Mitigation and Monitoring Plan*)
- Monitoring of general property conditions (TBD).

8.3 Annual meetings to discuss/update management plans

To be determined in consultation with leaseholder. BC Hydro suggests meeting annually in April each year, with potential follow up meetings in October if required.

9.0 SUMMARY OF UNGULATE WINTER RANGE MANAGEMENT

The Property has excellent historical winter range use by elk, deer, and moose. The agricultural activity has enhanced forage opportunities for wildlife in this area and the maintenance of agricultural use is important to this value. Ungulate winter range values are enhanced by maintaining 10-40% shrub cover of preferred deciduous forage species in the old fields and surrounding hillsides with at least 15% of the area in high suitability foraging habitat - grazing/browsing habitat (grasses and shrubs) and the intermediate age class (80-100 years) forest within the Property for thermal cover. Grazing will be managed to short term rotational grazing in the old field and post harvest residue grazing on the crop fields to ensure forage levels will be maintained for ungulate winter use. To further prevent winter disturbance to ungulates, no new road or access development and no recreational activities on the Property during the winter months will ensure its continued suitability as ungulate winter range.

10.0 REFERENCES

Backmeyer, R. 1994. Peace Arm Elk Study. Peace Williston Wildlife Compensation Program. BC Environment.

BC Hydro. 2017. Site C Invasive Weed Mitigation & Adaptive Management Plan. Revision 6. Burnaby, BC, 58 pages.

BC Hydro. 2013. Site C Clean Energy Project - Environmental Impact Statement, Volume 3: Economic and Land and Resource Use Effects Assessment, Section 20: Agriculture.

BC Hydro. 2012a. Site C Clean Energy Project – Agricultural Assessment Supporting documentation.

BC Hydro. 2012b. Land Capability for Agriculture, Maps 11 and 12 of 25.

BC Hydro. 2011. Agricultural Slope Classification, Maps 31 and 32.

BC Soil Survey. 1986. Agriculture Canada - Soils of the fort St. John-Dawson Creek area, British Columbia, Report No. 42.

BC Ministry of Environment. 1983. Climatology Unit, Climate Capability for Agriculture, 1:100,000 NTS Sheet 94A/SW.

BC Ministry of Environment and Ministry of Agriculture and Food. 1983. MOE Manual 1, RAB Technical Paper #1, Land Capability Classification for Agriculture in BC.

BC Ministry of Environment, Ecosystems Branch. Accessed May 27, 2014. Proposed Ungulate Winter Range: https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do;jsessionid=EBF0A28F93729E7F771EE670CC4CC9CB.node2

Canada. 2024. Accessed on the Internet at: https://laws.justice.gc.ca/eng/acts/s-15.3/page-10.html#h-435647

Cheeseman, G.E. 1983. RAB Technical Paper #1. Climatic Capability Classification for Agriculture in British Columbia. Climatology Unit, BC Ministry of Environment, Victoria, BC.

Christie, P., K.A. McIntosh. 2015. Site C Clean Energy Project, Wilder Creek Property Management Plan DRAFT.

Eco-Web Ecological Consulting Ltd. (Eco-Web). 2022. Site C Clean Energy Project, UWR Compensation Properties – Reconnaissance Level Soil, Vegetation, Wildlife Survey. Prepared for BC Hydro, Vancouver, BC

Environment Canada. 2013. Bird Conservation Strategy for Bird Conservation Region 6: Boreal Taiga Plains.

Fort Nelson First Nation (FNFN). 2025. *2025 Winter Moose Survey: MU 7-52 Moose | Golo, Mooswa*. Report prepared by Mackenzie Askin, Dan Webster and Michel Lavallée (Eco-Web Ecological Consulting Ltd.). FNFN report number 2025-01.

Hilton, S., L. Andrusiak, R. Krichbaum, L. Simpson, and C. Bjork. 2013a. Part 1 Vegetation and Ecological Communities. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and C. Guppy. 2013b. Part 2 Butterflies and Dragonflies. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, L. Andrusiak, and C. Albrecht. 2013c. Part 4 Migratory Birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., and L. Simpson. 2013. Part 5 Non-migratory birds. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

Hilton, S., L. Simpson, and L. Andrusiak. 2013d. Part 6 Raptors. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

iMapBC. 2022. Groundwater wells – all layer. Accessed online Sept 2, 2022 at: iMapBC (gov.bc.ca)

Mowat, G, R.G. D'Eon , G. Woods, M. Panian, K.G. Poole, R. Serrouya and J. Wierzchowski. 2002. West Kootenay Ungulate Winter Range Mapping. DRAFT Prepared for: B.C. Ministry of Water, Land, and Air Protection, Fish and Wildlife Division Kootenay Region, Nelson, BC.

Ministry of Agriculture Food and Fisheries. 2002. BC Agricultural Fencing Handbook. Accessed online February 7, 2025, at:

https://peaceforage.bc.ca/wp-content/uploads/2021/07/BC_Agriculture_Fencing_Handbook.pdf

Ministry of Forests, Lands and Natural Resource Operations (MFLNRO). 2014. A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance. Accessed online at: https://a100.gov.bc.ca/pub/eirs/viewDocumentDetail.do?fromStatic=true&repository=BDP&documentId=12121

Peace River Regional District (PRRD). 2022. Profile of Invasive Plant Species within the Peace River Regional District, Dawson Creek, BC 103 pgs.

Soil Classification Working Group. 1998. The Canadian System of Soil Classification, 3rd ed. Agriculture and Agri-Food Canada Publication 1646, 187 pp.

Triton Environmental Consultants (Triton). 2002. Establishing Ungulate Winter Range Objectives – Omineca Region Prepared for Ministry of Water, Land and Air Protection Environmental Stewardship Division, Omineca Region, Prince George, BC.

Appendix I – Site C Clean Energy Project - UWR Compensation Properties – Reconnaissance Level Soil, Vegetation, Wildlife Survey

Eco-Web Ecological Consulting Ltd.
(o) 250-787-1110, (f) 250-787-1175
www.eco-web.ca

8211 93rd Street,
Fort St. John. BC
V1J6X1

SITE C CLEAN ENERGY PROJECT

UWR Compensation Properties – Reconnaissance Level Soil, Vegetation, Wildlife Survey

REPORT PREPARED FOR:

BC HYDRO
ATTENTION BROCK SIMONS

Report Date: August 31, 2022
Field Assessment Dates: Aug 12-15, 18, 2022

ECO-WEB PROJECT #: R3-2342

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1.0 INTRODUCTION

Provincial Environmental Assessment Certificate (EAC) condition 24 for the Site C Clean Energy Project (the Project) requires that BC Hydro protect Ungulate Winter Range (UWR). Through the Vegetation and Wildlife Technical Committee (VWTC), BC Hydro developed a plan for Ungulate Winter Range Identification, Retention and Maintenance. That plan describes the protection of about 515 ha of UWR after reservoir filling and the commencement of Project operation. It also requires the development of property-specific management plans so that agriculture or other land uses do not interfere with the protection of UWR. This report has been prepared to provide supplementary information for the management plans summarizing a reconnaissance level survey for soil, vegetation, and incidental wildlife observations.

2.0 SITE DESCRIPTION

BC Hydro has identified 16 parcels, or properties, that will wholly or in part be added to the UWR compensation program. These parcels have been grouped into eight contiguous groups that will each form a cohesive UWR. Table 1 below identifies the area of each parcel proposed for inclusion in the UWR, the soil map units, and the general habitat types. Each site varies but generally is comprised of some forested, agricultural, and/or hillside habitat with a few steeper ravines and slopes between the Halfway River and the Site C boundary.

2.1 Soils

Soils were assessed within each habitat type in each parcel to verify the soil types as compared to the mapped soil survey data (Soil Survey Report No. 42[1] and Soil Survey Report No. 8[2]). In all cases fewer soil types were observed than what is potentially present. A substantial increase in the number of soil plots would be needed to identify all the potential soil types in a parcel. This reconnaissance level survey focused on main soil types in each represented habitat.

Table 1 – UWR Compensation Properties

Contiguous Group	Parcel #s	Area (ha)	Soil Map Units (underlined soils verified)	Habitat Types
1	192.2 192 159	2.07 23.47 1.13	Lynx, Eaglesham, Centurion Attachie, Rockland Lynx, Eaglesham, Centurion	Forested Forested, agricultural Agricultural
2	160 153 150.2 151	42.69 25.10 10.12 3.59	Lynx, Eaglesham, Centurion, Attachie Attachie, Rockland Taylor, Branham Taylor, Branham	Hillside, Agricultural Hillside, Agricultural Agricultural, Forested Agricultural
3	144	4.44	Taylor, Branham, Attachie, Rockland	Agricultural, hillside
4	134	36.41	Lynx, Eaglesham, Centurion, Attachie, Branham, Clayhurst	Agricultural, hillside, forested
5	82.1	1.24	Taylor, Branham	Agricultural, Forested
6	62 60	51.12 62.09	Attachie, Rockland Attachie, Rockland	Agricultural, hillside Hillside, Forested
7	21.4	32.32	Attachie, Judah, Kathleen, Nampa	Ravine, agricultural
8	9 9.1 7	13.99 6.27 0.83	Attachie, Rockland Judah, Kathleen, Nampa, Attachie Falher, Judah, Nampa	Hillside, forested Forested Ravine, Forested

[1] T.M. Lord and A.J. Green. 1986. Soils of the fort St. John-Dawson Creek area, British Columbia, Report No. 42. BC Soil Survey. Vancouver, BC

[2] L. Farstad, T.M. Lord, A.J. Green, H.J. Hortie. 1965. Soil Survey of the Peace River Area in British Columbia. Report No. 8 of the British Columbia Soil Survey. Research Branch, Canada Dep't of Agriculture.

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Soil Map Units

Table 1 outlines the soil map units that could potentially be in the area, however a number of these were not encountered so will not be discussed in this report. In some cases other soil types not mapped were encountered and will be discussed below. The following soil map unit descriptions from Soil Survey reports number 42[1] and 8[2] represent those encountered during the survey.

Lynx (LY) map units are dominated by Brunisolic Gray Luvisols on loamy glaciofluvial materials. Lynx soils were found on properties 192.2, 192, 159, 160, and 134 typically at the top of the slopes on the upland fields. The variable sandy and silty sediments from which the Lynx soils formed are strongly calcareous and variable in thickness. Lynx soils are well drained, moderately pervious, and have a humid water regime. The most common soil of the map units is a Brunisolic Gray Luvisol with brown sandy loam Bm and Ae horizons, and a thin loamy Bt horizon overlying a calcareous Ck horizon about 30 cm from the surface.

Attachie (AH) map unit soils were found in most of the properties including 192.2, 192, 160, 153, 144, 134, 62, 60, 21.4, 9, 9.1, and 7. Attachie soils[1] are typically found along the very steep, erodible, south facing slopes above the floodplain of the Peace River and its tributaries. Attachie soils are made up of undifferentiated colluvial materials at the base of the steep slopes comprised of loamy tills, shale and sandstone, with layers of glaciofluvial gravels, sands and silts, along with sedimentary deposits of windborne loess. As a result Attachie soils were found to be highly variable within the Peace valley with drastically different soil profiles even within the same parcel. Attachie soils are divided into Regosols on the more unstable surfaces that are poorly developed and rapidly draining and Chernozemic soils that have developed under native grass and shrub vegetation and are more well drained. Both were noted during this assessment, however the Chernozemic soils dominated most accessible areas. Due to instability and steep irregular topography, agricultural and forestry uses are severely limited on the AH unit[1]. The open grassy slopes have the capacity to support limited domestic grazing if not too steep or erosion prone. This was noted as an historical practice in most areas with few landowners actively grazing these slopes except in properties 62, 60, 134, 21.4, 9, and 9.1.

Rockland (RK) map unit is used for those areas where bedrock outcrops at the surface and dominates the map unit. Most areas where Attachie soils were found had some small components of Rockland soils. Soil pits were not completed on these areas due to the steepness of the topography. Rockland soils were noted in properties 192, 160, 153, 134, 62, 21.4, 9, 9.1, and 7. Soil development is confined mainly to areas with more than 10 cm of soil material over consolidated rock. The consolidated component consists of undifferentiated, hardened bedrock that is mostly of sedimentary origin.

Taylor (TY) soils were found in properties 150.2, 151, 144, and 82.1 in the better cropland areas on intermediate terraces along the Peace valley and are mostly all cultivated. Taylor soils are classified as Rego Black Chernozems on clayey colluvial deposits, although most of those observed in the river valley being actively farmed were Orthic Black Chernozems with a thicker and more developed Bm horizon under the Ap. Taylor soils are moderately well to well drained, slowly pervious, and have a subhumid moisture regime. Taylor soils encountered that had not been plowed had a well-developed Ah horizon over the Bm and clay loam C horizon. Inclusions of Regosols and Rego Dark Gray Chernozems associated with Taylor map units. Branham soils may make up to 20-40% of the map unit. Taylor soils are highly productive, and crops of wheat, canola and peas were observed to be very healthy on these soils in the Peace valley.

Branham (BR) map units are confined to that part of the Peace River valley extending from the Peace Canyon Dam downstream to near the confluence of Cache Creek and the Peace River. The dominant soils are Orthic Eutric Brunisols on sandy and silty colluvial fan and terrace materials. Branham soils are well drained and

rapidly pervious and have a subhumid water regime. The Branham soil has a yellowish brown sandy loam Bm horizon that directly overlies the gray, calcareous sandy or loamy parent material. The Branham soils contain moderate amounts of Regosolic soils that are poorly developed with silty and sandy textured Ah horizons that can restrict the range of crops that can be planted, but they are still fairly arable. The growing of legumes and grass crops has been successful in some areas if cultivation is kept shallow due to a high concentration of lime within 30 cm of the surface.

Centurion (Ce) map unit is dominated by carbonated Rego Humic Gleysols on silty, glaciofluvial deposits on outwash plains. The variable, sandy and silty sediments that constitute the parent materials of the soils of the unit are calcareous and bedded. Centurion soils are poorly drained, slowly pervious, and have an aquic water regime. The typical profile has thick L-F and Ahk horizons that are moderately calcareous and overlie gleyed silty-textured C horizons. Centurion soils were only found in Parcel 134, with most of the soils with similar properties being Attachie.

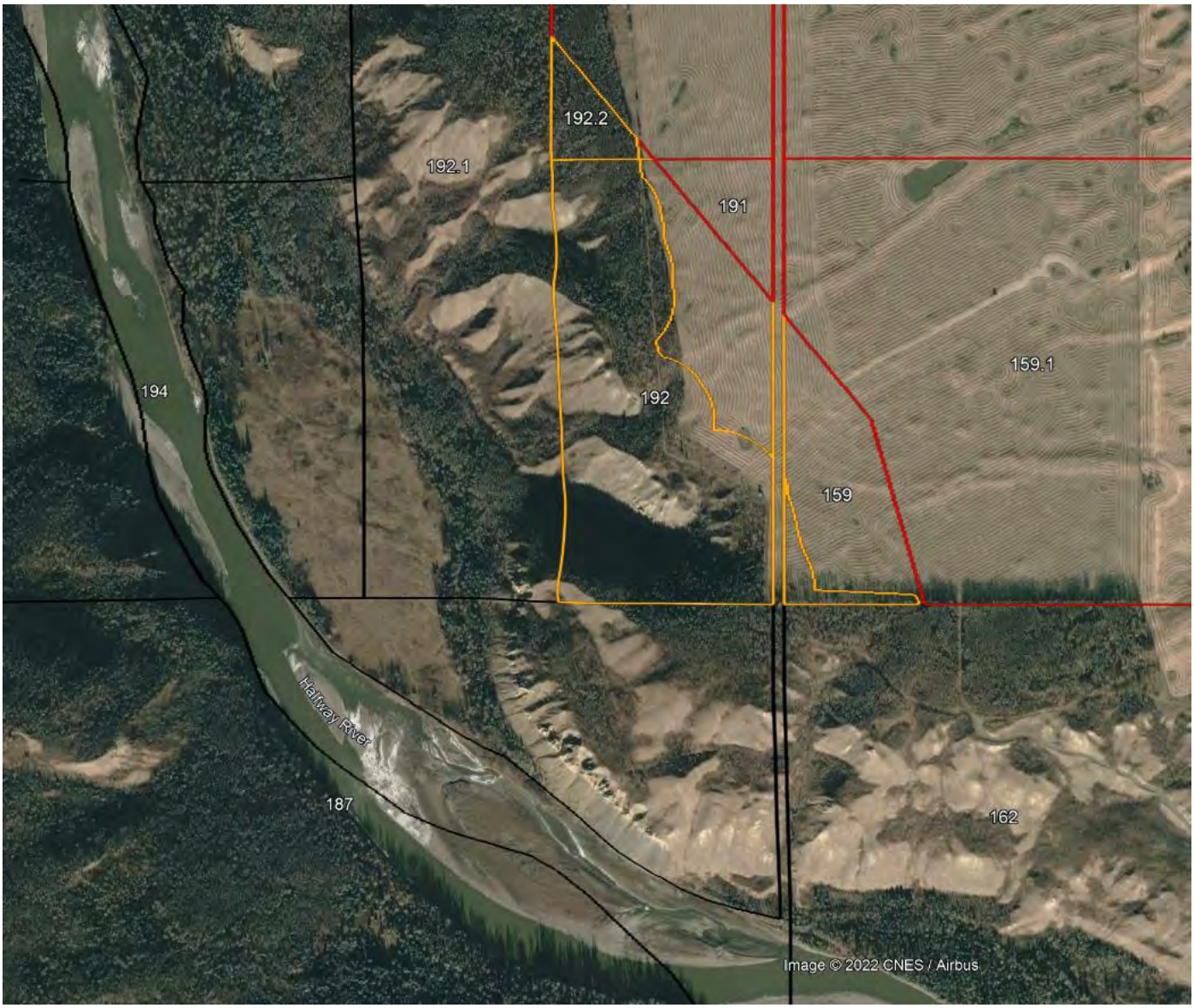
Judah (JU) map units are dominated by Dark Gray Luvisols on loamy and clayey deposits on the glaciolacustrine plains. Judah soils were found in properties 21.4 and 9.1 only. The Judah map units occur on brown, moderately calcareous, silty clay loams and silty clays at elevations below 750 m. Judah soils are well drained, moderately pervious, and have a subhumid water regime. The Dark Gray Luvisols have thick Ah or Ahe horizons, Ae horizons, and well developed, blocky-structured Bt horizons. Concentrations of lime carbonates occur at depths of 50-60 cm. Judah soils are fairly good to good arable land but can be susceptible to water erosion and may require cultivation and use of amendments to maintain productivity.

Kathleen (KT) map units are dominated by Orthic Gray Luvisols on loamy and clayey deposits in the glaciolacustrine plains. Kathleen soils were found in parcel 9.1 only. The Kathleen map units occur on brown, moderately calcareous, silty clay loams and silty clays at elevations below 750 m. Kathleen soils are well drained, moderately pervious, and have a subhumid water regime. The Orthic Gray Luvisols have fairly thick loamy Ae horizons and thick, friable, silty clay Bt horizons overlying Cca horizons at 50-60 cm. While these soils are low in natural fertility, they are fairly good arable land. Amendments and fertilizers are required along with grass and legume rotations to maintain productivity.

2.2 Agriculture

2.2.1 Contiguous Group 1, Parcel #s 192.2, 192 & 159

This area is at the top of the Peace River valley above the adjacent Halfway River valley. This upland area is mostly farmland, with this area containing a small amount of open aspen forest before dropping off steeply towards the Halfway River. Despite having five potential soil map units in the area only two variations of the Lynx soil were identified between the juvenile aspen forest and the adjacent cropland. Attachie soils were evident on the steeper slopes but were not assessed due to the topography. The Lynx soils in this area were fair producing reasonable crops, but bare areas were noted in the pea field as these soils typically require fertilizer amendments to produce[2]. The aspen forest areas had an open understory and supports wide variety of ungulates and black bears as evidenced by the high volume of tracks, scat and beds. The portions of these parcels to be set aside for UWR includes the field edges, the open forest and the upper steep south facing slopes.



Climate Capability for Agriculture

The upper field edges and open aspen forest of the parcels are outside the reservoir study area and are mapped as Climate Capability for Agriculture Class 3G, with the "G" limitation denoting an insufficient accumulation of heat units above 5°C during the growing season and the growing degree days (GDD) in which the temperature is above 5°C is on average 1100 with a freeze free period (FFP) of 74 days[3]. The portions of the property over the slopes on west and south facing aspects are mapped as Class 2FG, with the additional "F" limitation denoting that the minimum temperature is near freezing adversely affecting plant growth during the growing season and the GDD is on average 1251 (Station 1 Attachie Mid) and FFP of 93 days[4][5].

[3]Cheeseman, G.E. 1983. RAB Technical Paper #1. Climatic Capability Classification for Agriculture in British Columbia. Climatology Unit, BC Ministry of Environment, Victoria, BC.

[4] BC Hydro. 2012. Site C Clean Energy Project – Agricultural Assessment Supporting documentation.

[5] BC Hydro. 2013. Site C Clean Energy Project - Environmental Impact Statement, Volume 3: Economic and Land and Resource Use Effects Assessment, Section 20: Agriculture.

Land Capability for Agriculture

The open aspen forest Lynx soils and the Attachie soils on the steep slopes, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing[6]. The field investigation identified from visual evidence that historically there may have been grazing in this area, but currently the area is not fenced for this activity.

The Lynx soil map units, occupying the top of valley field edges, have moderate capability for agriculture, Class 6:3T~4:4W and has limitations that require moderately intensive to special management practises without which can moderately to severely restrict the range of crops. These upper fields are rated as 60% Class 3 with topography limitations, and 40% Class 4 with topography and shallow bedrock limitations. The field investigation confirmed that much of the area occupied by the field is Class 3 and no topography or shallow bedrock limitations were noted in the plowed fields. This rating would not improve with irrigation due to the proximity to the steep slopes, but forage production would benefit from irrigation. It was noted that there were some wet areas in the field caused by shallow fine textured soils holding water and forming small wetlands.

Crop Suitability

The steep slopes are not suitable for growing crops and the open aspen forest would require logging and grubbing to potentially grow a hay crop, although even this would likely require additional improvements. The field edges were occupied with fair to good pea crops and are suitable, with improvements (fertilizer), to grow a number of the grain crops grown in the Peace Region and hay (evidence of previous hay included alfalfa, fescue, and clover). The Class 3G climate and Class 3-4 Land Capability will limit the range of many crops, which could be grown commercially without irrigation and intensive fertilization. The climatic moisture deficit (~245 mm at Attachie Mid) would allow for a fair to good amount of forage that could be produced i.e., one or two hay crops per year, plus some grazing afterwards. Soil and moisture conditions observed during the field investigation, confirm that with improvements crops can be produced (a fair pea crop was present) or 1-2 cuts of hay could be taken from the fields in most years.

Summary of past use

The open aspen forest and steep slopes may have been historically grazed, although this practice was not observed. The fields that the edge of the area overlaps have historically been used for forage and grain production including peas, wheat and hay. The lack of fencing indicates farm operators do not currently graze livestock on these fields following harvest.

Noxious Weeds

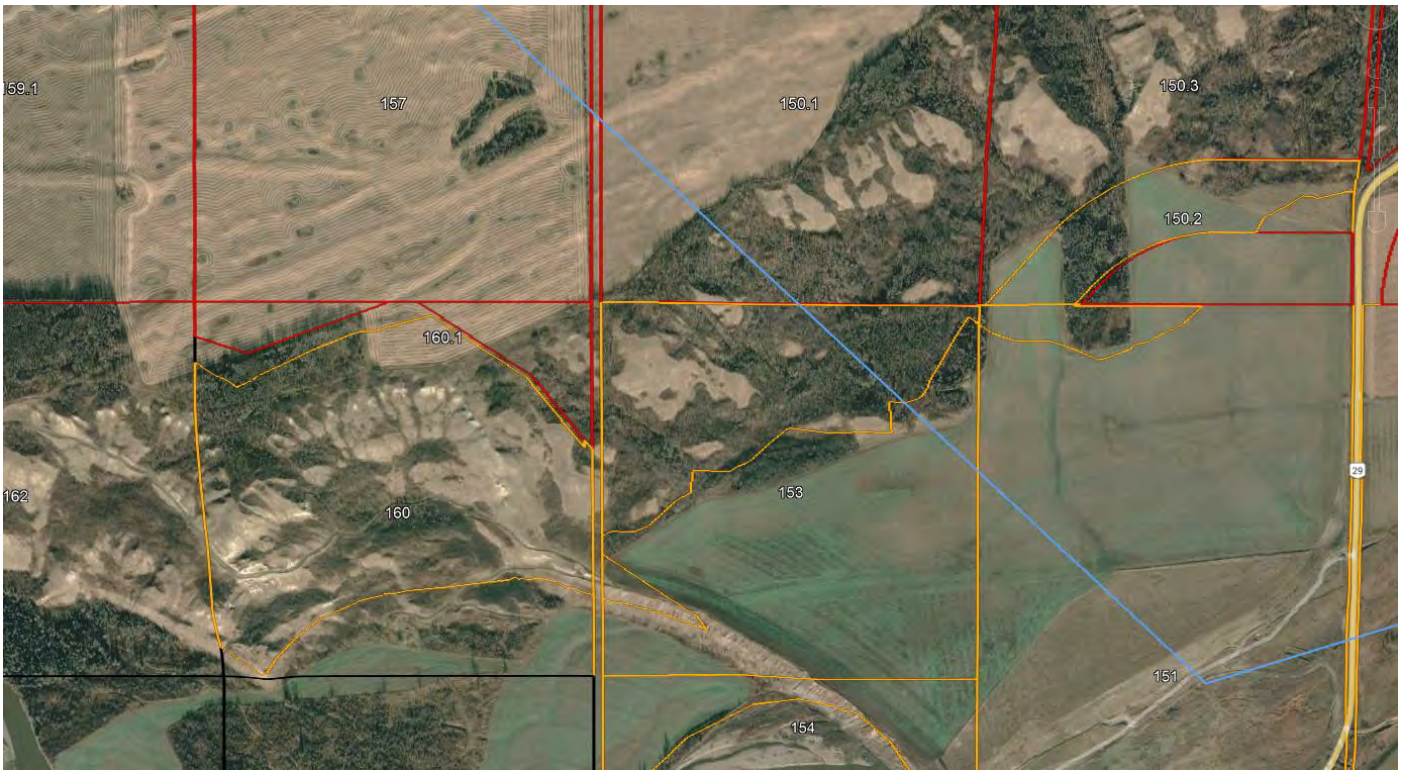
The leaseholder has been managing noxious weeds in the cultivated portions of the parcels presumably by spraying. Minor infestations of lamb's quarter (*Chenopodium album*) and shepherd's purse (*Capsella bursa-pastoris*) were observed along the field edges during the field investigation. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.2.2 Contiguous Group 2, Parcel #s 160, 153, 150.2 & 151

This area is mid-slope above the wide agriculture dense middle bench in the Peace valley. Of the seven potential soil map units in the area, the soil map units of Taylor, Branham, and Lynx, to the undifferentiated colluvial materials of the Attachie soils on the steeper slopes were encountered. Rockland is also present

[6] BC Hydro. 2012. Land Capability for Agriculture, Maps 1 to 25

but was not assessed due to the steepness of the topography and open bedrock. Some variations were noted in the Branham soils as well as the Attachie, where both Gleyed Cumulic Regosols and Eluviated Brown Chernozems were present. The portions of parcels 160 and 153 to be set aside for UWR represent the steeper hillside with forested and open grassland slopes with predominantly Attachie soils. The portions of parcels 150.2 and 151 overlap agricultural areas (pea fields) with some thick forest and are comprised of Taylor and Branham soils. Black bear, deer, moose and elk activity was high along the field edges as evidenced by tracks, scat, bedding areas, browse and foraging.



Climate Capability for Agriculture

The slopes of the Peace River valley overlapped by this area are mapped as Climate Capability for Agriculture Class 2G, with the "G" limitation denoting an insufficient accumulation of heat units above 5°C during the growing season and the GDD in which the temperature is above 5°C is on average 1251 with a FFP of 93 days[4,5]. The lower portions of the parcels that come down into the agricultural fields are mapped as Class 3A, with the additional "A" limitation denoting that drought between May 1st and September 20th result in moisture deficiencies that limit plant growth and the GDD is on average 1230 (Station 1 Attachie Low) and FFP of 75 days[4,5]. With irrigation the climatic capability rating improves to Class 1GF, with the "F" limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season[3].

Land Capability for Agriculture

The Attachie soils on the steep slopes, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing[6]. The field investigation identified that historically there may have been grazing in this area as there is an old fence line in the bush above the fields. The old fence is in a very bad state of repair and could not contain livestock, indicating that grazing in this area has not occurred in some time.

The Taylor and Branham soil map units, occupying the edges of the field, have good capability for agriculture, Class 6:1~4:2X, and can support a wide range of crops. The Agricultural Land Capability mapping denotes this transition lower in the field, but the field investigation noted that this transition is at the bush line. The fields are rated as 60% Class 1, and 40% Class 2 with multiple limitations. The agricultural capability maps show these fields as improved Class 1. The updated climatic data and capability classification reflects closer to the improved Class 2 due to growing degree days of 1230 in the Attachie Low area. However, it was noted during the field investigation that pea crops in this area were very good, supporting the high Agricultural Land Capability .

Crop Suitability

The steep escarpment slopes and open grassy slopes interspersed with mature thick understory aspen forest are not suitable for growing crops. These areas would require logging and grubbing to potentially grow a hay crop, and the steep topography and lack of stability would make this difficult without substantial improvements. The Class 2G climate and Class 6-7 Land Capability severely limit any crop production in these areas. The field edges were growing a very good pea crop and are suitable to grow most of the grain crops grown in the Peace Region. The Class 2G climate and Class 1-2 Land Capability at the field will allow for a wide range of crops, which could be grown commercially. The climatic moisture deficit (~220 mm at Attachie Low) would allow for plenty of forage that could be produced i.e., two or even three hay crops per year, plus some grazing afterwards. Soil and moisture conditions observed during the field investigation, confirm that crops can be produced in the fields but not on the steeper valley slopes.

Summary of past use

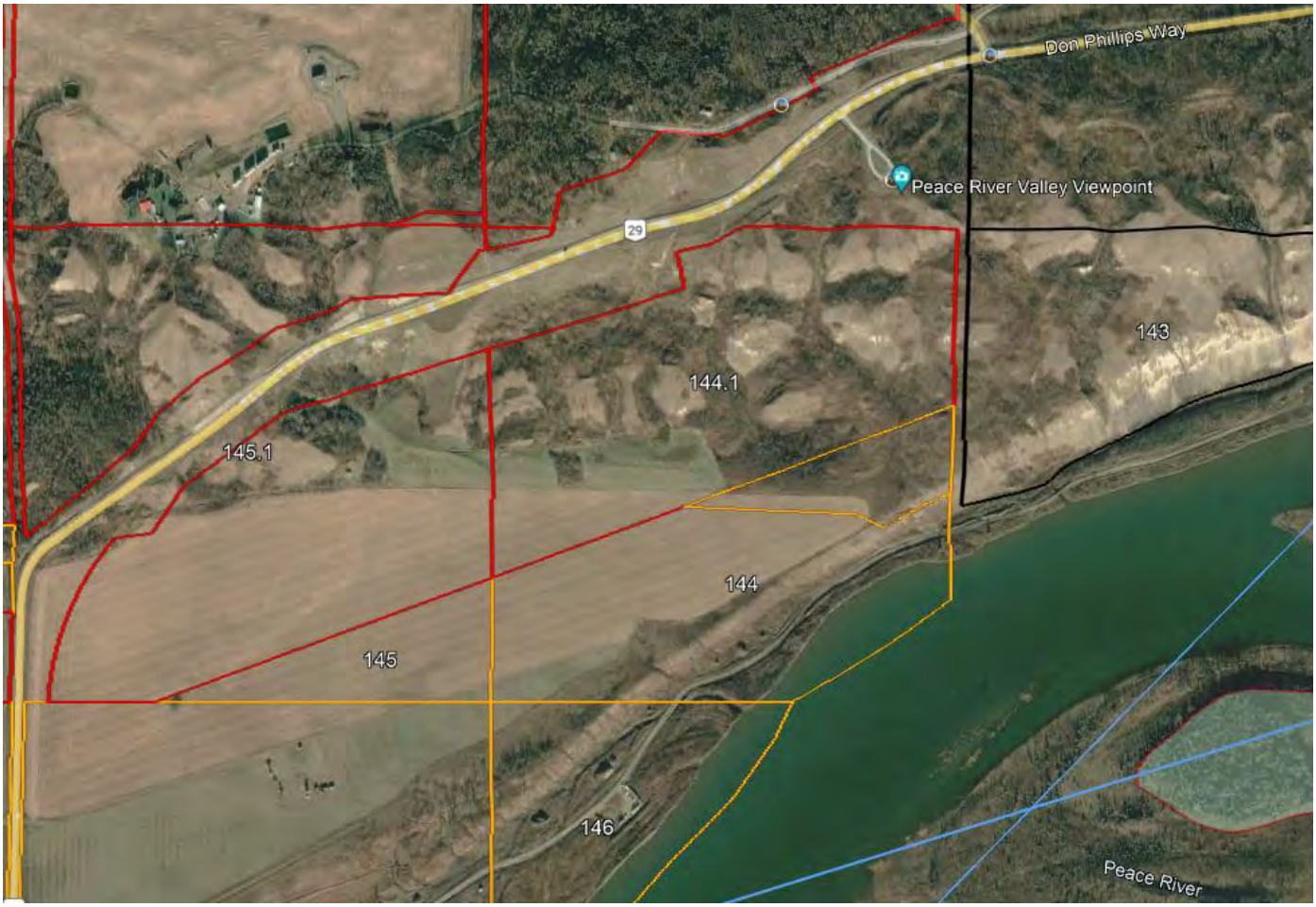
The steep escarpment slopes and open grassy slopes interspersed with mature thick understory aspen forest have been historically grazed, although this practice was not currently observed, and the fencing has fallen into disrepair. The fields that the edge of the area overlaps have historically been used for grain production including peas, wheat, and canola. There is an old trail that connects the lower fields with the upper fields through Parcel 160. Cattle may have been moved between the areas and the old fence in the middle portion of this area supports that grazing of cattle took place at one point in time. No evidence of current grazing was observed in the field.

Noxious Weeds

The leaseholder has been managing noxious weeds in the cultivated portions of the parcels presumably by spraying. Some minor and several larger infestations of creeping thistle (*Cirsium arvense*), lamb's quarter, meadow goat's beard (*Tragopogon pratensis*), yellow hawkweed (*Pilosella* spp.), stinkweed (*Thlaspi arvense*), bluebur (western) (*Lappula squarrosa*) and shepherd's purse were observed along the field edges during the field investigation. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.2.3 Contiguous Group 3, Parcel # 144

This area is on the bottom bench above the Peace River overlapping a productive wheat field. The wheat field contains Taylor map unit soils, while the slopes above and below are comprised of Eluviated Brown Chernozem and Attachie soils. While Branham and Rockland soils are also documented here, they were not observed in the field assessment. The agricultural crops create an attractant for ungulates, various bird species, and black bears. The surrounding slopes are rich in grasses, shrubs, and berries. Black bear, deer and moose tracks, scat and evidence of foraging were prevalent through the area. Large groups of mule deer have been observed in these fields and the adjacent slopes.



Climate Capability for Agriculture

This low bench north of the Peace River is mapped as Climate Capability for Agriculture Class 3A, with the additional "A" limitation denoting that drought between May 1st and September 20th result in moisture deficiencies that limit plant growth and the GDD is on average 1204 (Station 1 Attachie Flat) and FFP of 93 days[4,5]. With irrigation the climatic capability rating improves to Class 1GF, with the "F" limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season[3].

Land Capability for Agriculture

The Attachie soils here have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing[6]. The field investigation identified that the area is used for grazing as the fence line surrounding the field has been improved to keep livestock within the field, presumably to allow for grazing after harvest of the crop.

The Taylor soil map units, occupying the field overlapped by this area, have good capability for agriculture, Class 6:1~4:2X and are capable of supporting a wide range of crops. The field is rated as 60% Class 1, and 40% Class 2 with multiple limitations. The agricultural capability maps show these fields as improved Class 1. The updated climatic data and capability classification reflects closer to the improved Class 2 due to growing degree days of 1204 in the Attachie Flat area. It was noted during the field investigation that the wheat crop in this field was very good, supporting the high Agricultural Land Capability.

Crop Suitability

The steeper undulating slopes and open grassy slopes are not suitable for growing crops. These areas would require clearing and grubbing to potentially grow a hay crop, and the steep topography and lack of stability would make this difficult without substantial improvements to the landscape. The Class 3A climate and Class 6-7 Land Capability severely limit any crop production in these areas. The field overlapped by the area is growing a very good wheat crop and is suitable to grow most of the grain crops grown in the Peace Region. The Class 3A climate and Class 1-2 Land Capability at the field will allow for a wide range of crops, which could be grown commercially. The climatic moisture deficit (~148 mm at Attachie Low) limits the amount of forage that could be produced i.e., cut hay would be limited to 2 crops per year, with the potential for additional post-harvest grazing. The fine textured soils of in this field mitigate the climatic soil moisture deficit, to some extent, and allow for a better range of cropping alternatives and production levels as was observed during the field investigation.

Summary of past use

The steep open grassy slopes have been historically grazed, although there is now fencing in place to prevent cattle movement between the field and the slopes. The field portion may be grazed after harvest and fencing is in place to facilitate this. The large field has historically been used for grain production, including peas, wheat, and canola. This area has been sustainably farmed for generations and continues to produce excellent crops that provide a side benefit to the deer and black bears that occupy the river slopes.

Noxious Weeds

The leaseholder has been managing noxious weeds in the cultivated portions of the parcels, presumably by spraying. The perimeter of the field contains several infestations of creeping thistle, lamb's quarter, meadow goat's beard, stinkweed , and bluebur (western). It was noted during the field investigation that on the bench below these fields there is a major infestation of creeping thistle, perennial sow thistle (*Sonchus arvensis*) and bluebur along the service road used by BC Hydro. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program. In addition, if the noxious weeds on the lower bench are not managed, they will present a constant seed source on this field and other agricultural fields in the area.

2.2.4 Contiguous Group 4, Parcel # 134

This area covers a number of different habitats, from the thick aspen forests to open grassland slopes. The portion of parcel 134 set aside for UWR is outside of the agricultural areas and the soils represent this being mostly Attachie and Centurion soils. Branham and Clayhurst soils are mapped and would be anticipated in the agricultural fields on the east side of this parcel, outside of the proposed UWR area. Eaglesham soils were not observed but would be anticipated in any wet low areas within the forested habitat. Some Lynx soils are present, but topography limits the agricultural potential of these areas. Below Highway 29 there is a steep ridge running to the southwest with forested Lynx soils on the back side and Gleyed Cumulic Regosol Attachie soils on the open grassland with south facing slopes. The Rego-Humic Gleysol, Centurion soil was found on the top of the last bench above the river. Ungulate and black bear use was high in this area, even with Highway 29 bisecting the northern portion of the parcel, with substantial tracks, scat and evidence of foraging and browsing.

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Climate Capability for Agriculture

This steeply undulating terrain rises above the lower bench of the Peace River and is mapped as Climate Capability for Agriculture Class 2F, with the additional "F" limitation denoting that the minimum temperature is near freezing adversely affecting plant growth during the growing season and the GDD is on average 1230 (Station 1 Attachie Low) and FFP of 75 days[7][8]. Irrigation is not feasible on this steep undulating slope and the rapidly drained soils on the open grassy slopes would not be conducive to this.

Land Capability for Agriculture

The Attachie soils on the steep grassy slopes and the Lynx soils in the thick and steep aspen forest through the central and southern parts of this area, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing[6]. The field investigation identified that there is no current grazing activity and if it did occur historically, it would have been limited as it is all forested with a few open grassy south facing slopes. The fencing in place around the good cropland to the east would presumably to allow for grazing after harvest of the crop, not for grazing this area.

[7] BC Hydro. 2012. Site C Clean Energy Project – Agricultural Assessment Supporting documentation.

[8] BC Hydro. 2013. Site C Clean Energy Project - Environmental Impact Statement, Volume 3: Economic and Land and Resource Use Effects Assessment, Section 20: Agriculture.

The steep upper bench north of Highway 29 was within the Lynx soil map unit and had a moderate capability for agriculture, Class 6:3T~4:4W so may be capable of some crops with improvements, although caution would be required due to some unstable soils. The upper bench is rated as 60% Class 2 with topographic limitations, and 40% Class 4 with excess water limitations. The topography and slope instability would limit agricultural activities to grazing only in this area. It was noted during the field investigation that some historical grazing may have occurred through this area based upon trails and old cattle scat.

Crop Suitability

The steep undulating grassy slopes and steep forested areas are not suitable for growing crops. These areas would require clearing and grubbing to potentially grow a hay crop, and the steep topography and lack of stability would make this difficult without substantial improvements, not limited to recontouring the area and implementing erosion control measures. The Class 2F climate and Class 6-7 Land Capability of most of the area severely limit any crop production in these areas. Even the better Class 3-4 land on the top bench is far too unstable to consider improvements for crops and even grazing needs to be on a rotation and very lightly. This is contrasted with the field to the east outside of the UWR area which was observed to be growing a very good wheat crop and is suitable to grow most of the grain crops grown in the Peace Region.

Summary of past use

The upper bench of steep open grassy slopes and forest around Highway 29 have been historically grazed, although there is no current fencing in place to prevent cattle movement between the slopes and the road. The wheat crop field outside of the UWR area is fenced and while the area of undulating aspen forest and steep grassy slopes may have been grazed there is no current grazing. Highway 29 used to come down the hill lower through this area, but was replaced with a higher, steeper section of road that is sliding and in a state of poor repair.

Noxious Weeds

The leaseholder has been managing noxious weeds in the cultivated field east of this area, but extensive infestations of creeping thistle were noted around the edges of the field and into the forested area. Within the UWR area several small infestations of lamb's quarter, meadow goat's beard (*Tragopogon pratensis*), yellow hawkweed and bluebur (western) were noted. A noxious weed inventory was not conducted beyond these observations and this area is outside of where the leaseholder is managing through their weed management program.

2.2.5 Contiguous Group 5, Parcel # 82.1

This area at Bear Flats overlaps a hay field and bush pasture on the highly productive Taylor map unit soils. Branham soils are documented here but were not observed and may be located closer to the Peace River, outside of the proposed UWR area. It was observed that the soils in this parcel did not appear to be as productive as some of the adjacent active crop areas. This may be due to the field's use for hay production and pasture not receiving fertilizer or amendments. Mule deer and black bear activity was high in this area based on the number of tracks, scat and browse.

Climate Capability for Agriculture

Parcel 82.1 is broken into a hay field and bush pasture on the bench above the lowest bench of the Peace River and is mapped as Climate Capability for Agriculture Class 3A, with the additional "A" limitation, denoting that drought between May 1st and September 20th result in moisture deficiencies that limit plant growth. The GDD is on average 1241 (Station 4 Bear Flat) and FFP of 91 days[4,5]. With irrigation the climatic capability rating improves to Class 1GF, with the "F" limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season[3].

Land Capability for Agriculture

The Taylor soil map unit was field observed on this second bench above the river where the hay field and bush pasture are located. These soils have high capability for agriculture and are capable of supporting a wide range of crops. The detailed Land Capability for Agriculture mapping rates the hay field and most of the bush pasture as Class 1 with no limitations. The southeast tip of the bush pasture downgrades to Class 6 and 7 (6:6T~4:7TR) with topographic and shallow bedrock limitations. The Class 1 classification is not supported by the updated climatic data and capability classification which reflects improved Class 2 due to growing degree days of 1241 in the Bear flat area. Based on the field investigation, the hay field is dominantly Class 2, with soil structure limitations due to fine (clay) textures.

Crop Suitability

The hay field and the bush pasture in this parcel are suitable for all the hay and grain crops grown in the Peace Region, with the Class 3A climate limiting the range of other crops, such as vegetables, that could be grown commercially without irrigation (note: vegetables were historically grown on one of the adjacent properties [Parcel 89.2] to the west using irrigation). The climatic moisture deficit (~132 mm at Bear Flat) limits the amount of forage that could be produced, i.e., hay crops would be limited to one or two crops per

year, with the potential for additional grazing after harvest. Discussions with the leaseholder indicates this is typically what is done, although this year he was only removing one hay crop.

Soil and moisture conditions observed during the field investigation, indicate that a single cut of hay can be taken from the fields, but in wetter years, two crops are achieved. The hay field has a high moisture holding capacity and fertility, but given the south facing aspect, the hay field would only get enough moisture in the wettest years. Actual harvested hay yields are unknown but would likely improve with irrigation to gain two cuts of hay if irrigated.

Summary of past use

This second bench above the Peace River has been historically used for hay crops and then grazed once the hay has been harvested. This is evident since the area is currently fenced with cattle on the bush pasture, presumably to be moved to the hay field following harvest. The Old Hope Road comes out at Bear Flat at this location, so has some historical significance, as this was the old route to Hudson's Hope from Fort St. John.

Noxious Weeds

The leaseholder has been managing noxious weeds in the hay field and bush pasture. Some minor infestations of creeping thistle were noted along the Old Hope Road, with most of the major infestations along the Highway 29 corridor. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.2.6 Contiguous Group 6, Parcel #s 62 & 60

This area is documented in the soil survey as containing Attachie and Rockland soils. Several variants of the Attachie soil map unit (Orthic Black Chernozems and Gleyed Cumulic Regosols) were identified and Rockland soils, while not assessed, are present along a steep cliff at the north end of parcel 60. The southwest portion of Parcel 62 contains some developed farmland and Dark Gray Luvisolic Judah map unit soils were encountered in these areas. This soil is producing a fairly good wheat crop along the lower bench below the Old Hope Road. The remainder of the area is either steep topography or old slides and is suitable for grazing as it is producing a good amount of grass and shrubs. Discussions with the leaseholder, Blaine Meek, indicate that he grazes the area on a two year rotation and was not grazing it this year (2022).

Deer, elk and moose were noted in the area via scat, tracks, browse and dropped antler. Black bear also make high use of the area, with a large male observed mid-slope in parcel 62 feeding on saskatoons.

Climate Capability for Agriculture

This large area is on steep south facing slopes with several escarpments and active slides. One lower bench above the Peace River has been broken and cultivated for farming, while the remainder is used primarily for low density grazing every second year. The steeper upper slopes of the area are mapped as Climate Capability for Agriculture Class 2G, with the additional "G" limitation denoting that there is insufficient accumulation of heat units above 5°C during the growing season and the GDD is on average 1241 (Station 4 Bear Flat) and FFP of 91 days[4,5]. The lower agricultural field is mapped as Climate Capability for Agriculture Class 3A, with the additional "A" limitation denoting that drought between May 1st and September 20th result in moisture deficiencies that limit plant growth and the GDD is on average 1241 (Station 4 Bear Flat) and FFP of 91 days[4,5]. With irrigation the climatic capability rating in this lower field improves to Class 1GF, with the "F" limitation denoting that the minimum temperature is near freezing and adversely affects plant growth during the growing season[3]. While there was no evidence of irrigation in place, the wheat crop was fair, and the fine textured soils would help with moisture retention in this area.

Land Capability for Agriculture

The Attachie soils on the steep grassy slopes and in the thick and steep aspen forest in the slide areas, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings, which limit agricultural use to non-intensive grazing[6]. The field investigation confirmed that the slopes are grazed but no cattle are on them this year, as the leaseholder indicated, grazing is rotated every two years. Fencing is in place separating the slide prone slopes from the steep grassy slopes and around the small field on the bench above the Peace River. The field may also be grazed after harvest of the crop, although this was not confirmed.

The Judah soil map unit was represented on the low bench above the river which is split between a forested area and a small wheat field. These soils have a higher capability then Attachie soils for agriculture and are evidently capable of supporting a fairly wide range of crops. The detailed Land Capability for Agriculture mapping rates the field and forest on this bench though as Class 6 and 7 (6:6T~4:7TR) with topographic and shallow bedrock limitations. Despite this, based upon the better mapped soil unit, this area would actually be better described as Class 4C, with the fine (clay) textured soils providing adequate moisture retention and nutrients to grow a fair wheat crop.

Crop Suitability

The small field on the lower bench is suitable for all the hay and grain crops grown in the Peace Region, with the Class 3A climate limiting the range of other crops, such as vegetables, which could be grown commercially without irrigation. The climatic moisture deficit (~132 mm at Bear Flat) limits the amount of forage that could be produced, i.e., hay crops would be limited to one or two crops per year, with the potential for additional grazing after harvest. The field investigation noted that the current wheat crop was fair, with moderate height and some bare areas.

The steep grassy slopes and steep forested slide areas are not suitable for growing crops. These areas would require clearing and grubbing to potentially grow a hay crop, but the steep topography and lack of stability would make this impossible. The Class 2G climate and Class 6-7 Land Capability of most of the area severely limit any crop or hay production in these areas.

Summary of past use

The Old Hope Road traverses the lower portion of this area and remains as a low-grade road used by the farmers in this valley. It is accessible under dry conditions but would be difficult to travel under wet conditions. The lower bench has been fenced and cultivated for growing crops. The steep grassy upper slopes in Parcel 62 are used for some grazing. The steep slide dominated slopes in Parcel 60 have also seen some levels of non-intensive grazing. The fence line runs at an angle through Parcel 62 towards to private land at the top of the hill.

Noxious Weeds

The leaseholder has been managing noxious weeds in the crop field, but there were many small infestations of creeping thistle in and around the field. Some minor infestations of wild buckwheat, shepherd's purse , lamb's quarter and annual sow thistle (*Sonchus oleraceus*) were also noted in this lower area and along the Old Hope Road. On the steep upper slopes, minor infestations of meadow goat's beard (*Tragopogon pratensis*) were present on the south facing grassy slopes. In and around the water features, creeping thistle was present in large quantities. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.2.7 Contiguous Group 7, Parcel # 21.4

This area is documented in the soil survey as containing Attachie, Judah, Kathleen, and Nampa map unit soils. The field investigation identified dark gray Luvisolic Judah map unit soils in the northern field, with Orthic Eutric Brunisolic Branham soils in the forested areas north and south of the north field. The southern field along the top of the Peace valley slopes contained the Attachie soil map unit (Orthic Black Chernozems) and Rockland soils on the lower part of the slopes that were not assessed due to the steepness of the terrain. The Judah and Attachie soils in the fields were producing a limited alfalfa crop. The hardness of the Judah soils appeared to be creating a profile restriction in the north field, while the low nutrients of the Attachie soils also did not make for a very good hay crop in the south field. The remainder of the area is steeper topography and is somewhat suitable for grazing as it is producing a good amount of grass and shrubs.

Wildlife use was mainly deer with some moose and black bear sign noted along the edges of the fields.

Climate Capability for Agriculture

These upper fields above the Peace River valley in this parcel are mapped as Climate Capability for Agriculture Class 2G, with the "G" limitation denoting an insufficient accumulation of heat units above 5°C during the growing season and the GDD in which the temperature is above 5°C is on average 1359 (Station 7 Site C) with a FFP of 125 days[4,5].

Land Capability for Agriculture

The Judah and Branham soil map units, occupying the north field and surrounding forest overlapped by this area, have good capability for agriculture, Class 6:3T~4:2C and can support a wide range of crops. The north field and the eastern part of the south field are rated as 60% Class 3 with topographic limitations, and 40% Class 2 with climate limitations. Despite this the soil rooting restrictions and actual site conditions were not producing to this predicted level and are closer to an agricultural capability of Class 4C.

The Attachie soils on the south field and the steep slopes, have very low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep irregular slopes and instability and shallow soil over bedrock and/or bedrock outcroppings. The relatively flat topography of the southern field and better soils along the east side have made hay crops an acceptable agricultural use, while the rest of the area would only be suitable for non-intensive grazing, although some of the slopes are very steep. The field investigation identified that historically there may have been grazing in this area as there are old fence lines along the east and west sides. The fences are no longer maintained except for where they parallel the adjacent agricultural fields to the northeast.

Crop Suitability

The north and south fields were growing a fair to poor alfalfa crop and are suitable to grow hay crops although they would be limited to one crop per year, possibly two with irrigation. The Class 2G climate and Class 2-3 Land Capability at the north field should allow for a wider range of crops, but without improvement practices, such as manure amendments, fertilization, plowing or irrigation, could not grow crops commercially.

The steep escarpment slopes are not suitable for growing crops. These areas are too steep to consider logging and grubbing in preparation for hay crops, as the steep topography and lack of stability would make these activities impossible. The Class 2G climate and Class 6-7 Land Capability severely limit any crop production in these areas. Soil and moisture conditions observed during the field investigation confirm that hay crops can be produced in the fields but not on the steeper valley slopes.

Summary of past use

The fields, mature forest, and even the steep escarpment slopes may have been historically grazed, although this practice was not currently observed, and the fencing has fallen into disrepair. The fields produce a single hay crop and are currently planted in alfalfa. There is an old trail down to the Peace River that runs through the northwest part of this area. Heavy four-wheel drive use is evident on this this trail and efforts at fencing it off were in various stages of disrepair with trail routes around the gates through the bush observed. The old trail goes down to a historic ferry landing site, where the paddle wheel ferries transporting goods up and down the Peace River would stop, with some sternwheelers travelling all the way from Fort Vermillion including the steamer "Peace River" and the "D.A. Thomas".

Noxious Weeds

The leaseholder has been managing noxious weeds in the cultivated portions of the parcel presumably by spraying. There were very few spot occurrences of weeds, mostly at the parcel entrance where the access

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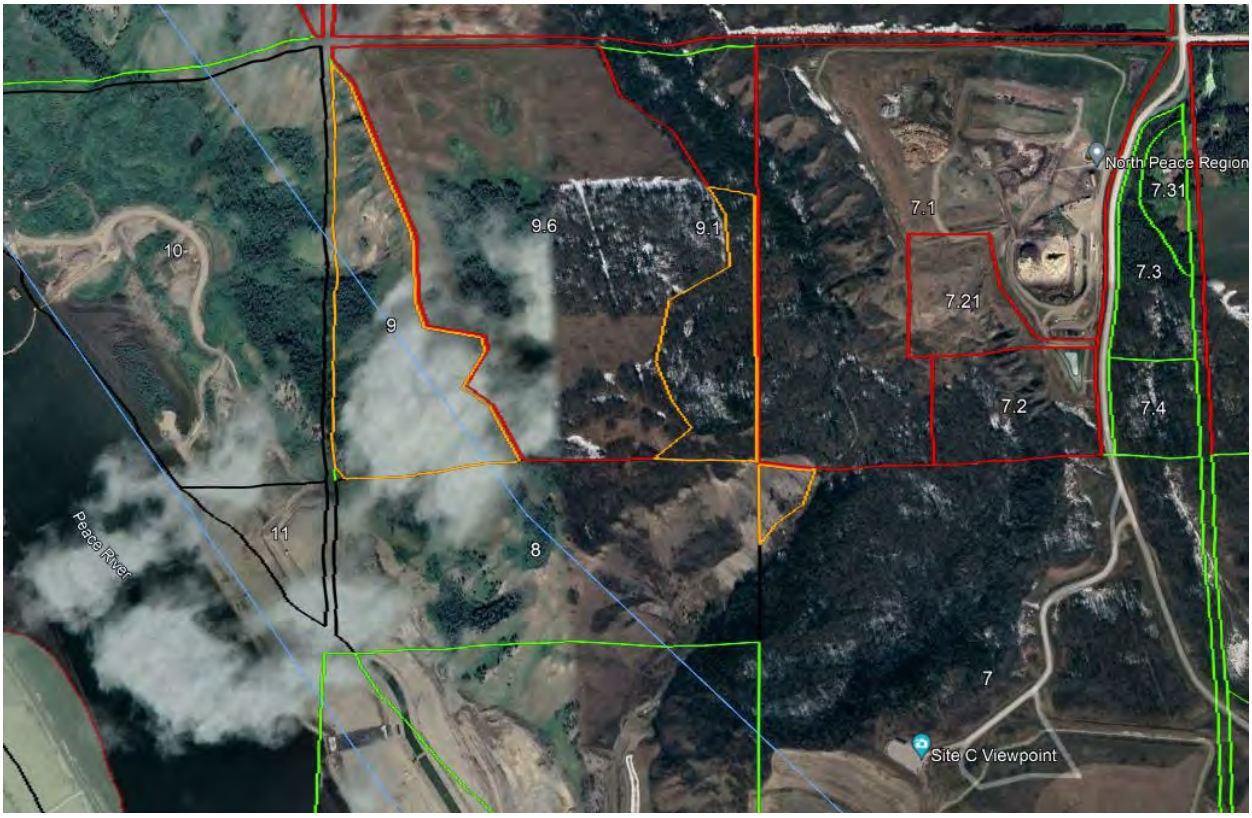
issue was noted. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.2.8 Contiguous Group 8, Parcel #s 9, 9.1 & 7

This area is bounded on the east by Garbage Creek and on the west by the steep slopes above the debris boom upstream of Site C. This area is documented in the soil survey as containing a relatively large number of soil map units (Attachie, Rockland, Judah, Kathleen, Nampa, Falher, and Nampa). The field investigation identified dark gray Luvisolic Judah and orthic gray Luvisolic Kathleen map unit soils along the east edge of Parcel 9.1 and Attachie map unit soils (eluviated brown chernozems) at the south end of that parcel. Parcel 7 is all Rockland map unit with a very steep (80%) slope to the southeast. Parcel 9 contained the Attachie soil map unit (eluviated brown chernozem) as the UWR portion only overlaps the steep slopes and the lower forest slide areas below the slopes that have poor horizon development. None of the areas assessed were being used for hay or crop production due to steep topography and erodible slopes. The upper part of the area excluded from this UWR contiguous group (parcel 9.6) is used for hay crops and grazing. This area had several fences, some in a state of disrepair that allowed cattle to graze the accessible part of these slopes. Most of the area is very steep topography and is somewhat suitable for grazing as it is producing a good amount of grass and shrubs. Moose, elk, deer, black bears and coyotes were noted in fair numbers within this area via tracks, scat, browse and beds.



Climate Capability for Agriculture

This narrow plateau of land bounded by Garbage Creek and the Peace River valley are mapped as Climate Capability for Agriculture Class 2G, with the "G" limitation denoting an insufficient accumulation of heat units above 5°C during the growing season and the GDD in which the temperature is above 5°C is on average 1359 (Station 7 Site C) with a FFP of 125 days[4,5].

Land Capability for Agriculture

The Judah and Kathleen soil map units along the forested east side of Parcel 9.1 have good capability for agriculture, Class 6:3T~4:2C and are capable of supporting a wide range of crops. While this area is undeveloped and will likely remain so due to a steep and erodible topography within the Garbage Creek valley, it is rated as 60% Class 3 with topographic limitations, and 40% Class 2 with climate limitations. The soil, moisture, and nutrient levels were good, but the topographic constrictions and erodible nature of the soils would prevent developing agricultural improvements in this area. It could be used for grazing, but an existing north to south running fence is in place to keep cattle out of this area as they would have access to the Peace River Regional District Fort St. John landfill to the east of the creek valley.

The portion of Parcel 7 overlapped by the UWR area has no agricultural potential and is just a shale slope with an 80% slope above the creek. Soils were Rockland soils with shallow bedrock. The Agricultural Land Capability for the area is 6:6T~4:7TR, but within this slope, the land capability is Class 7TR with severe topographic restrictions and exposed shallow bedrock. With very little vegetated cover, it is not suitable for grazing and this activity would result in severe landslide potential through this area.

The Attachie soils on the south end of Parcel 9.1 and all along the steep grassy slopes of Parcel 9 have low agricultural capability (Class 6:6T~4:7TR) due to topographic restrictions of the steep slopes and instability and shallow soil over bedrock that would only be suitable for non-intensive grazing. The field investigation identified that grazing areas are fenced off from these parcels, but the fence is in a very bad state of disrepair allowing grazing to occur on these grassy slopes.

Crop Suitability

None of the parcels investigated were suitable for growing crops either due to poor land capability or topographic and erosion restrictions making it not possible to develop the land for agricultural uses. The steep slopes in parcel 7 restrict any agricultural activity. The grassy slopes of Parcel 9 would allow for some non-intensive grazing, but no crop production. Within Parcel 9.1 the Class 2G climate and Class 2-3 Land Capability should allow for a wider range of crops, but without significant improvement practices crop production is not feasible or recommended.

Summary of past use

Parcel 9.1 has a fence running through it that separates the small western part of the area. No other development was noted down towards the creek. Parcel 7 has had no development and is too steep for any development to occur. Parcel 9 is on the edge of the adjacent landowner's hay fields and some grazing has occurred here historically. Directly below this area is the debris boom road access.

Noxious Weeds

The Peace River Regional District Fort St. John Landfill is located east of this area and a large number of weed species were noted throughout the creek valley and up into these parcels as a result. Scattered infestations of creeping thistle, bluebur (western), perennial sow thistle, scentless chamomile, and yellow hawkweed were noted throughout the area. The western edge of the parcels was better with no infestations noted. A noxious weed inventory was not conducted beyond these observations and the leaseholder will need to manage this through their weed management program.

2.3 Infrastructure on site

2.3.1 Contiguous Group 1, Parcel #s 192.2, 192 & 159

Access

These Parcels are 37 kms west of Fort St. John and are located on the top of the Halfway River valley where it flows into the Peace River. The area is accessed via a farm trail that turns off the new portion of Highway 29 immediately before the new Halfway River bridge. The first part of the access is an all-weather gravel road travelling north from Highway 29, then intersects to head down into the lower part of the Halfway valley. At this intersection, a low-grade dirt farm trail cut by a bulldozer runs up the valley slope at 10-20% grades. This trail is accessible by light pickup or off-road vehicles under dry conditions, but the silty clay soils get very slippery with any precipitation. The low-grade farm trail ascends to the top of the valley and runs alongside the existing agricultural fields and the Parcels can be accessed off this trail.

Water

There were no livestock watering areas on the Parcels, but there is a small non-classified wetland in the southwest corner of Parcel 159. This wetland is fed by a shallow drainage swale through the field that conveys surface water to the wetland during periods of high precipitation and spring snow melt. A second drainage swale through the field runs across the midpoint of Parcel 192 carving a steep erosion gully down towards the Halfway River. There are no known dug or drilled wells on the parcels investigated[9].

Fencing

There is no current fencing within any of the parcels investigated. Old fencing may be present in some areas on the parcels but nothing that would restrict livestock movement.

2.3.2 Contiguous Group 2, Parcel #s 160, 153, 150.2 & 151

Access

These parcels are located 34 kms west of Fort St. John along the base of the Peace River valley north of Highway 29 at the new Halfway Bridge location. Access to the west end (Parcels 160 and 153) is via the farm trail that turns off the new portion of Highway 29 immediately before the new Halfway River bridge. The first part of the access is an all-weather gravel road travelling north from Highway 29, then intersects to head down into the lower part of the Halfway valley. At this intersection a low-grade dirt farm trail cut by a bulldozer runs up the valley slope at 10-20% grades. This trail intersects Parcel 160 and, via the edge of the pea field, Parcel 153. Parcels 150.2 and 151 are accessed off Highway 29 at the base of the steep hill coming down from the Peace View Lookout. The only access is the edge of the farmed field, so while crop is on this field, access is via foot traffic, but once crop is off, off-road vehicles could be used to access these parcels.

Water

There are three drainage swales that run through the thick forested portions of the valley and out across the agricultural fields south to the Halfway River and the Peace River. These drainages only convey water from heavy precipitation and snow melt and have no distinct channels. No water sources for livestock were observed within the parcels and there are no known dug or drilled wells on the parcels[9].

Fencing

There is an old fence line that has fallen in a state of disrepair that runs through the southern portion of Parcel 153, turning north and heading up the slopes of the Peace Valley. This fence would not be able to contain livestock without a complete rebuild. The eastern edge of Parcel 150.2 has a suitable four strand barb wire fence that runs to the north up the Peace Valley and bounds the south edge of the fields.

[9] iMapBC. 2022. Groundwater wells – all layer. Accessed online Sept 2, 2022 at: iMapBC (gov.bc.ca)

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2.3.3 Contiguous Group 3, Parcel # 144

Access

This Parcel is located 32 kms west of Fort St. John straight south of the Peace Viewpoint on Highway 29. The parcel is accessed via a low-grade farm trail off Highway 29 across from the turnoff to the new Halfway Bridge. This low-grade farm trail goes ~800 m to the east along the fence line, then access is along the field edge. When crop is on the field this allows for foot traffic only, but once the crop is off light vehicles could access Parcel 144.

Water

There are no water sources for livestock within this part of Parcel 144. There is a seasonal drainage that begins just below the viewpoint and runs down the Peace Valley slopes across the east end of the parcel. This drainage only conveys water from heavy precipitation and snow melt and has no distinct channel. There are no known dug or drilled wells on the parcels, with the nearest well being located ~ 1 km to the northwest at a private residence farm site at the top of the Peace River Valley[9].

Fencing

The Parcel 144 fields are fenced in the north, west and east perimeter with four-strand barb wire on split fence posts. The fencing is in good repair with many areas left open as the field currently contains a wheat crop that was just starting to be combined. If cattle are placed in this area following harvest to graze the remnants they have access to the properties to the south, although there is a very steep slope down to the lowest bench above the Peace River.

2.3.4 Contiguous Group 4, Parcel # 134

Access

This parcel is located 27 kms west of Fort St. John on a steeply sloped bench above the Peace River. The parcel is accessed off Highway 29 which bisects the northern third of the parcel. Vehicle access is only available through the agricultural field to the east which has a locked metal gate in place and four-strand barb wire surrounding it. This field was in crop at the time of assessment and so would only be accessible by light vehicles or off-road vehicles once the crop is off.

Water

There are no water sources for livestock within the parcel. There is a seasonal drainage that begins in the thick forested slope in the centre of the parcel and runs south along the west end of the parcel spilling over the steep slope onto the flat bench adjacent the river, before flowing into the Peace River. This drainage only conveys water from heavy precipitation and snow melt and has no distinct channel, although it has eroded the steep slope between this upper bench and the lower bench. There are no known dug or drilled wells on the parcel[9].

Fencing

The parcel fields are fenced and cross-fenced with four-strand barb wire on split fence posts. Much of the fencing is in disrepair and requires replacement. The main access gate along the northern edge of the field west of the parcel is metal and field gates are barbed slip wire.

2.3.5 Contiguous Group 5, Parcel # 82.1

Access

The Parcel is located 21 kms west of Fort St. John just off the edge of Highway 29 at Bear Flats on the south side of the Old Hope Road. The Old Hope Road exits east off Highway 29 and there is a barb wire gate ~70

m in on the Road. The Parcel can be accessed through a second gate along the north side just east of this road gate.

Water

Parcel 82.1 has one water source for livestock, a dugout located in the shrubby rough pasture south of the UWR area that is fed by water drainage from the hillside area. The overflow from this dugout has created some channelization and erosion below this on the steep slope leading down to the lower bench adjacent to the Peace River. There are no known dug or drilled wells on the parcel[9].

Fencing

The hay field is fenced with a four-strand barb wire fence and this fencing extends into the thick brush before the forested section on the easy side of the parcel. The fence was maintained and in good condition. The gates on the Old Hope Road and into the hay field are barb wire on slip posts that are secured at one end and tied off tightly at the other. Both gates were secured and closed when the site was accessed.

2.3.6 Contiguous Group 6, Parcel #s 62 & 60

Access

These parcels are located 16 kms west of Fort St. John along the slopes of the Peace River valley. The Parcel is accessed via the Old Hope Road which begins at Charlie Lake and is paved/gravel for a portion before entering the old road route to Hudson's Hope. This old road is low grade dirt and gravel and passes through several private land parcels. There is a large metal gate that is not locked at the end of the publicly maintained road and landowner permission is required to go past this point. A second locked metal gate is located after the first parcel and requires a code provided by the landowner. All landowner access permissions require 48 hours notification prior to entry. Old Hope Road winds its way down the Peace slopes up to a ford crossing of Wilder Creek. After this crossing, the access is a farm trail along the edge of the planted wheat crop. Beyond the wheat crop fields the old road is present as a very low-grade dirt trail that is accessible under dry conditions into Parcel 62 running beside the small wheat field. Parcel 60 has no access beyond foot traffic. There is an old trail that comes down from the private land to the north, but historical slides appear to have made this impassable.

Water

There are a total of four seasonal drainages that flow southwest from the higher slopes to the north, towards the Peace River. These drainages only convey water from heavy precipitation and snow melt and have no distinct channels. There are two water sources for livestock within the parcel:

- A dugout located in the bush pasture, upland area of Parcel 60 near the centre of the west boundary of the parcel. This dug out is fed by a drainage swale that runs off to the southwest towards the Peace River.
- An overgrown wetland located just above the steep drop down to the Peace River in the southern end of Parcel 62.

There are no known dug or drilled wells on these parcels[9].

Fencing

The fence is a four strand barb wire fence and extends from the height of land in the northeast corner of Parcel 62 to the southwest down to a gate across the Old Hope Road. This gate is tied up with slip posts and was closed upon inspection. The fence runs down towards the river, then around the wheat field at the west edge of Parcel 62. Portions of the fence have been upgraded to wildlife game fence (10 foot square wire) although this is incomplete, and the fencing was down in places.

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2.3.7 Contiguous Group 7, Parcel # 21.4

Access

This Parcel is 5 kms southwest of Fort St. John overlapping the top flats above the Peace valley and a deeply incised creek valley that leads down to the river. Access to the parcel is via the 273 Road, straight south of the Alaska Highway. There is a very low-grade farm trail that accesses the north field and then a dirt farm trail to access the south field. A dirt farm trail runs up the eastern boundary of the parcel and branches off towards the adjacent private land to the east. There is the old road down to the Ferry landing on the Peace River that can be used to access the southwest portion of the parcel, but an offroad vehicle may be required due to the rutted and steep nature of this road.

Water

The creek running along the west side of the parcel is an unnamed second order stream (Watershed Code 230-747400). There is no fish capture data on this steep stream (average 18% gradient) although it has direct connectivity to the Peace River so has the potential to contain sport species at various points in the year[10]. A second small drainage runs down through the middle of the parcel at slopes >35% and would be non-fish bearing and had no water flow at the time of the assessment. There are no water sources for livestock within the parcel. There are no known dug or drilled wells on the parcel with the nearest well being an unlicensed water supply well 750 m to the north[9].

Fencing

There is an open metal gate at the entrance to the steep road down to the river. This gate was connected with barb wire fencing to a second gate on the farm access, although the fencing was in a bad state of disrepair, presumably from people cutting it to access the river. An old barb wire fence runs along the eastern boundary of the parcel and may have at one point blocked off access to the larger fields to the east, although much of this was not maintained.

2.3.8 Contiguous Group 8, Parcel #s 9, 9.1 & 7

Access

These parcels are 5 kms southwest of Fort St. John across the valley from the Peace River Regional District Fort St. John landfill. There is no access directly to parcels 9.1 and 7. Parcel 9 could be accessed through the private land to the north via low-grade farm trails, although the landowner will not grant access. Foot access from the 269 Road across Garbage Creek or walking up the slope from the Debris Boom Road on the Site C property are the only points of access to these parcels.

Water

Garbage creek (local common name) runs along the east side parcels 9.1 and 7 and is second order stream (Watershed Code 230-744600). There is no fish capture data on this steep stream although it has direct connectivity to the Peace River so has the potential to contain sport species at various points in the year[10]. There is a second small steep drainage that runs to the southwest on the steep slopes of Parcel 9 towards the Peace River. There are no water sources for livestock within the portions of the parcels to be set aside for UWR. There are no known dug or drilled wells on these parcels[9].

Fencing

There is an old fence line of four-strand barb wire on split fence posts that runs north-south along the west side of Parcel 9.1, then running to the east boundary of Parcel 9 where it also runs north-south. This fence is in poor repair on the east to west portion and does not stop cattle from entering the areas to the south

[10] BC Government. 2022. Habitat Wizard. Accessed online on Sept 2, 2022 at: Habitat Wizard (gov.bc.ca)

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towards the Peace River, however the topography restricts cattle from getting too far. The fence line running up the east side of Parcel 9 is in good shape and follows a dirt farm trail with one gate in place.

2.4 Baseline Vegetation Resources on the Property

2.4.1 Ecosystems Present

The Site C Environmental Assessment[11] portion on vegetation and ecological communities involved the completion of Terrestrial Ecosystem Mapping(TEM) for most of the parcels. For each parcel that had TEM mapping completed the various ecosystem habitats have been referenced below in Table 2 and summarized to the amount of each ecosystem mapped within the Parcel. The only sensitive ecological community[11] identified were the grasslands, mapped as Fuzzy-spiked wildrye-Wolf Willow (WW). None-of the ecosystems on any of the parcels are classified as at risk[11].

Table 2 - Habitats mapped within the Parcels[11]

Parcel	Habitat	TEM Code[b]	Structural Stage[a]	Site Series	Area (ha)
192	At - Creamy peavine, warm aspect	AMw:ap	5	01	0.941
	At – Black Twinberry, cool aspect	SCk:ab	5	05	3.692
	Wolf willow-Fuzzy-spiked Wildrye	WW	3	00	1.144
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg	2	00	0.953
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg	3	00	6.042
160	At - Creamy peavine, warm aspect	AMw:ap	5	01	4.978
	At - Creamy peavine, warm aspect	AMw:ap	3	01	1.628
	At - Creamy peavine, moist	AMy:ap	5	01	1.487
	Sw-At-Soopolallie	AS	3	00	0.507
	Sw-At-Soopolallie, gullying occurring, or in a gully bottom	ASg	3	00	4.644
	Sw-At-Soopolallie, gentle to moderate slope	ASj	3	00	0.482
	Cutbank, gullying occurring, or in a gully bottom	CBg	1	00	3.350
	Cultivated Field	CF	2	00	0.958
	At - Soopolallie, shallow soils	SWs:as	3	03	0.798
	Wolf willow-Fuzzy-spiked Wildrye	WW	2	00	0.702
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg	2	00	16.011
153	At - Creamy peavine, shallow soils	AMs:ap	5	01	0.108
	Sw-At-Soopolallie, gullying occurring, or in a gully bottom	ASg	3	00	0.436
	Cutbank, gullying occurring, or in a gully bottom	CBg	1	00	0.762
	Cultivated Field	CF	2	00	0.426
	At - Soopolallie	SW:as	4	03	6.013
	At - Soopolallie, shallow soils	SWs:as	4	03	8.961
	At - Soopolallie, shallow soils	SWs:as	3	03	1.736
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg	2	00	3.338

[11] Hilton, S., L. Andrusiak, R. Krichbaum, L. Simpson, and C. Bjork. 2013. Part 1 Vegetation and Ecological Communities. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

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Parcel	Habitat	TEM Code[b]	Structural Stage[a]	Site Series	Area (ha)
151	At - Creamy peavine, fan or cone	AMn:ap	5	01	1.427
	Cultivated Field	CF:	2	00	1.237
	Cultivated Field, fan or cone	CFn:	2	00	0.625
	Gravel Bar	GB:	1	00	0.216
150.2	At - Creamy peavine, fan or cone	AMn:ap	5	01	2.700
	At - Creamy peavine, shallow soils	AMs:ap	5	01	2.366
	Cultivated Field	CF	2	00	1.703
	Cultivated Field, fan or cone	CFn	2	00	2.499
	Gravel Bar	GB	1	00	0.848
144	Sw-At-Soopolallie, gentle to moderate slope	ASj:	3	00	2.940
	Cutbank, gullying occurring, or in a gully bottom	CBg:	1	00	0.266
	Cultivated Field	CF:	2	00	1.239
134	At - Creamy peavine, gullying occurring, or in a gully bottom	AMg:ap	4	01	5.644
	Cutbank, gullying occurring, or in a gully bottom	CBg:	1	00	5.454
	Cultivated Field	CF:	2	00	2.468
	At - Soopolallie	SW:as	4	03	0.058
	At - Soopolallie, warm aspect slope	SWw:as	4	03	1.935
	Wolf willow-Fuzzy-spiked Wildrye	WW:	3	00	14.125
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	2.066
	Wolf willow-Fuzzy-spiked Wildrye, gentle to moderate slope	WWj:	2	00	4.057
	Wolf willow-Fuzzy-spiked Wildrye, cool aspect	WWk:	3	00	0.607
82.1	Sw-At-Soopolallie, gentle to moderate slope	ASj:	3	00	0.710
	Cultivated Field	CF:	2	00	0.527
	Wolf willow-Fuzzy-spiked Wildrye, gentle to moderate slope	WWj:	2	00	0.004
62	At - Creamy peavine	AM:ap	5	01	0.070
	SwAt - Step moss, gullying occurring, or in a gully bottom	AMg:	4	01	7.367
	At - Creamy peavine, gullying occurring, or in a gully bottom	AMg:ap	5	01	3.986
	Sw-At-Soopolallie	AS:	3	00	1.019
	Sw-At-Soopolallie, gullying occurring, or in a gully bottom	ASg:	3	00	0.774
	Sw-At-Soopolallie, gullying occurring, or in a gully bottom	ASg:	2	00	6.204
	Sw-At-Soopolallie, fan or cone	ASn:	3	00	8.926
	Cutbank, gullying occurring, or in a gully bottom	CBg:	1	00	4.318
	Cutbank, warm aspect slope	CBw:	1	00	2.754
	Cultivated Field	CF:	2	00	6.347
	Sw - Currant – Horsetail, warm aspect slope	SHw:	6	07	2.251
	At - Soopolallie, terrace	SWt:as	5	03	3.123
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	3.677
	Wolf willow-Fuzzy-spiked Wildrye, gentle to moderate slope	WWj:	2	00	0.309

Parcel	Habitat	TEM Code[b]	Structural Stage[a]	Site Series	Area (ha)
60	SwAt - Step moss, shallow soils	AMs:	5	01	1.510
	At - Creamy peavine	AM:ap	5	01	11.497
	At - Creamy peavine, gullying occurring, or in a gully bottom	AMg:ap	5	01	21.411
	SwAt - Step moss, gullying occurring, or in a gully bottom	AMg:	4	01	6.153
	At - Creamy peavine, hummocky terrain	AMh:ap	5	01	2.648
	Sw-At-Soopolallie, gullying occurring, or in a gully bottom	ASg:	2	00	2.022
	Cutbank, gullying occurring, or in a gully bottom	CBg:	1	00	8.422
	Cutbank, warm aspect slope	CBw:	1	00	2.149
	At - Soopolallie, gullying occurring, or in a gully bottom	SWg:as	4	03	0.011
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	5.677
	Wolf willow-Fuzzy-spiked Wildrye, gentle to moderate slope	WWj:	2	00	0.165
21.4	At - Creamy peavine	AM:ap	4	01	1.219
	At - Creamy peavine	AM:ap	5	01	3.057
	At - Creamy peavine, gullying occurring, or in a gully bottom	AMg:ap	4	01	3.544
	At - Creamy peavine, shallow soils	AMs:ap	4	01	0.175
	At - Creamy peavine, warm aspect	AMw:ap	4	01	12.204
	Sw-At-Soopolallie, cool aspect	ASk:	3	00	0.269
	Cultivated Field	CF:	2	00	10.491
	At - Soopolallie, warm aspect slope	SWw:as	5	03	0.053
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	0.869
	Wolf willow-Fuzzy-spiked Wildrye, shallow soils	WWs:	3	00	0.320
9.1	At - Creamy peavine	AM:ap	5	01	1.129
	Cultivated Field	CF:	2	00	0.084
	At - Soopolallie, gullying occurring, or in a gully bottom	SWg:as	5	03	5.059
9	Sw-At-Soopolallie	AS:	3	00	0.551
	Sw-At-Soopolallie, gentle to moderate slope	Asj:	3	00	0.358
	Cultivated Field	CF:	2	00	0.213
	At - Soopolallie, warm aspect slope	SWw:as	5	03	3.490
	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	9.375
7	Wolf willow-Fuzzy-spiked Wildrye, gullying occurring, or in a gully bottom	WWg:	2	00	0.828

Notes:

[a] - Structural Stage Descriptions

1 Sparse/bryoid: < 20 years since major disturbance unless disclimax ecosystem
1a Sparse: less than 10% vegetation cover
1b Bryoid: bryophyte & lichen-dominated communities—> 50% of total vegetation cover
2 Herb: less than 20-years-old unless disclimax
2a Forb-dominated: dominated by non-graminoid herbs
2b Graminoid-dominated: dominated by grasses, sedges, reeds, and rushes
2d Dwarf Shrub: dominated by dwarf woody species
3 Shrub: shrubs less than 10 metres tall, less than 20-years-old for forested sites

[b] - Map Modifier Codes

g the ecosystem occurs on gullied terrain or in a gully
h the ecosystem occurs on hummocky terrain
j the ecosystem occurs on gentle slopes (<25%)
k the ecosystem occurs on a cool aspect (aspect of 285-135° on a slope that is 25-100%)
n the ecosystem occurs on a fan or cone
s the ecosystem occurs on shallow soils
t the ecosystem occurs on a terrace
w the ecosystem occurs on a warm aspect (aspect of135 - 285 ° on a slope that is 25-100%)

3a Low Shrub: shrubs less than two metres tall
3b Tall Shrub: shrubs two to 10 metres tall
4 Pole /Sapling: trees greater than 10 metres tall, usually less than 40-years-old
5 Young Forest: trees greater than 10 metres tall, 40- to 80-years-old
6 Mature Forest: trees greater than 10 metres tall, 80- to 140-years-old
7 Old Forest: trees greater than 10 metres tall, greater than 140-years-old

y the ecosystem is moister than average

2.4.2 Vegetation

Table 3 – Forested Vegetation identified within each parcel area

Parcel #s	Predominant Vegetation	
	Dominant Overstory	**Shrub Layer, Ground Cover**
192.2, 192, 159	Trembling Aspen, Spruce	Alder, Prickly rose, wolf willow, highbush cranberry, fireweed, aster, bunchberry, bluejoint, grass spp., lichens, bedstraw, peavine, cranberry, raspberry, lambs' quarters, timothy, mosses (step moss, Knight's plume), yarrow, golden rod, cattail, alfalfa.
160, 153, 150.2 & 151	Trembling Aspen	Saskatoon, chokecherry, showy aster, yarrow, bluejoint grass, wheat, bedstraw, timothy, oats, meadow rue, wild strawberry, alfalfa, prickly rose, canola, hawksbeard, shepherds' purse, stinkweed, raspberry, goldenrod, wormwood, porcupine grass.
144	Trembling aspen	Saskatoon, chokecherry, prickly rose, snowberry, showy aster, yarrow, timothy, bluejoint grass, wheat, northern bedstraw.
134	Trembling Aspen, Alder	Prickly rose, saskatoon, porcupine grass, wormwood, bunchberry, peavine, golden rod, paintbrush, northern bedstraw, soopolallie, meadow goats' beard, lamb's quarters, yarrow, bluejoint grass, wolf willow.
82.1	Trembling Aspen	Alfalfa, bluejoint grass, showy aster, wolf willow, wormwood, porcupine grass.
62 & 60	Trembling Aspen	Snowberry, saskatoon, fringed sagebrush, yarrow, white heath aster, bastard toadflax, dogwood, prickly rose, Canada violet, timothy, smooth brome, American vetch, lily-of-the-valley, wild buckwheat, shepherd's purse, orchid grass, Canada thistle, sticky goldenrod, brittle prickly pear, smooth blue aster.
21.4	Trembling Aspen, Spruce, Salix sp.	Prickly rose, alfalfa, bluejoint grass, sticky golden rod
9, 9.1 & 7	Aspen, Spruce, Alder, Birch	Wolf willow, saskatoon, showy aster, northern bedstraw, bunchberry, porcupine grass, orchid grass, bluejoint grass, soopolallie, shepherdia, wormwood, meadow rue.

2.4.3 Rare Plants

Inventories for rare plants were not conducted as part of the scope of work covered by these surveys. Habitats within the various parcels have the potential to support several rare plants documented during baseline surveys[11]. Table 4 contains the rare plants from the baseline surveys that occupy the habitat types encountered as well as the observations within 1 km of each parcel. A rare plants survey would need to be conducted in non-cultivated portions of the parcels if any construction were to take place to determine which if any rare plants are present within each parcel. Since these lands are to be set aside as UWR, it is unlikely any construction will take place and rare plants should not be impacted by the change in designation of these parcels.

Table 4 - Rare plants that could occur on the parcels

Species	Status	Observed Within 1km of Parcels	Expected habitat
Riverbank anemone (*Anemone virginiana* var. *cylindroidea*)	Blue	No	Upland areas in understory of open aspen forest or in mixed woodlands of aspen, balsam poplar and white
Herriot's sage (*Artemisia herriotii*)	Red	No	River shores, cut banks, slopes; areas of loosely-consolidated soils; moist to dry.
Gardner's saltbrush (*Atriplex gardneri* var. *gardneri*)	Red	No	Dry grassy slopes; saline clay slopes
Plains reedgrass (*Calamagrostis montanensis*)	Blue	No	Dry grassland slopes, shrub flats, and in open forests
Tawny paintbrush (*Castilleja miniata* var. *fulva*)	Yellow	No	Mesic open forests; bluffs
Tender sedge (*Carex tenera*)	Blue	No	Mesic to dry meadows, shorelines, and open forests
Torrey's sedge (*Carex torreyi*)	Blue	Yes	Grassland; mesic to moist meadows and shrubland; moist woods
Sprengel's Sedge *Carex sprengelii*	Red	Yes	Moist to wet gravelly or sandy slopes and alluvial woodlands and open sites
Dry-land sedge (*Carex xerantica*)	Blue	Yes	Dry grasslands and hillsides, open forests, and rock outcrops
Drummond's thistle *(Cirsium drummondii*)	Red	No	Dry to moist soils of pastures, meadows, forest openings, prairies, and roadsides
Peace daisy (*Erigeron pacalis*)	No Status	No	Grassland opening near low shrubs and mixed woodland.
Old-man's whiskers (*Geum triflorum* var. *triflorum*)	Yellow	No	Dry to mesic grasslands, meadows, rocky slopes and open forests
Spike-oat (*Avenula hookeri*)	Yellow	No	Mesic to dry open slopes, meadows, and forest clearings
Colorado rush (*Juncus confusus*)	Red	No	Moist steppe and montane habitats such as open grasslands, meadows, stream banks, and woods
Fennel-leaved desert-parsley (*Lomatium foeniculaceum* var.*foeniculaceum*)	Red	Yes	Dry slopes, prairies, and grasslands
Davis' oxytrope (*Oxytropis campestris* var. *davisii*)	Blue	Yes	River shores, mesic to dry meadows, gravel bars, forest openings
Slender penstemon (*Penstemon gracilis*)	Red	Yes	Mesic to dry plains and grasslands
Canada Ricegrass (*Piptatheropsis canadensis*)	Red	Yes	Dry slopes, grasslands, open forests.
Prairie Buttercup (*Ranunculus rhomboideus*)	Blue	Yes	Dry grasslands, thickets and open forests
persistent-sepal yellow-cress (*Rorippa calycina*)	No Status	No	River shorelines
Arkansas rose (*Rosa arkansana*)	Blue	No	Prairies and grasslands, thickets, and woodlands
Little bluestem (*Schizachyrium scoparium*)	Red	No	Mesic to dry grasslands, shrublands, open woods, rocky slopes, and canyons
Rock selaginella (*Selaginella rupestris*)	Red	No	Rock outcrops and grassy ridges

Species	Status	Observed Within 1km of Parcels	Expected habitat
Drummond's campion (*Silene drummondii* var. *drummondii*)	Blue	No	Dry shrubland, meadows, and woodland openings
slender wedgegrass (*Sphenopholis intermedia*)	Blue	No	Moist habitats such as shorelines, streambanks, meadows, ponds, etc.
purple-stemmed aster (*Symphyotrichum puniceum* var.	Blue	No	Various wetlands; shoreline

3.0 CLOSURE

Eco-Web Ecological Consulting has prepared this report for the exclusive use of BC Hydro using generally accepted environmental assessment practices. Information was obtained while conducting an authorized investigation on the proposed UWR Parcels along the Peace River.

If there are any questions or comments with the contents of this report, please contact the undersigned at 250-787-1110.

Sincerely,

ECO-WEB ECOLOGICAL CONSULTING

Prepared by: Reviewed by

Dan Webster, B.Sc., P.Ag., R.P.Bio.
Professional Agrologist

Eco-Web Ecological Consulting Ltd

Jason Brogan, M.Sc., R.P.Bio.
Professional Biologist

Ausenco Sustainability Inc.

Disclaimer

This report has been prepared by Eco-Web Ecological Consulting Ltd. for BC Hydro. Information was obtained while conducting an authorized investigation for the proposed UWR Compensation Properties – Reconnaissance Level Soil, Vegetation, Wildlife Survey. The material contained in this report reflects Eco-Web's best judgment in light of the information available at the time of preparation. The information collected for the purposes of this report was interpreted solely for the purposes stated and reflects the available data at the time of creation. Any information provided by a third party was assumed to be accurate.

Although the information was obtained at specific locations, the reported information contained herein is believed to provide a reasonable representation of the general environmental conditions at the site. The findings outlined herein, however, do not preclude the existence of additional habitat features in areas of the site not specifically investigated or presence of wildlife or vegetation at different times of the year.

Eco-Web does not accept any responsibility if the report is used for any purpose other than that outlined and is also not responsible if a third party chooses to use whole or part of the information for alternative uses. Please contact Eco-Web for any replication, copying, recording or duplication by any other means prior to use.

This report has been prepared for BC Hydro's proposal to create new Ungulate Winter Ranges as compensation for the footprint of the Site C Clean Energy Project and is solely based on the information either publicly available, provided to Eco-Web or gathered during the field investigation. BC Hydro can use the information contained within this report for the purpose of determining whether the parcels meet all applicable requirements to be designated as UWRs. Any use, reliance on, or decision made by any person other than Eco-Web's client, based on this report is the sole responsibility of that person. This report has been prepared based upon current regulations and regulatory guidance, directives and policies. If the applicable standards change, or if site conditions change and/or additional information become available, report modifications may be required.

It is also assumed that due diligence with respect to compliance with all pertinent operational guidelines relative to protection of the soils, vegetation, aquatic and wildlife resources by the Ministry of Forests, Lands, Natural Resource Development and Rural Development, Environment Canada and the Canadian Wildlife Service will be exercised and complied with.

Please consider the environment before printing

APPENDIX I – SOILS DATA AND PHOTOPLATES

Continuous Group 1 - Soil Types

Parcels	192.2	**Assessment Date:**	August 12 - 15, 18, 2022
	192	**Soil Technician:**	Dan Webster
	159	**Assistant:**	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Bm	SiL	Br	<2	Gran	0	friable	well	none
	Ae	SL	LGr	<2	Gran	0	friable	well	none
	Bt	SiCL	LBrGr	5-10	SAB	0	friable	well	none
	C	SiC	DBr	2-5	Platy	0	firm	well	none
Soil Series	***Lynx - Brunisolic Gray Luvisol***								
II	Ap	SiL	DBr	<2	loose	30-40	friable	well	none
	Bt	SiL	DBr	<2	Gran	0	friable	well	none
	BC	SiCL	LBr	5-10	SAB	0	friable	well	none
	C	SiL	LGrBr	2-5	Platy	0	friable	well	none
Soil Series	***Lynx - Brunisolic Grey Luvisol***								
Soil Series									
Soil Series									
Soil Series									
Soil Series									

Continuous Group 1 - Soil Data Chart

Parcels:	192.2
	192
	159

Assessment Date:	August 12 - 15, 18, 2022
Soil Technician:	Dan Webster
Assistant:	Brooklyn Phillips
Page Number:	5

= Topsoil stripping layer (first lift) **= Subsoil stripping layer (second lift)**

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
192.2-1	LFH	7-0		**Location:** 10U 0593878 6233758 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 3 % N
	Bm	0-5	SiL	
	Ae	5-15	SL	
	Bt	15-53	SiCL	
	C	53+	SiC	
	Soil Type	I-Lynx		
192.2-2	LFH	7-0		**Location:** 10U 0592961 6233628 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 3 % N
	Bm	0-6	SiL	
	Ae	6-12	SL	
	Bt	12-47	SiCL	
	C	47+	SiC	
	Soil Type	I-Lynx		
159-1	Ap	0-18	SiL	**Location:** 10U 059384276 6232962 **Position**: Mid-slope **Surface Expression:** Undulating **Slope:** 3 % S
	Bt	18-44	SiL	
	C	44+	SiL	
	Soil Type	II-Lynx		
	Soil Type			
	Soil Type			
	Soil Type			

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
192-1	LFH	4-0		**Location:** 10U 0593970 6233525 **Position**: Mid-slope **Surface Expression**: Undulating **Slope:** 3 % NW
	Bm	0-8	SiL	
	Ae	8-16	SL	
	Bt	16-37	SiCL	
	C	37+	SiC	
	Soil Type	I-Lynx		
192-2	Ap	0-22	SiL	**Location:** 10U 0594147 6233179 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 5 % SW
	Bt	22-54	SiL	
	BC	54-69	SiCL	
	C	69+	SiL	
	Soil Type	II-Lynx		
	Soil Type			
	Soil Type			
	Soil Type			

Continuous Group 1 - Photos

Parcels:	192	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 1: 192.1-1

Photo 2: 192-1

Photo 3: 192.2-1

Photo 4: Looking North at representative Aspen stand within parcel 192.2

Photo 5: Representative valley at parcel 192.2

Photo 6: Agricultural crop at parcel 192.2

Continuous Group 1 - Photos

Parcels:	192.2, 159	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 7: Valley at edge of agricultural field in parcel 192.2

Photo 8: Wetland at 159-1

Photo 9: Representative slopes found within parcel 192 and 159

Photo 10: Slope

Continuous Group 2 - Soil Types

Parcels:	160	**Assessment Date:**	August 12 - 15, 18, 2022
	153	**Soil Technician:**	Dan Webster
	150.2	**Assistant:**	Brooklyn Phillips
	151	**Page Number:**	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ap	L-SiCL	DBr	<2	Gran	20-30	friable	well	none
	Bm	SiCL	DGrBr	<2	SAB	0	friable	well	none
	BC	SiCL	LBr	2-5	SAB	0	friable	well	none
	Cca	CL	DGrBr	2-5	Platy	0	firm	well	none
	Ck	C	DBr	2-5	B	0	firm	well	none
Soil Series		***Taylor - Orthic Black***							
II	Ahe	SiL	DBr	<2	platy	0	friable	well	none
	Ae	SiL	LBrGr	<2	SAB	0	friable	well	none
	Bm	SiL	Br	<2	SAB	0	friable	well	none
	BC	SiCL	DBr	2-5	Gran	0	friable	well	none
	C	SiCL	DBr	2-5	Platy	0	firm	well	none
Soil Series		***Branham - Orthic Eutric Brunisol***							
III	Ahe	SiL	DBr	<2	Gran	0	friable	well	none
	Bm	SiCL	Br	2-5	SAB	0	friable	well	none
	BC	SiCL	LBrGr	2-5	SAB	0	friable	well	none
	C	CL	DBr	2-5	Platy	0	firm	well	none
Soil Series		***Branham - Orthic Eutric Brunisol***							
IV	Ah	SiL	DBr	<2	Gran	0	friable	well	none
	C	SL	LBr	<2	Gran	0	friable	rapid	none
	Ahb	SiL	LGr	2-5	Gran	10	friable	well	none
	Cg	SiCL	LGrBr	2-5	SAB	0	friable	well	none
	C	SiL	LGr	2-5	B	0	friable	well	none
Soil Series		***Attachie - Gleyed Cumulic Regosol***							
V	Ahe	SiL	DBr	<2	Gran	0	friable	well	none
	Ae	SiCL	LGr	<2	Gran	0	friable	well	none
	AB	SCL	LGrBr	2-5	Gran	0	friable	well	none
	Bt	SCL	LGr	2-5	SAB	0	friable	well	none
	C	SiCL	LBr	2-5	Platy	0	friable	well	none
Soil Series		***Attachie - Eluviated Brown Chernozem***							
VI	Ap	SiL	DBr	<2	loose	30-40	friable	well	none
	Bt	SiL	DBr	<2	Gran	0	friable	well	none
	BC	SiCL	LBr	5-10	SAB	0	friable	well	none
	C	SiL	LGrBr	2-5	Platy	0	friable	well	none
Soil Series		***Lynx - Brunisolic Grey Luvisol***							

Continuous Group 2 - Soil Data Chart

Parcels:	160	**Assessment Date:**	August 12 - 15, 18, 2022
	153	**Soil Technician:**	Dan Webster
	150.2	**Assistant:**	Brooklyn Phillips
	151	**Page Number:**	4

= Topsoil stripping layer (first lift)

= Subsoil stripping layer (second lift)

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
160-1	LFH	5-0		**Location:** 10U 0595747 6232491 **Position:** Mid slope **Surface Expression:** Steep **Slope:** 65% SW
	Ahe	0-10	SiL	
	Ae	10-16	SiCL	
	AB	16-38	SiCL	
	Bt	38-56	SCL	
	C	56-60+	SiCL	
	Soil Type	V-Attachie		
153-1	LFH	3-0		**Location:** 10U 0596435 6232730 **Position:** Upper slope **Surface Expression:** Undulating **Slope:** 50% SW
	Ah	0-5	SiL	
	C	5-18	SL	
	Ahb	18-33	SiL	
	Cg	33-60	SiCL	
	C	60+	SiL	
	Soil Type	IV-Attachie		
153-3	LFH	10-0		**Location:** 10U 0595972 6232476 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 5%
	Ahe	0-5	SiL	
	Bm	5-16	SiCL	
	BC	16-55	SiCL	
	C	55+	C	
	Soil Type	III-Branham		
150.2-1	LFH	10-0		**Location:** 10U 0597341 6233256 **Position:** Mid-slope **Surface Expression:** Undulating **Slope**: 2-3 % S
	Ap/Ah	0-12	SiCL	
	Bm	12-31	SiCL	
	Bc	31-70	SiC	
	Cca	70+	CL	
	Soil Type	I-Taylor		
150.2-3	Ap	0-24	SiCL	**Location:** 10U 05696842 6233111 **Position:** Upper mid-slope **Surface Expression:** Undulating **Slope:** 4 % SW
	Bm	24042	SiCL	
	Bc	42-53	SiC	
	Cca	53-63+	CL	
	Soil Type	I-Taylor		
151-1	LFH	3-0		**Location**: 10U 0596964 6232928 **Position:** Mid-slope **Surface Expression:** Undulating **Slope**: 4% S
	Ahe	0-5	SiL	
	Ae	5-18	SiL	
	Bm	18-31	SiL	
	Bc	31-74	SiCL	
	C	74-84+	SiCL	
	Soil Type	II-Branham		

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
160-2	Ap	0-18	SiL	**Location:** 10U 0595538 6232828 **Position:** Top **Surface Expression:** Gently sloped **Slope:** 5%
	Bt	18-41	SiL	
	BC	41-51	SiCL	
	C	51+	SiL	
	Soil Type	VI-Lynx		
153-2	LFH	7-0		**Location:** 10U 0595995 6232540 **Position:** Upper slope **Surface Expression:** Undulating **Slope:** 50%
	Ahe	0-10	SiL	
	Ae	10-18	SiCl	
	Ab	18-36	SCL	
	Bt	36-50	SCL	
	C	50-65+	SiCL	
	Soil Type	V-Attachie		
	Soil Type			
150.2-2	Ap	0-27	SiCL	**Location:** 10U 0597020 6233277 **Position:** Upper mid-slope **Surface Expression:** Undulating **Slope**: 12-15%
	Bm	27-40	SiCL	
	Bc	40-78	SiC	
	C	78+	CL	
	Soil Type	I-Taylor		
	Soil Type			
151-2	Ap	0-24	SiCL	**Location:** 10U 0596873 6232914 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 6% SW
	Bm	24-46	SiC	
	Bc	46-61	SiC	
	Cca	61-90	C	
	Ck	90+	C	
	Soil Type	I-Taylor		

Continuous Group 2 - Photos

Parcels:	160	**Assessment Date:**	August 12 - 15, 18, 2022
	153	**Soil Technician:**	Dan Webster
	150.2	**Assistant:**	Brooklyn Phillips
	151		

Photo 1: 153-1

Photo 2: 153-2

Photo 3: 153-3

Photo 1: 151-1

Photo 1: 150.2-1

Photo 2: 150.2-2

Continuous Group 2 - Photos

Parcels:	160	**Assessment Date:**	August 12 - 15, 18, 2022
	153	**Soil Technician:**	Dan Webster
	150.2	**Assistant:**	Brooklyn Phillips
	151		

Photo 7: Facing East at Empty Eagle Tower

Photo 8: Facing west Representative vegetation within parcel from mid slope

Photo 9: Facing West at agricultural field and Peace River valley

Photo 10: Facing north at valley slopes and agricultural field

Photo 11: Facing south at canola field at 150.2-2

Photo 12: Looking North at representative mixed forest vegetation, shrubs and grasses at 151.2-1

Continuous Group 2 - Photos

Parcels:	160	**Assessment Date:**	August 12 - 15, 18, 2022
	153	**Soil Technician:**	Dan Webster
	150.2	**Assistant:**	Brooklyn Phillips
	151		

Photo 13: Looking North at canola field and forested slope, soil point 151.2-2

Photo 14: Looking South from upper-mid slope at agricultural field and BC Hydro Bridge

Continuous Group 3 - Soil Types

Parcels:	144	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ap	SiCL	LGrBr	<2	SAB	20	friable	mod well	none
	Bm	SiCL	DBr	2-5	SAB	0	friable	mod well	none
	BC	SiCL	LGrBr	5-10	SAB	0	friable	mod well	none
	C	CL	Br	<2	Gran	0	friable	mod well	none
Soil Series	***Taylor - Orthic Black***								
II	Ah	L	DBr	<2	Gran	0-10	loose	well	none
	Ae	SL	LBr	<2	Gran	0	friable	rapid	none
	Bt	SiCL	LGrBr	2-5	SAB	0	friable	well	sudden texture change
	BC	SCL	LBr	2-5	platy	0	friable	well	none
	Cca	S	Ybr	<2	B	0	friable	well	stony
	Ck	CL	DBr	5-10	SAB	0	firm	well	none
Soil Series	***Attachie - Eluviated Brown Chernozem***								
Soil Series									
Soil Series									
Soil Series									
Soil Series									

Continuous Group 3 - Soil Data Chart

Parcels:	144	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	1

= Topsoil stripping layer (first lift)

= Subsoil stripping layer (second lift)

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
144-1	LFH	4-0		**Location:** 10U 0598522 6233030 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 2% at 180
	Ap	0-12	SiC	
	Bm	12-29	SiC	
	Bc	29-54	SiC	
	C	54+	C	
	Soil Type	I-Taylor		
144-2	LFH	2-0	L	**Location:** 10U 0598606 6233141 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 4% SW
	Ah	0-14	SL	
	Ae	14-25	SiC	
	Bt	25-45	SSiC	
	Bc	45-58	S	
	C	58+		
	Soil Type	II-Attachie		
144-3	LFH	2-0		**Location**: 10U 0598980 6233400 **Position**: Mid-slope **Surface Expression:** Undulating **Slope**: 6% SW
	Ah	0-12	L	
	Ae	12-22	SL	
	Bt	22-49	SiCL	
	Bc	49-58	SCL	
	Cca	58-87	S	
	Ck	87+	CL	
	Soil Type	II-Attachie		
	Soil Type			
	Soil Type			
	Soil Type			
	Soil Type			

Continuous Group 3 - Photos

Parcels:	144	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 1: 144-1

Photo 2: 144-2

Photo 3: 144-3

Photo 4: Facing south vegetation in parcel 144

Photo 5: Facing North vegetation and slope in parcel 144

Photo 6: Facing South in parcel 144

Continuous Group 3 - Photos

Parcels:	144	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 7: Bat Boxes actively used in parcel

Continuous Group 4 - Soil Types

Parcels	134	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ahe	SiL	DBr	<2	Gran	0	Friable	Well	none
	Bm	SL	Br	<2	Gran	0	Friable	Well	none
	Ae	SiL	LGr	<2	Gran	0	Friable	Well	none
	Bt	SiCL	Ybr	2-5	SAB	0	Friable	Well	none
	Btk	SiL	LBr	<2	SAB	0	Friable	Well	none
	Ck	SiL	LGrBr	<2	Gran	0	Friable	Well	none
Soil Series	***Lynx - Brunisolic Gray Luvisol***								
II	Ah	SiL	Gr	<2	Platy	0	Friable	Rapid	none
	Cg	SiL	LGrBr	<2	Blocky	0	Friable	Rapid	none
	Ahb	SiL	LGr	<2	gran	10	Friable	Rapid	none
	Cg	SiL	LGrBr	<2	gran	0	Friable	Rapid	none
	Ck	SiCL	LBr	2-5	SAB	0	Friable	Well	none
Soil Series	***Attachie - Gleyed Cumulic Regosol***								
III	Ahgj	L	Br	<2	Gran	0	Friable	Rapid	none
	Ckg1	SL	LBr	2-5	gran-Blocky	0	Friable	Rapid	none
	Ckg2	SiCL	LBr	5-10	Platy	0	Friable	Rapid	none
Soil Series	***Centurion - Rego-Humic Gleysol***								
Soil Series	***Snipe***								
Soil Series									
Soil Series									

Continuous Group 4 - Soil Data Chart

Parcels:	134	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	5

= Topsoil stripping layer (first lift)

= Subsoil stripping layer (second lift)

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
134-1	LFH	8-0	SiL	**Location:** 10U 0603777 6234471 **Position:** Mid-bench **Surface Expression:** Undulating **Slope:** 3% SE at 124
	Ahe	0-4	SL	
	Bm	4-20	SiL	
	Ac	20-25	SiL	
	Bt	25-63	SiCL	
	Btk	63-73	SiL	
	Ck	73+	SiL	
	Soil Type	I-Lynx		
134-2	LH	5-0		**Location:** 10U 0603492 6234334 **Position:** Upper **Surface Expression:** Undulating **Slope:** 52% SE at 138
	Ah	0-7	SiL	
	C	7-25	SiL	
	Ahb	25-35	SiL	
	Cg	35-75	SiL	
	Ck	75-95+	SiCL	
	Soil Type	II-Attachie		
134-3	OH	12-0		**Location:** 10U 0602474 6234118 **Position:** Upper **Surface Expression:** Undulating **Slope:** 70 % S at 177
	Ahgj	0-20	L	
	Ckg1	20-50	SL	
	Ckg2	50-70+	SiCL	
	Soil Type	II-Centurion		
134-4	LFH	7-0		**Location:** 10U 0603382 6234661 **Position:** Upper **Surface Expression:** Undulating **Slope:** 20% S
	Ahg	0-12	L	
	Ckg1	12-59	SL	
	Ckg2	59+	SiCL	
	Soil Type	II-Centurion		

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
	Soil Type			
	Soil Type			
	Soil Type			
	Soil Type			
			134-	
	Soil Type			
	Soil Type			
	Soil Type			
	Soil Type			

Continuous Group 4 - Photos

Parcels:	134	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 1: 134-1

Photo 2: 134-2

Photo 3: 134-3

Photo 4:134-4

Photo 5: South towards the Peace River. Valley and field overview.

Photo 6: South-West at Soil Pit 134-2 towards Peace River.

Continuous Group 4 - Photos

Parcels:	134	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 7: North at soil Pit 134-3. Mixed forest, grassy slopes and shrubs.

Photo 8: North toward valley slope. Representative of area. Mixed forest, agricultural fields and grassland.

Continuous Group 5 - Soil Types

Parcels:	82.1	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
	Ap	SiCL	DBr	2-5	AB	0	firm	well	none
	Bm	SiCL	LGrBr	2-5	SAB	0	firm	well	none
	BC	SiCL	DGr	2-5	SAB	0	firm	well	none
I	C	CL	DGrBr	2-5	B	0	firm	well	none
Soil Series	***Taylor - Orthic Black***								
Soil Series									
Soil Series	***Mesisol***								
Soil Series	***Snipe***								
Soil Series									
Soil Series									

Continuous Group 5 -Soil Data Chart

Parcels:	82.1	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	5

= Topsoil stripping layer (first lift) **= Subsoil stripping layer (second lift)**

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
82.1-1	LH	3-0		**Location:** 10U 0610602 6238147 **Position:** Lower bench **Surf. Expression:** Undulating **Slope:** 2 % S at 180
	Ap	0-19	SiCL	
	Bm	19-34	SiC	
	Bc	34-52	SiC	
	C	52+	C	
	Soil Type	I-Taylor		

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
82.1-2	Lfh	2-0		**Location:** 10U 0610828 6238128 **Position:** Lower **Surface Expression:** Undulating **Slope:** 30 % S at 200
	Ah	0-14	SiC	
	Bm	14-27	SiC	
	Bc	27-58	SiC	
	C	58+	C	
	Soil Type	I-Taylor		

Continuous Group 5 - Photos

Parcels:	144	**Assessment Date:**	August 12 - 15, 18, 2022
From Location:		**Soil Technician:**	Dan Webster
To Location:		**Assistant:**	Brooklyn Phillips
Surveyed by:			

Photo 1: 82.1-1

Photo 2: 82.1-2

Photo 9: South East towards Peace River at soil pit 82.1-1. Area represented by short proken valley slopes,

Photo 10: Mixed wood forest found at soil pit 82.1-2

Continuous Group 6 - Soil Types

Parcels	62	**Assessment Date:**	August 12 - 15, 18, 2022
	60	**Soil Technician:**	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ahe	SiCL	DGBr	<2	Gran	0	Friable	Mod Well	none
	AB	SiCL	GBr	5-10	SAB	0	Firm	Mod Well	very firm AB
	Bt	SiCL	DBr	2-5	AB	0	Firm	Mod Well	none
	C	SiC	DBr	2-5	AB	0	Firm	Mod Well	none
Soil Series		***Judah - Dark Gray Luvisol***							
II	Ap	SiCL	DGBr	2-5	AB	20-30	Friable	Mod Well	none
	AB	SiCL	GBr	2-5	AB	10	Firm	Mod Well	none
	Bt	SiC	DBr	2-5	AB	0	Firm	Mod Well	none
	C	C	DGBr	2-5	Pl	0	Firm	Mod Well	none
Soil Series		***Judah - Dark Gray Luvisol***							
III	Ah	SiCL	DGr	2-5	AB	0	Friable	well	stony
	AB	SiCL	DGBr	2-5	AB	0	Firm	well	stony
	Bt	SiC	DGr	2-5	AB	0	Firm	well	stony
	C	C	DBr	2-5	Pl	0	Firm	well	stony
Soil Series		***Attachie - Orthic Black Chernozem***							
IV	Ah	SL	DBr	<2	Gran	0	Friable	rapid	stony
	Bt	SL	LGr	<2	Gran	0	Friable	rapid	stony
	Ahb	SL	LBr	<2	Loose	10	Friable	rapid	stony
	Cg	SiL	LGrBr	<2	Loose	0	Friable	rapid	stony
	C	SL	Ybr	<2	Loose	0	Friable	rapid	stony
Soil Series		***Attachie - Gleyed Cumulic Regosol***							
V	Ah	L	DBr	<2	Gran	0	Friable	rapid	
	AB	SCK	LGBr	2-5	AB	0	Firm	rapid	abrupt texture change
	Bt	SiCL	DGr	2-5	AB	0	Firm	rapid	stony
Soil Series		***Attachie - Orthic Black Chernozem***							
Soil Series									

Continuous Group 6 - Soil Data Chart

Parcels	62
	60

Assessment Date:	August 12 - 15, 18, 2022
Soil Technician:	Dan Webster
Assistant:	Brooklyn Phillips
Page Number:	5

= Topsoil stripping layer (first lift) **= Subsoil stripping layer (second lift)**

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
62-1	LFH	3-0		**Location:** 10U 0614971 6235427 **Position:** Toe slope **Surface Expression:** Benched **Slope:** 6 % 223°
	Ahe	0-10	SiCL	
	AB	10-29	SiCL	
	Bt	29-55	SiCL	
	C	55+	SiC	
	Soil Type	I-Judah		
62-3	F	1-0		**Location:** 10U 0615155 6235678 **Position:** Crest **Surface Expression:** Benched **Slope:** 60% 188°
	Ah	0-13	SiCL	
	AB	13-27	SiCL	
	Bt	27-51	SiC	
	C	51+	C	
	Soil Type	III-Attachie		
60-1	LFH	8-0		**Location:** 10U 0615654 6235651 **Position:** Mid-slope (above slide) **Surf. Expression:** Benched **Slope:** 10% 266°
	Ah	0-5	SL	
	Bt	5-9	SL	
	Ahb	9-18	SL	
	Cg	18-48	SiL	
	C	48+	SL	
	Soil Type	IV Attachie		
60-3	LFH	3-0		**Location:** 10U 0615496 6235314 **Position:** Low slope **Surface Expression:** Benched **Slope:** 17% 167°
	Ah	0-5	L	
	AB	5-17	SCL	
	Bt	17-21+	SiCL	
	Soil Type	V Attachie		
	Soil Type			
	Soil Type			

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
62-2	Ap	0-28	SiCL	**Location:** 10U 0614828 6235579 **Position:** Mid-slope **Surface Expression:** Benched **Slope:** 11% 211°
	AB	28-42	SiCL	
	Bt	42-76	SiCL	
	Cca	76+	C	
	Soil Type	II-Judah		
	Soil Type			
60-2	F	2-0		**Location:** 10U 0626712 6233780 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 2 % N
	Ah	0-11	SiCL	
	AB	11-25	SiCL	
	Bt	25-52	SiCL	
	C	52+	C	
	Soil Type	III Attachie		
	Soil Type			
	Soil Type			

Continuous Group 6 - Photos

Parcels:	62	**Assessment Date:**	August 12 - 15, 18, 2022
	60	**Soil Technician:**	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 1: 62-1

Photo 2: 62-2

Photo 3: 62-3

Photo 4:60-1

Photo 5: 60-2

Photo 6: 60-3

Continuous Group 6 - Photos

Parcels:	62	**Assessment Date:**	August 12 - 15, 18, 2022
	60	**Soil Technician:**	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 7: Facing east representative vegetation for parcel 62

Photo 8: Facing North at soil point 62-2, agricultural field, mized forest and grass slopes

Photo 9: Facing south at forested valley slope and agricultural field

Photo 10: Facing North along slope ridge. Reprentative vegetation for parcel 62.

Photo 11: Facing North-east from mid slope, Short broken valley slopes.

Photo 12: Facing East from upper slope

Continuous Group 6 - Photos

Parcels:	62	**Assessment Date:**	August 12 - 15, 18, 2022
	60	**Soil Technician:**	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 13: Facing south at ridge of valley.

Photo 14: Facing North at 60-1, representative vegetation

Photo 14: Facing west at mid slope of valley

Photo 15: Facing south at pond waypoint 1070

Continuous Group 7 - Soil Types

Parcels:	21.4	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ap	SiCL	DGrBr	<2	Gran	20-30	Friable	well	none
	Bt	SiCL	LGrBr	2-5	SAB	0	firm	well	Firm B Layer
	BC	SiCL	LGr	<2	B	0	firm	well	none
	C	SiCL	DGr	2-5	SAB	0	firm	well	none
Soil Series	***Judah - Dark Gray Luvisol***								
II	Ap	SiL	DGr	2-5	B	30-40	Friable	well	none
	Bm	SL	DGrBr	2-5	SAB	0	Friable	rapid	raidly drianed
	Ck	SL	LBr	<2	Gran	0	Friable	rapid	none
	C	SiL	Br	<2	Platy	0	Friable	well	none
Soil Series	***Attachie - Orthic Black Chernozem***								
III	Bm	L	DBr	<2	Gran	0	Friable	well	none
	Ae	L	LGrBr	<2	loose	0	Friable	well	none
	BC	SiL	LBr	<2	loose	0	Friable	rapid	none
	Ck	L	LBr	<2	Gran	0	Friable	well	none
Soil Series	***Branham - Orthic Eutric Brunisol***								
Soil Series									
Soil Series									
Soil Series									

Continuous Group 7 - Soil Data Chart

Parcels	21.4	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips
		Page Number:	5

= Topsoil stripping layer (first lift)

= Subsoil stripping layer (second lift)

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
21.4-1	Ap	0-22	SiCL	**Location:** 10U 0626852 6234339 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 2 % N
	Bt	22-52	SiC	
	Bc	52-65	SiC	
	C	65+	SiCL	
	Soil Type	I-Judah		
21.4-2	Ap	0-20	SiL	**Location:** 10U 0626712 6233780 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 2 % N
	Bm	20-29	SL	
	Ck	29-43	SL	
	C	43+	SiL	
	Soil Type	II_Attachie		
21.4-3	LFH	4-0		**Location:** 10U 0626889 6233902 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:**
	Bm	0-14	L	
	Ae	14-21	L	
	BC	21-36	SiL	
	Ck	36-95+	L	
	Soil Type	III-Branham		
21.4-4	LFH	9-0		**Location:** 10 U 0626714 6234405 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 23 % N
	Bm	0-9	L	
	BC	9-18	SiL	
	Ck1	18-39	L	
	Ck2	39+	SiL	
	Soil Type	III-Branham		
	Soil Type			
	Soil Type			
	Soil Type			
	Soil Type			

Continuous Group 7 - Photos

Parcels:	21.4	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 1: 21.4-1

Photo 2: 21.4-2

Photo 3: 21.4-3

Photo 4:21.4-4

Photo 5: 21.4-1 Looking South at Alfalfa crop, Weather station and bat boxes present.

Photo 6: Valley overview

Continuous Group 7 - Photos

Parcels:	21.4	**Assessment Date:**	August 12 - 15, 18, 2022
		Soil Technician:	Dan Webster
		Assistant:	Brooklyn Phillips

Photo 7: Represetive valley at 21.4 parcel

Photo 8: Looking North at spruce stand in parcel 21.4

Continuous Group 8 - Soil Types

Parcels	9.1	**Assessment Date:**	August 12 - 15, 18, 2022
	9	**Soil Technician:**	Dan Webster
	7.1	**Assistant:**	Brooklyn Phillips
		Page Number:	

Notes: Insert the Soil Types encountered on the development. The following Soil Data Charts will reference the "Soil Type" on this page for reference to the specific horizon features and details.

Soil Type	Horizon Description	Texture	Colour	Aggregate Size (cm)	Aggregate Structure	Admixing %	Strength	Drainage	Profile Restrictions
I	Ahe	SL	DBr	<2	Gran	0	friable	rapid	none
	Ae	SL	LBr	<2	Gran	00	friable	rapid	fast water movement
	Bt	SL	Br	<2	Gran	0	friable	rapid	none
	C	CL	DGr	2-5	SAB	0	friable	well	none
Soil Series		***Attachie - Eluviated Brown Chernozem***							
II	Ahe	SiCL	DBr	<2	Gran	0	friable	mod well	none
	AB	SCL	BrGr	2-5	SAB	0	firm	mod well	Hard layer
	Bt	SiCL	GrBr	2-5	B	0	firm	mod well	none
	Cca	SiCL	DYBr	5-10	SAB	0	firm	mod well	none
Soil Series		***Judah - Dark Gray Luvisol***							
III	Ahe	SiCL	DGr	<2	Gran	0	friable	mod well	none
	Ae	SiCL	LGr	<2	Platy	0	friable	mod well	none
	AB	SiCL	BrGr	2-5	SAB	0	friable	mod well	none
	Bt	C	Br	<2	B	0	firm	mod well	none
	Cca	SiC	DBr	5-10	SAB	0	firm	mod well	none
Soil Series		***Kathleen - Orthic Gray Luvisol***							
IV	Ahe	SL	LBr	<2	Gran	0	friable	rapid	none
	Ae	SL	LGr	<2	Gran	0	friable	rapid	none
	AB	SL	Br	2-5	loose	0	friable	rapid	none
	Bt	SCL	Br	5-10	SAB	0	friable	rapid	none
	C	SCL	DBr	5-10	Platy	0	friable	well	none
Soil Series		***Attachie - Eluviated Brown Chernozem***							
Soil Series									
Soil Series									

Continuous Group 8 - Soil Data Chart

Parcels	9.1	**Assessment Date:**	August 12 - 15, 18, 2022
	9	**Soil Technician:**	Dan Webster
	7.1	**Assistant:**	Brooklyn Phillips
		Page Number:	5

= Topsoil stripping layer (first lift) **= Subsoil stripping layer (second lift)**

= Sample Points within the Agricultural Land Reserve

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
9.1-1 / 7.1-1	Ahe	0-5	SL	**Location:** 10U 0623938 6231421 **Position:** Upper-slope **Surface Expression:** Undulating **Slope:** 78 %
	Ae	5-9	SL	
	Bt	9-64	SL	
	C	64+	CL	
	Soil Type	I-Attachie		
9.1-3	LFH	10-0		**Location:** 10U 0629399 6231754 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:**
	Ahe	0-8		
	Ae	8-13		
	Ab	13-40		
	Bt	40-80		
	Cca	80+		
	Soil Type	III-Kathleen		
9-1	Ahe	0-6	SL	**Location:** 10U 0628871 6231542 **Position:** Mid-Bench **Surface Expression:** Undulating **Slope: 60** %
	Ae	6-14	SL	
	Ab	12-39	SL	
	Bt	39-89	SCL	
	C	89+	SCL	
	Soil Type			
	Soil Type			
	Soil Type			
	Soil Type			

Sample Point	Horizon Description	Horizon Depth (cm)	Texture	Comments
9.1-2	LFH	6-0	SiCL	**Location:** 10U 0629361 6231627 **Position:** Mid-slope **Surface Expression:** Undulating **Slope:** 43 % E at 85
	Ahe	0-10	SiCL	
	Ab	10-19	SiCL	
	Bt	19-53	SiCL	
	Cca	53+	SiCL	
	Soil Type	II-Judah		
	Soil Type			
9-2	Ahe	0-3	SL	
	Ae	3-12	SL	
	Ab	12-35	SL	
	Bt	35-78	SCL	
	C	78+	SCL	
	Soil Type			
	Soil Type			
	Soil Type			

Continuous Group 8- Photos

Parcels:	9.1	**Assessment Date:**	August 12 - 15, 18, 2022
From Location:		**Soil Technician:**	Dan Webster
To Location:		**Assistant:**	Brooklyn Phillips
Surveyed by:			

Photo 1: 9.1-1

Photo 2: 9.1-2

Photo 3: 9.1-3

Photo 4:9-1

Photo Facing south from mid slope

Photo 6: Facing west at steep valley slope

Continuous Group 8- Photos

Parcels:	9.1	**Assessment Date:**	August 12 - 15, 18, 2022
From Location:		**Soil Technician:**	Dan Webster
To Location:		**Assistant:**	Brooklyn Phillips
Surveyed by:			

Photo 7: Facing East, looking down towards valley bottom from upper-mid slope

Photo 8: Facing east towards Site C dam site

Photo 9: Facing North at forested valley slopes

Photo 10: Representative mixed-forest vegetation at parcel 9.1

Photo 11: Facing West at peace river upstream of Site C dam

Photo 12: Facing south, downslope at cleared area

Appendix 11. 2025 Wetland Mitigation & Compensation Plan

BC Hydro
Power smart

Site C Wetland Mitigation and Compensation Plan

April 2, 2026

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1.0 Introduction

In 2015, BC Hydro (BCH) developed the Site C Clean Energy Project's Vegetation and Wildlife Mitigation and Monitoring Plan (VWMMP) to describe the mitigation, offsetting and monitoring measures to reduce the overall impacts of the Site C Clean Energy Project (the Project) on vegetation and ecological communities and wildlife resources.

Prepared in accordance with the Site C Project's Environmental Assessment Certificate (EAC) and Federal Decision Statement (FDS), the VWMMP includes a sub-plan called the Wetland Mitigation and Compensation Plan (Plan) which describes how BCH is addressing the Project's impacts resulting in the unavoidable loss of wetland areas and functions. Up until now, this sub-plan has existed in smaller components as BCH and regulators agreed on methods to be used to offset wetland impacts. As mitigation and compensation approaches were developed over multiple discussions over the years as the Project progressed, a formal plan synthesizing all the components has not been completed. This is the purpose of this document.

This Plan has been completed post-reservoir fill primarily because the wetland impact footprint could only be accurately determined once the Project's dam site construction activities were completed. Prior to reservoir fill, impacts could only be estimated based on projections and modeling, whereas post-reservoir filling assessments and monitoring provided more accurate measurements. A preliminary wetland impact footprint calculation was conducted in 2015, pre-construction, but was considered a conservative estimate as the full extent of the Project footprint was yet to be finalized at the time.

Reservoir filling was completed in November 2024 and the Site C Project is now in Operation with all six generating units fully online. Given completion of reservoir fill and land development impacts, BCH has now calculated the amount of wetland habitat lost as a result of the Project (see Section 2.3 of this Plan).

This Plan provides details on the regulatory conditions related to the measurement of wetland impacts and offsetting, and the methodologies developed by the Project and the Vegetation and Wildlife Technical Committee (VWTC; joint committee of Provincial and Federal agency biologists required by the Project's Conditional Water Licence; see Section 1.2) to satisfy the conditions of the FDS and EAC. This includes explaining how BC Hydro will have achieved full implementation of all physical compensation measures by the end of 2027. The only remaining component will be long-term reporting under FDS 11.9, which continues until Year 30 of operations. The requirements of both the EAC and FDS conditions as per the Plan in terms of replacing lost wetland functions and compensation in terms of area have been fulfilled.

Specifically, this Plan describes:

- Regulatory requirements regarding mitigation, compensation, and monitoring to offset the impacts of the Project on wetlands;
- Methods used to assess and measure the extent of wetlands impacted in terms of area and function now that the Project's land development activities are completed;
- Details of the calculations of wetland loss impacts in terms of area and function and how both have been mitigated and compensated by rebuilding, restoring, and creating new wetlands;
- How mitigation and compensation offsetting efforts have exceeded losses to satisfy compliance conditions and program closure.

1.1 Regulatory Requirements

This Plan was developed in accordance with the following federal requirements:

FDS Condition 11[1] requires the following measures for offsetting impacted wetlands:

11.1 The Proponent shall mitigate the potential effects of the Designated Project on wetland habitat used by migratory birds, species at risk and for current use of lands and resources for traditional purposes by Aboriginal people;

11.2 The Proponent shall develop a plan that addresses potential effects of the Project on wetland habitat used by migratory birds, species at risk and for current use of lands and resources for traditional purposes;

11.3 The Proponent shall, in developing the Plan, describe how the mitigation hierarchy and the ***objective of no net loss of wetland functions*** were considered (see Section 1.2);

11.4 The Plan should include:

11.4.1 Baseline data on the biogeochemical, hydrological and ecological functioning of the wetlands and associated riparian habitat in the area affected by the Designated Project, including: ground and surface water quality and quantity; vegetation cover; biotic structure and diversity; migratory bird abundance, density, diversity and use; species at risk abundance, density, diversity and use; and current use of the wetlands for traditional purposes by Aboriginal people, including the plant and wildlife species that support that use;

11.4.2 Mitigation measures to maintain baseline wetland functions for those wetlands that will not be permanently lost;

11.4.3 An approach to monitor and evaluate any changes to baseline conditions, as defined in Condition 11.4.1 and identify improvements based on monitoring data;

11.4.4 Compensation measures to address the unavoidable loss of wetland areas and functions supporting migratory birds, species at risk, and the current use of lands and resources by Aboriginal people in support of the objective of full replacement of wetlands in terms of area and function (See Sections 3.0 and 4.7); and

11.4.5 An analysis of the effects of any compensation measures identified in Condition 11.4.4 on the current use of lands and resources for traditional purposes by Aboriginal peoples.

11.8. The Proponent shall commence the implementation of the compensation measures specified in condition 11.4.4 no later than five years from the initiation of construction.

11.9. The Proponent shall implement each component of the plan and provide to the Agency an analysis and summary of the implementation of the plan, as well as any amendments made to the plan in response to the results, on an annual basis during construction and at the end of year 1, 2, 3, 5, 10, 15, 20 and 30 of operation.

[1] Decision Statement for the Site C Clean Energy Project Issued under Section 54 of the Canadian Environmental Assessment Act, 2012 and Environmental Assessment Certificate for the Site C Clean Energy Project under the Environmental Assessment Act, 2014.

EAC Condition 12[1] requires the development of a Wetland Mitigation and Compensation Plan that includes the following components:

- A defined mitigation hierarchy that prioritizes mitigation actions to be undertaken (Province of BC, 2014), including but not limited to:
  - Avoid wetland impacts wherever possible;
  - Minimize direct effects where avoidance is not feasible;
  - Maintain or improve hydrology and function of existing wetlands where avoidance is not feasible;
  - Seek suitable candidate locations or wetlands for compensation for impacts that cannot be avoided;
  - Replace like-for-like where wetlands will be lost, in terms of functions and compensation in terms of area;
  - Measure wetland losses and gains through the Wetland Function Assessment which takes into account various wetland function metrics; and,
  - Create new wetland habitat.
- Information on location, size and type of wetlands affected by the Project (see Section 2.0).
- If roads cannot avoid wetlands, culverts will be installed under access roads to maintain hydrological balance, and sedimentation barriers will be installed.[2]
- Stormwater management will be designed to control runoff and direct it away from work areas where excavation, spoil placement, and staging activities occur.[3]
- Develop, with the assistance of a hydrologist, site-specific measures prior to construction to reduce changes to the existing hydrologic balance and wetland function during construction of the Jackfish Lake Road and Project access roads and transmission line.[4]
- All activities that involve potentially harmful or toxic substances, such as oil, fuel, antifreeze, and concrete, must follow approved work practices and consider the provincial Best Management Practices (BMP) guidebook Develop with Care (BC Ministry of Environment 2014 or as amended from time to time).[5]
- The EAC Holder must monitor construction and operation activities that could cause changes in wetland functions.[6]

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[2] Measures described in detail in Section 4.4 of the Site C Construction Environmental Management Plan (CEMP).

[3] Stormwater across the site is managed by contractors under the Erosion and Sediment Control Program. Management includes installation of sedimentation ponds and interception ditches. Interception ditches capture and divert stormwater away from construction areas into the sedimentation ponds. Water from the sedimentation ponds is discharged into surrounding environment.

[4] BCH engaged a forestry consultant to design access roads and clearing prescriptions along the Jackfish Lake Road, Project access road and the transmission line. A hydrologist on staff with the forestry consultant reviewed the design to ensure that the hydrology of wetlands was maintained.

[5] Sections 4.8 and 4.13 of the CEMP require contractors to follow approved work practices and BMPs regarding potentially harmful or toxic substances. BCH audits compliance with this requirement by reviewing contractor Environmental Protection Plans, or EPPs, and conducting environmental audits during construction to verify implementation of EPPs.

[6] BCH requires its contractors to describe in their EPPs construction activities that could cause changes in wetland functions, including how those construction activities will be monitored and at what frequency. BCH audits compliance with this requirement by reviewing contractor EPPs and conducting environmental audits during construction to verify implementation of EPPs.

We highlight through the above-***bolded italicized*** text, differences in the wording of the EAC and FDS conditions. FDS Condition 11.3 requires meeting an objective of "*no net loss of wetland functions*" but does not require the replacement of wetland area lost. EAC Condition 12 requires the replacement of "*like for like where wetlands will be lost, in terms of functions,*" but adds that BC Hydro must achieve, "*compensation in terms of area"* without specifying a compensation goal (e.g., 1:1 for area).

BC Hydro considers the FDS and EAC references to "no net loss" and "replacing wetland functions" to mean that the sum of wetland functions created by Project compensation should exceed the sum of wetland functions lost/impacted due to Project activities. This approach recognizes that some functions may have a net loss while others a net gain (i.e., not all lost functions will be equally gained and vice-versa).

Similarly, BC Hydro considers the FDS and EAC references to compensation for area and no net loss to mean that the area of wetlands created or restored by the Project should be greater than the area of impacted wetlands. As determined by the Wetland Function Assessment (WFA; explained further in Section 3.0), BC Hydro proposed to offset wetland losses through the creation and rebuilding of wetlands in the Peace Region. The VWTC accepted this approach in March 2021 (see Sections 3.0 and 4.0). Overall, this approach shows that by the end of 2027, BC Hydro's wetland compensation efforts will result in a net positive wetland compensation gain in terms of both area and wetland functions to satisfy physical compliance with the FDS and EAC Conditions (see details in Section 4.7).

1.2 Wetland Mitigation and Compensation

Based on the conditions outlined in the EAC and FDS, BCH is required to mitigate the loss of and impact to wetlands affected by the Project's wetland impact footprint (construction of the Site C dam, transmission lines and subsequent flooding of the reservoir). FDS Approval Conditions 11.3 and 11.4 and EAC Condition 12 identified a wetland compensation target of "no net loss of wetland functions and area."

Achieving a target of no net loss requires first determining the amount and degree of loss, which was approached by:

i. Estimating the impacted wetland area (or "Wetland Impact Footprint") expected from all Site C- associated land development activities. This included a hierarchical series of GIS assessments of partially affected wetlands;

ii. Developing a quantifiable assessment of functions associated with the impacted wetlands via a "Wetland Function Assessment Tool," described in Section 3.0.

When wetland impacts could not be avoided, the following approach was taken:

i. Measure wetland losses and gains through the Wetland Function Assessment tool which takes into account various wetland function metrics;

ii. Seek suitable candidate locations or wetlands for compensation;

iii. Create, restore or protect wetlands to offset impacts.

This Plan provides a detailed summary of habitat compensation measures undertaken by BCH, including an assessment of compensation wetland area (constructed or re-built) of each habitat offset site, and an assessment of the corresponding wetland functions created by those offsets.

To support delivery of the VWMMP, the VWTC was established by the Comptroller of Water Rights under Conditional Water Licenses 132990 and 132991 to provide ongoing engagement between BCH, Ministry

of Environment and Climate Change Strategy (MOECCS) and the Ministry of Land, Water, and Resource Stewardship (MLWRS; formerly the Ministry of Forests, Lands, Natural Resource Operations and Rural Development aka. MFLNRORD or truncated as MFLNRO) with respect to the implementation of vegetation and wildlife mitigation and monitoring programs. The province requested that the VWTC be formed as a sub-committee of the existing BC and BCH joint Fish / Hydro Management Committee. The Canadian Wildlife Service of Environment and Climate Change Canada joined the VWTC in July 2016. The VWTC's role is to ensure that measures will be used to mitigate potential adverse effects of the Project on vegetation and ecological communities and wildlife resources during Project construction and operations and ensure that the directions in the EAC and FDS are followed.

In 2013, BCH signed an agreement with Ducks Unlimited Canada (DUC), BC operations, to evaluate opportunities to compensate for wetland losses due to the Project, and to deliver a series of offset sites to deliver the full area and function-based compensation. As part of that contract, DUC provided BCH with specific wetland offset proposals which resulted in the construction and completion of five compensatory habitat offset sites (see Section 4.5 for details).

During early discussions of this Plan in 2015, BCH had considered establishing a general compensation fund as part of the Project to allow for future (ongoing) habitat enhancements and ongoing habitat maintenance at various existing wetland sites in the Peace region. DUC had suggested a funding structure along with some program ideas that could be used to support long-term wetland mitigation in addition to other benefits, but this was not further pursued because the incremental habitat or functional contributions associated with this type of fund would be difficult to assess and apportion towards BCH's offsetting balance.

Continuing progression of the Plan post-reservoir fill, BC Hydro undertook and refined the steps below to determine appropriate compensation for offsetting lost wetlands:

i. Determine impacted wetland area: Develop a quantifiable assessment of the extent of wetland impacts once all Project land development activities were completed. This included a hierarchical series of GIS assessments of partially affected wetlands;

ii. Develop a qualifiable assessment of functions for impacted wetlands;

iii. Complete a detailed measure of compensation wetland area (constructed or re-built) and functions; and,

iv. Assess wetland area and functions impacted by the Project compared to wetland area and function offsets created by the Project.

Details regarding these steps are described in the next section.

2.0 Wetland Area Impacts

In 2015, BC Hydro estimated approximately 700 hectares (ha) of wetlands would be impacted by the Project. However, this was not confirmed or ground-truthed and was conservatively assessed using limited Terrestrial Ecosystem Mapping (TEM) data available at the time.

In 2024-2025, upon completion of reservoir fill and land-disturbing activities, BC Hydro conducted a re-assessment indicating that 299 ha of wetland has been impacted by the Project. The discrepancy between the 2015 and 2025 assessments is described below.

2.1. Data and Ground-truthing

The initial desktop TEM assessment in 2015 used 2006 LiDAR (Light Detection and Ranging) data and orthophotos. A more detailed and qualitative re-assessment (Detailed Wetlands Assessment; DWA) was conducted later in 2015 focused on the TEM wetland polygons and refined by examining updated orthophotos to determine wetland boundaries occurring within the polygons.

The 2024-2025 re-assessment which assessed 299 ha of wetland impacted by the Project is based on the below information sources:

i. Ground-truthed wetlands delineated by foresters during vegetation clearing;

ii. Wetlands monitored/ground-truthed by the multi-year Wetlands Monitoring Program;

iii. As-built mapping based on Project Environmental Completion Reports;

iv. Detailed Wetlands Assessment (DWA; refined desktop assessment focused on TEM wetland polygons then cross-checked with updated orthophotos);

v. TEM data if no other details were available on a wetland type (e.g., non-classified wetlands; Watson Slough).

An example of some of the differences between the 2015 and 2025 assessed boundaries are shown in Figure 1. The pink polygons show areas that were field-verified during tree clearing. The orange polygons show wetlands that were identified by the DWA and verified during tree clearing. The light blue polygons show wetlands that were missed by TEM but confirmed during tree clearing. The red polygons are those that were identified in 2015 by TEM but confirmed in the field as non-existent. They were therefore excluded from the assessment.

2.2. Consideration of Partially Affected Wetlands

Since the full effects of the Project were not known in 2015, BCH adopted a conservative approach to delineating potential impacts to wetlands. Consequently, many wetlands appeared in the original Project footprint that were not affected by the Project. At the time, boundaries were conservatively delineated as the full Project footprint and the extent of activities was not known. However, this became clearer post-reservoir-fill. For the 2025 wetland impact assessment, a Project Impact Area (PIA) was refined to more clearly delineate the extent of true wetlands impacted by Project activities. This resulted in the 2025 assessment completed after reservoir filling and land clearing showed that fewer wetlands were impacted than that estimated in 2015.

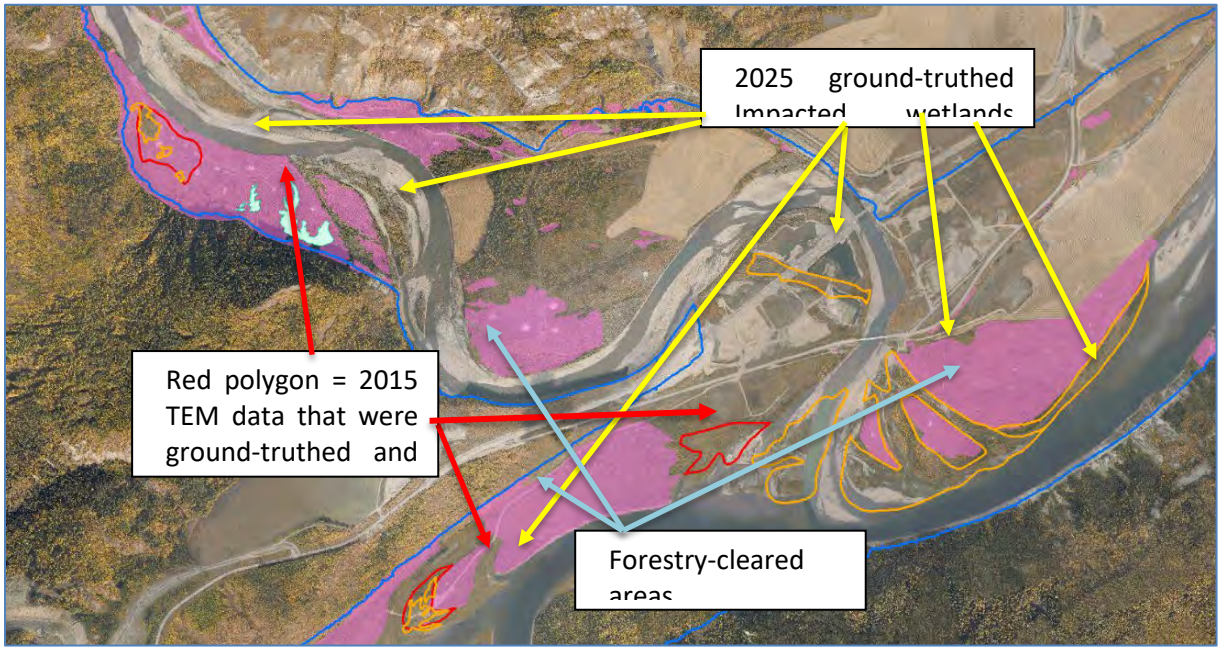

***Figure 1**. Example of mapping (Halfway River) showing impacted wetlands per 2015 data (red = TEM) versus 2025 data with ground truthing (orange, light blue). The pink shaded areas show areas cleared. Ground-truthing verified the red polygons from 2015 data that did not exist whereas the orange and blue polygons confirmed existing wetlands. The dark blue line indicates the reservoir boundary.*

For wetlands that occurred along the boundaries of the PIA, a threshold was set so that if ≥25% of the wetland area was impacted by the Project, we included the entire area of that wetland even if it continued outside the Project boundary. For wetlands where <25% of the wetland area overlapped into the PIA, only the amount inside the PIA was included. This 25% threshold was established with input from DUC, as a best effort based on professional opinion since there are no guidelines specified at the federal or provincial level. Additionally, a wetland monitoring program was established in 2017 to monitor for changes in various wetland parameters (i.e., physical, ecological, biochemical, hydrological). This is discussed in Section 5.0 and detailed in NPS (2018a, 2020a,b).

Figure 2 shows an example of this approach at Septimus Siding Road within the dam site area. The boundary of the 2015 assessment area is demarcated by the black line. The yellow shaded polygons show the wetlands within this area that were assessed as impacted in 2015. The 2015 assessment included the full extent of each of these wetlands regardless of how much of the wetland(s) occurred in the PIA.

Along the transmission line, BCH quantitatively accounted for wetlands directly impacted by infilling due to road, laydown, or tower infrastructure because the wetted area of the wetland remained intact, unlike the reservoir fill area in which wetlands were clearly lost. While some wetland functions will be affected by the loss/alteration of vegetation (e.g., tree clearing), the extent of wetland functions affected cannot be quantified. Similar to the wetlands impacted by reservoir fill, the same 25% threshold was applied to any transmission line wetlands that occurred along the ROW boundary that were impacted by road, laydown, or tower infrastructure.

And as previously mentioned, wetland monitoring has been ongoing since 2017 to assess changes over time relative to baseline, including 80 wetlands along the transmission line (Section 5.0, NPS 2018a, 2020a,b, EcoLogic 2026). Updated details on the wetland monitoring program observations will be included in the Vegetation and Wildlife Mitigation and Monitoring Program 2025 Annual Report.

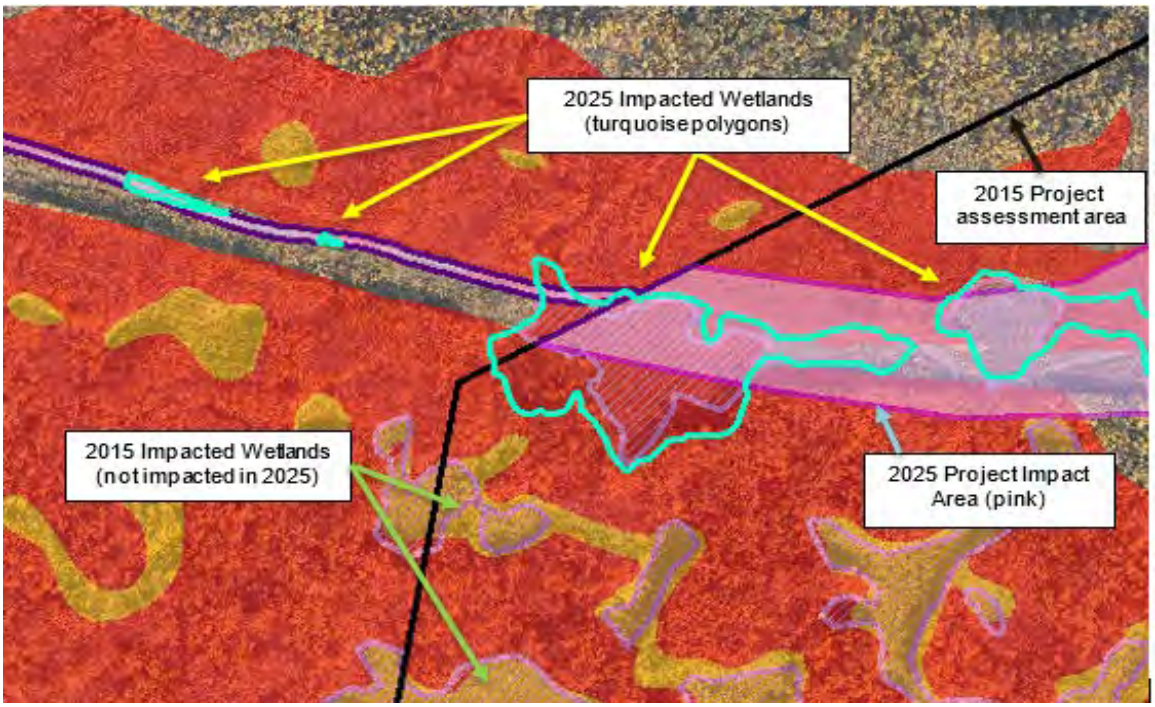

Figure 2. *Septimus Road wetland example showing the 25% impact threshold for partial or full inclusion in the 2025 assessment. Yellow polygons are wetlands identified in the 2015 using the DWA. Turquoise polygons confirm wetlands overlapping into the ground-truthed 2025 Project impact area (pink shading).*

2.3 Conclusion Regarding Area of Impacted Wetlands

Based on the above considerations, the updated area of wetlands impacted by the Project's construction footprint and reservoir amounts to 299 ha, broken down into the eight wetland classes (Table 1). These categories were used in the original assessment in 2015 and allowed a comparison of changes in area from the conservative estimation based on the TEM information to include data from the DWA and ground-truthed wetland occurrence for the 2025 re-assessment (DUC 2025).

Table 1. Total impacted wetland area (ha) for each wetland type (=wetland class) from the updated/re-assessed 2025 BC Hydro Wetland Impact Footprint (DUC 2025).

Wetland Class	Area in Hectares
Shallow Open Water (OW)	97.27
Willow Sedge (WS)	33.94
Willow Horsetail Sedge Riparian (WH)	125.6
Sedge or Cattail (SE)	20.77
Tamarack Sedge (TS)	8.78
Scrub Birch – Water Sedge Fen (Wf02)	2.15
Narrow-leaved cotton- grass – Shore sedge Fen (Wf13)	1.34
Labrador Tea-Sphagnum (BT:Sb)	9.14
Total	**298.99**

2.4 Timeline of Major Activities

A summary of the timeline of major mitigation activities and regulatory events is displayed in Table 2.

Table 2. Timeline of major activities and regulatory events.

Major Activity or Regulatory Event	Date
Baseline Vegetation and Wildlife Studies	2005-2012
Environmental Impact Statement (EIS) submitted	January 25, 2013
Environmental Assessment Certificate Issued	October 14, 2014
Federal Decision Statement Issued	November 25, 2014
BCH develops the Site C Clean Energy Project Vegetation and Wildlife Mitigation and Monitoring Plan (VWMMP)	June 5, 2015
Vegetation Wildlife Technical Committee approves the Wetland Function Assessment Tool	April 26, 2018
First compensatory offset site (Golata Canyon Ranch) completed	October, 2019
Environment and Climate Change Canada approves Wetland Rebuilds to qualify as wetland mitigation	March 15, 2021
BC Ministry of Environment and Climate Change Strategy approves Wetland Rebuilds to qualify as mitigation	March 16, 2021
Second compensatory offset site (Cutbank Lake) completed	August 2022
Third compensatory offset site (Doig- Beatton East Marsh) completed	September 2022
Fourth compensatory offset site (Doig- Beatton West Marsh) completed	September 2022
Scoping and reconnaissance expanded focus in Proximity Zone 4	July 2023
Fifth compensatory offset site (Scott Lake) completed	October 2023
Sixth compensatory offset site (Area A) expected to be completed	Spring 2027

2.4.1 Ducks Unlimited Canada's Role

In 2014, BCH hired Native Plant Solutions (NPS), a consulting branch of DUC, to develop a functional assessment tool that would support BCH's accounting system for tracking wetland habitat losses and gains as measures for required compensation. This assessment was completed in 2018 and is described in Section 3.0.

3.0 Wetland Function Assessment (WFA)

3.1 Development of the WFA Tool

In addition to requiring an assessment of the areal extent of wetlands lost and gained through compensation, FDS Condition 11.3 and EAC Condition 12 required an assessment of wetland functions lost and gained. As there are many different types of wetlands serving a multitude of functions, BCH partnered with DUC and developed a Wetland Function Assessment (WFA) tool to assess the extent of wetland functions lost to Site C, as well as the wetland functions gained while creating new wetlands or restoring

old wetlands to compensate for wetland losses. The first version of the WFA was developed from 2016 to 2018 and was accepted and considered complete by the VWTC on April 26, 2018 (see Appendix 2).

The WFA Tool, detailed in NPS (2018b), included three components: (1) classification of wetland types and areal extent of wetlands affected by the Project, (2) selection of wetland indicator species and (3) identification of important wetland habitat functions. The WFA procedure considered the importance of wetland functions to specific wildlife and plant groups during important periods of their lifecycles. Six wetland habitat functional groups were considered: migratory birds, amphibians, bats, fauna species at risk, flora species at risk and species important to Aboriginal land use. For some groups, functions were further subdivided to generate a total of 12 "function types." Overall, this process assessed 62 indicator species and their categories of use (i.e., nesting, feeding, brood-rearing, and migration) in wetland habitats to evaluate the functional value associated with the wetland habitat. Functional importance of wetland habitat for these 62 species can be assessed using a scientifically based process for estimating and evaluating wetland function (NPS, 2018b).

The WFA tool identifies function at the landscape level and incorporates peer-reviewed literature with existing GIS and baseline survey data from the Project, to identify the relative importance of wetlands for migratory birds, amphibians, bats, fauna species at risk, flora species at risk, and species important to Aboriginal land use. It uses a model that was developed based on wetland function assessment processes reviewed in the literature such as Habitat Equivalency Analysis to estimate the loss of wetland area and function (NPS, 2018b). Finally, it evaluates assumptions and uncertainty of the wetland function assessment process by running a sensitivity analysis to evaluate the likelihood that compensation measures address wetland area and functional loss.

To provide context for the model structure, most wetland function assessments make comparisons between wetlands of the same types or classes. This wetland function assessment calculates the total loss of each wetland habitat function by quantifying the degree of loss for each respective wetland type. Losses are weighted based on the habitat type's ability to perform a specific function and the wetland area scheduled to be lost, or partially lost, due to construction. Functional loss for each individual wetland type can then be combined to achieve an understanding of total functional loss for each wetland function (i.e., functional loss of migratory bird breeding habitat in Sedge wetland, Tamarack Sedge wetland, Willow Sedge wetland, etc. all combined to calculate total functional loss of migratory bird breeding habitat).

3.2 Application of WFA Tool

The WFA tool provides a more complete understanding of the amounts and types of functions that have been impacted by the Project and allows for more accurate offsetting. The application of the tool involved calculating the degree of loss of each wetland habitat function for each respective wetland type. Classification of wetland types followed the structure presented in the Environmental Impact Statement by Hilton et al. (2013) to classify impacted wetlands based on the Provincial wetland classification system used at the time. As such, wetlands could not be assigned to one of the five major classes of the Canadian Wetland Classification System (swamp, bog, marsh, fen and shallow open water) as several of the wetland ecosystem types described in Hilton et al. (2013) shared characteristics of more than one of the five classes so additional wetland types were included in the WFA to add more detail. This resulted in eight wetland types used in the WFA: Labrador Tea – Sphagnum (BT:Sb), Shallow Open Water (OW), Sedge wetland (SE), Tamarack Sedge (TS), Willow-Horsetail-Sedge riparian wetland (WH), Willow Sedge wetland (WS), Scrub Birch-Water Sedge (Wf02) and Narrow-leaved Cotton-Grass Shore Sedge (Wf13).

The functional gain resulting from the habitat compensation offset sites (offsets), have been similarly assessed. Offsets provide a measurable conservation balancing effect by establishing new ecosystem

features to compensate for those that have been impacted. Due to the magnitude of the wetland impacts associated with the Site C project, it was necessary to use a form of equivalency analysis classified as an "out of kind" offset, where the impacts and offsets may be of a different wetland type, compared to a more traditional "like-for-like" exercise. Wetland function is used as the common metric - wetland habitat types are not replaced on a like-for-like basis but rather on a function-for-function basis. For example, 2 hectares (ha) of Wf13 provides the same compensation for migratory bird nesting as 4 ha of BT:Sb. Different wetland types contribute to each function type proportionate to factors derived from an in -depth literature review conducted by NPS in 2018b.

The amount of habitat associated with a functional loss or gain is not expressed as a traditional area of land measured in hectares. Rather, quantities are expressed as "functional hectares," where the numbers represent the magnitude of the loss or gain incurred. Note that for the functional losses associated with the Impact Footprint, the sum of all functional hectares (~565 ha) is much larger than the total area of the Impact Footprint (~299 ha) because some areas of the wetlands provide multiple functions and therefore may be counted more than once. Losses or gains in each function type should be considered individually and not added to other function type impacts.

3.2.1 Functions Associated with Wetland Impact Footprint

On April 7, 2025, BCH provided DUC with the 2025 Wetland Impact Footprint from the Project (Table 3). This amount was determined by BCH and explained in detail in Section 2.0. DUC did not participate in calculating the wetland amounts impacted by the Project. Overall, 299 ha of wetlands were determined to be lost or impacted by the construction of the Project, associated transmission lines, and subsequent flooding of the reservoir.

Table 3. Total impacted wetland area in hectares from updated 2025 BCH Wetland Impact Footprint.

Area (ha) of each Wetland Type								
Shallow Open Water (OW)	Willow Sedge (WS)	Willow Horsetail Sedge Riparian (WH)	Sedge or Cattail (SE)	Tamarack Sedge (TS)	Scrub Birch – Water Sedge Fen (Wf02)	Narrow-leaved cotton-grass – Shore sedge Fen (Wf13)	Labrador Tea-Sphagnum (BT:Sb)	**All Wetlands**
97.27	33.94	125.60	20.77	8.78	2.15	1.34	9.14	**298.99**

Using the 2018 WFA methodology, DUC determined the wetland functional losses for the impacted wetlands for each wetland category based on the spatial hectares from Table 3. This document does not include an evaluation of the accuracy of the footprint provided by BCH. The functional losses are summarized in Table 4. Note that the hectares in Table 4 are not spatial hectares, but functional hectares, which are output from the WFA model and represent a standardized metric to quantify wetland functions lost.

Of the six main functional groups, migratory birds, amphibians and bats were impacted the most. Much of the Impact Footprint involved shallow open water, which is important for these groups. The migratory bird functions, amphibian functions and bat functions averaged approximately 50 impacted hectares within each of their main function types. The other functional groups were less impacted on average, ranging from 28 to 44 mean impacted hectares.

Table 4. Summary of total wetland functional area loss by function and wetland type. Refer to Appendix 1 for a more detailed representation of calculations summarized in this table.

Function Type	Functional Area (ha) of each Wetland Type								
	OW	WS	WH	SE	TS	Wf02	Wf13	BT:Sb	**All Wet-lands**
Migratory Birds - Nesting	0.00	3.68	13.61	8.19	0.68	0.29	0.16	0.56	**27.16**
Migratory Birds – Brood-Rearing	54.71	0.00	0.00	3.89	0.00	0.27	0.17	0.00	**59.05**
Migratory Birds – Feeding	38.35	2.15	7.97	5.05	0.20	0.25	0.10	0.21	**54.27**
Migratory Birds - Migration	49.57	2.37	8.78	2.38	0.25	0.22	0.10	0.26	**63.94**
Amphibian – Breeding	24.32	2.83	10.47	5.19	0.73	0.18	0.11	0.76	**44.59**
Amphibian - Feeding	0.00	4.85	17.94	2.97	1.25	0.31	0.19	1.31	**28.82**
Amphibian – hibernation	32.42	11.31	41.87	0.00	0.00	0.00	0.00	0.00	**85.60**
Bats – Feeding	9.12	4.24	15.70	1.95	1.64	0.20	0.13	1.71	**34.69**
Bats – Roosting	0.00	12.73	47.10	0.00	1.10	0.00	0.00	1.14	**62.07**
Fauna – Species At Risk	7.77	2.02	26.21	4.74	1.37	0.15	0.09	1.17	**43.52**
Floral – Species At Risk	0.00	1.43	18.55	1.88	3.19	0.11	0.04	2.52	**27.72**
Species important to Aboriginal land use	0.00	6.03	22.33	1.38	1.46	0.14	0.09	2.54	**33.98**

Among the 12 functional subgroups or "Function Types," amphibian hibernation was impacted the most, with a total impact of 85 functional hectares. Migratory bird migration and bat roosting were also heavily affected with each having approximately 63 impacted functional hectares.

Migratory bird nesting, amphibian feeding and floral species at risk were impacted the least, each only being impacted over approximately 28 functional hectares. A wider range of habitat types are important for these functions, and they were presumably less impacted by the high loss rate of shallow open water and willow horsetail sedge.

It should be noted that Table 4 only presents general groupings (e.g., fauna and flora species at risk functions are one category). A more detailed breakdown of species included within these categories is provided in the NPS (2018b) Wetland Function Assessment report. There were 19 faunal Species at Risk (SAR) incorporated into the model (7 butterflies, 1 dragonfly, 1 amphibian, 2 bats, 8 birds) of which eight species (listed in Table 3 of the report) are also indicator species for wetland function. Similarly, there are 11 floral SAR listed in Table 4 of the NPS (2018b) report, which also includes their status rankings. These were all accounted for in the assessment although only the overall general score/assessment is shown in Table 4 for brevity.

4.0 Wetland Offsets

4.1 Scoping and Reconnaissance

4.1.1 Proximity Zones

Beginning in 2014, DUC and BCH undertook a stratified approach to develop lists and maps of wetland mitigation opportunities in four nested proximity zones, from highest to least priority: within the Project footprint, in the Peace River valley within 1 km of the Project, in the Peace Lowland Ecosection, and in the remainder of BC.

4.1.1.1 ***Within the footprint of the Site C Project.*** In 2013, BCH identified three areas with potential for wetland offset development. These included Wilder Creek, an island in the Peace River near Watson Slough, and a site downstream of the proposed dam (Area A), along the south bank of the Peace River. DUC evaluated the feasibility of the sites at Wilder Creek and the island and determined that there would be significant challenges with maintaining stable wetland water levels and dam integrity under the conditions of fluctuating water levels and erosive forces of the Site C reservoir. The cost estimates were also too high on a cost/unit area basis. DUC also evaluated the feasibility for a portion of Area A to be transformed into wetland habitat once the area was fully mined for material for the dam construction. This assessment determined that this would be a good candidate for a wetland offset site. The construction of these wetlands is currently underway.

4.1.1.2 ***Within 1 km of the Project.*** BCH completed extensive mapping of the habitats within 1 km of the Project, and DUC evaluated these habitats, but unfortunately, there were no sites that were feasible from both a biological and engineering perspective.

4.1.1.3 ***Within the Peace Lowland Ecosection of British Columbia (BC).*** With a larger landscape to consider, multiple opportunities were identified. In 2015, DUC identified 22 high potential wetland mitigation sites within a corridor along part of the Peace River. Sites with potential for wetland restoration or enhancement were selected using orthographic imagery and Lidar contour data at 5 m intervals. Nine of the 22 sites were chosen for further investigation in the 2015 field season. In 2015, BCH and DUC flew these nine sites to document spring runoff conditions with vertical and oblique aerial photographs. Some sites were eliminated as potential wetland mitigation sites as they didn't appear to be significant depressions (contour line errors). During the subsequent years, these sites along with additional sites were investigated for feasibility. The Golata proposal was the first offset proposal submitted to BCH in 2017 and was constructed in 2019.

DUC has constructed and continues to manage about 70 wetland sites in the Peace Lowland Ecosection. These potential offset sites were reviewed to identify potential opportunities for reconstruction (where existing agreements were close to or had expired and/or where infrastructure needed replacement) or where existing wetland sites had the opportunity for further enhancement, securement, or expansion.

4.1.1.4 ***Remainder of BC.*** For the BC Interior and Coastal areas, sites were chosen by reviewing DUC files of recent wetland reconnaissance, historically identified potential wetland sites, and a list of current DUC wetland sites which have infrastructure such as water controls in need of rebuilding in the near future. The sites were inspected using satellite imagery mapping with site attributes such as land ownership and existing water licenses and land uses identified. Combined with DUC knowledge of the local area to assess each site's feasibility for mitigation, an Excel database with

attributes such as location, description, ownership, ecosection, wetland type and size, type of habitat intervention and success probability was populated for each site. Several sites were identified for potential mitigation outside of the Peace Region in 2015. Since then, particularly in 2024, additional wetlands have been reviewed outside of the Peace Lowland ecosection with some potential opportunities identified.

4.1.2 Desktop Review

The Peace region files were reviewed to produce an annotated list and map of potential mitigation sites relevant to the Project. Since the late 1960s, DUC has maintained files of potential sites investigated through an active reconnaissance program and ongoing referrals. In each priority zone, DUC used its library of wetland reconnaissance data, various habitat information sources (including historical waterfowl capability maps) and waterfowl population data to identify potential mitigation sites for the Project. This desktop review included:

- Land ownership, (i.e., prioritization of Crown Land due to challenges associated with restoring aboriginal land use functions)
- Conservation land status (if applicable)
- Biological valuation criteria (i.e., critical habitat, Canada Land Inventory Capability for waterfowl, trumpeter swan presence, fish presence, waterfowl/waterbird predictive model)
- BC Freshwater Atlas status
- BC Crown land tenures
- First Nations interests
- Previous reconnaissance information (i.e., date, potential size, ecological or development issues).

4.1.3 Field Assessment

DUC advanced 44 sites after an initial desktop reconnaissance stage to a more detailed assessment, and conducted field evaluations (reconnaissance and assessment) to gather the following information:

- Wetland type
- Access
- Ecological values (i.e., bird presence, productivity indicators, fish and amphibian presence)
- Functional enhancement potential (i.e. wildlife values, plant values, First Nations values, other socioeconomic or community issues, fish potential)
- Human impacts (i.e., mining, forestry, LNG, oil/gas, urban)
- Other limiting factor(s)
- Potential for land securement
- Feasibility / likelihood of success.

4.1.4 Sites Investigated and Selected

Table 5 presents potential offset wetland sites that have been investigated since 2015. A number of sites were considered and investigated. Many were rejected as they were determined to not be feasible for offsetting for various reasons (i.e., engineering feasibility, biological feasibility, cost, land securement, etc.).

Upon confirmation of continued interest by landowners and agreement from BCH, DUC investigated, followed up, and advanced some sites by developing detailed construction/mitigation plans to improve the function of existing wetlands, create new wetland habitats and revitalize existing sites.

To date, five locations were designed, secured, approved by regulatory authorities, and fully constructed, and another site (Area A) is currently underway.

4.1.5 Long-term Protection

Best practices for wetland and biodiversity offsetting require that the benefits generated from compensation sites endure for at least as long as Project impacts. For Site C, some offsets are only intended to provide short- and/or medium-term mitigation. However, the ecological benefits of wetland compensation are intended to last for the life of the Project. BC Hydro employed two measures to ensure such durability: legal security and funding security.

BC Hydro considered several approaches to obtaining permanent legal security for their compensation sites. This included consideration of approaches such as the delineation of reserves or special management zones, purchase of private lands and/or transfer of ownership of BC Hydro's non-operational surplus lands to conservation groups, and purchase of conservation easements on private lands.

For most of the wetland rebuilds conducted by DUC (Table 2), compensation sites were located on public lands (i.e., provincial crown land) which helped to mitigate impacts to the current use of lands and resources by Aboriginal people (e.g., FDS 11.4.4). Legal security was obtained through a conservation covenant (e.g., Golata), statutory right-of-way (e.g., Cutbank), License of Occupation (e.g., Area A), or Conservation Agreement with the (provincial) Crown (aka. Crown Protocol Agreement) combined with a Water Licence (e.g., Doig-Beatton, Scott Lake).

The long-term maintenance costs of each of the compensatory projects will be covered via funding that BC Hydro has provided into an endowment fund attached to the projects.

4.2 Habitat Offsetting Methods

There are several approaches to wetland habitat offsetting. Only the ones considered for the Project are discussed in this Plan as not all methods were feasible for implementation at Site C. Methods selected were based on efficiency, biological effectiveness, engineering feasibility, location, timing, cost, and capability to meet or exceed regulatory requirements.

The overall objective of any wetland compensation program is to replace wetland losses in terms of class, size, and function as close as possible to its original location. Ideally, any replacement would equal or exceed any losses. Realistically, this expectation is near-impossible for a project on a scale of magnitude and size as Site C. As such, four approaches for wetland offsetting were considered for the Project and are discussed within this Plan, each with varying probabilities of success (success being defined as a functional wetland within a reasonable time frame).

The mitigation in this Plan must offset for a specified size and function of impacted wetlands. Some of the approaches below are more suited to this requirement. For example, wetland restoration and creation

approaches lend themselves to clear and easily calculated offset sizes and functions. However, enhancement and protection benefits are not easily calculated so the amount of offsetting credit can be subjective. For this Plan, wetland restoration and creation approaches were mainly conducted.

4.2.1 Wetland Restoration

The approach with the highest probability of success is to restore a previously drained wetland. By installing small water controls or dams into a drained wetland, the site's historic hydrology can often be restored. Unless the area has been excessively altered (i.e., via deep excavation or water source diversion), the resulting basin would be expected to hold water. The seedbank of wetland plants will still have components intact, resulting in relatively rapid revegetation by wetland plants. A fully functional wetland can be expected in a relatively short time frame, within a few years. From a compensatory offset perspective, this is attractive because the probability of success is high and the resulting wetland area represents true 'additionality' by introducing a net wetland gain to the landscape. Additionality is the requirement that a habitat offset site must provide habitat that would not have existed without the compensation work being completed. These are usually sustainable, although in some cases regular management and monitoring is required to maintain function, particularly where beavers are active and/or infrastructure is complex. The cost-effectiveness of these types of offset sites is variable, depending on construction costs, complexity of water control structures, licensing and monitoring requirements, and annual maintenance requirements.

4.2.2 Wetland Creation

Wetland creation is the construction of an artificial wetland in an area where no wetland previously existed. As an example, excavating a wetland, establishing suitable organic soil substrate, creating an appropriate and sustainable hydrologic regime, and vegetating the area with native wetland plants is usually the most expensive and likely has the lowest probability of success of the four mitigation tools. Where it can be useful, however, is mitigating existing disturbed (non-wetland) areas such as borrow pits. In this example, the cost of excavation is no longer part of the mitigation economics and by creating irregular shorelines, re-dressing shorelines to a moderate slope, and redistributing salvaged topsoil along the slopes and bottom, one can dramatically increase the borrow pit's habitat potential. While it will still take years to evolve, ultimately a more useful habitat will result. In this case, sustainability is expected to be very good once vegetation is established. Cost-effectiveness is improved when the majority of expenses are part of the original construction project that created the borrow pit.

4.2.3 Wetland Enhancement

Wetland enhancement within the terms of this Plan is defined as: (1) increasing the size and depth of an existing wetland through the construction of a small dam or excavation, or (2) improving the condition or 'quality' of an existing wetland through altered management, sometimes involving the uplands surrounding it. In the former case, a shallow or temporary wetland could be dammed to create a deeper wetland, which would retain most values and functions of the shallower wetland while becoming larger and more permanent. The existing vegetation is in place to vegetate the new shoreline and flooded areas, contributing to a higher probability of success. From a compensatory offset perspective, this is attractive because the probability of success is high, and the resulting wetland area represents true 'additionality' by introducing a net wetland gain to the landscape. In the latter case, an existing wetland with high levels of anthropogenic impact (i.e., poor livestock management, cultivation in the riparian and upland buffer zones, urban development, etc.) could be improved by altering the surrounding landscape. The probability of success is still high, but it doesn't necessarily result in additional wetland area. As with restoration, sustainability is generally good and cost-effectiveness is variable, depending on construction costs,

complexity of structures and annual maintenance requirements.

4.2.4 Wetland Protection

Wetland protection is the prevention or control of certain or all activities that could have a negative influence on a wetland, via conservation easement or covenant on private lands, or via legislation or land use policy changes on Crown lands. Conservation agreements and water licenses are applicable on Crown lands but unfortunately can also be abandoned by the Crown if they wish (e.g., due to policy change). The value of wetland protection depends upon the degree of threat to the wetland and the value to society and/or ecosystems the wetland contributes. From a compensatory perspective, wetland protection does not contribute new additional area to the landscape. However, it may prevent the degradation or loss of habitat in the face of an otherwise unavoidable threat. For example, a wetland contributing to rare and endangered species and biodiversity, which is under imminent threat of drainage and destruction, would have value as a compensation wetland if protected, thereby providing additionality through 'avoided loss.' Avoided loss is the practice of compensating for habitat loss by preventing future losses. This involves protecting habitat that is already present to avoid the loss in the future.

Sustainability is expected to be very good for the duration of the agreement and/or policy changes that generated the protected status. Cost-effectiveness is very good if easements are low cost, or if the costs of policy change are borne by government staff as part of their regular objectives. Paid easements on private land, costs of land purchase, and requests for extensive supporting information can reduce the cost-effectiveness of wetland protection. However, the cost of preventing wetland drainage and degradation is almost always less expensive than the cost of wetland restoration.

4.3 Challenges in Site Selection

Based on past experience, there are challenges in finding appropriate sites for conservation offsets due to the following two factors:

i. BC is mostly Crown Land, but provincial land securement policies favour compensation delivery on private lands. In BC approximately 94% of land is owned by the Crown, and there are limited tools and mechanisms through which offsets can be achieved in perpetuity on these public lands. Because of this, most offsetting activities and potential sites occur on private lands, but the purchase costs associated with acquiring interests in private land tenures often make it prohibitively expensive to obtain.

ii. Restrictions on agricultural land within Agricultural Land Reserve: While agricultural producers can be important conservation partners, the limited private land base in BC is also sought by agricultural interests making it challenging to pursue some lands as candidate sites for conservation allowances.

Table 5. Wetlands investigated in the field as potential offset sites for Site C.

ID	Name	Proximity Zone *	Year First Assessed	Status	Potential Size (ha)	Primary Ownership
1	Wilder Creek	1	2015	Rejected	11	Crown
2	Watson Slough				13	
3	Fox Slough / Jarnagin	3	2017		49	
4	Ardills Ranch				17	Private
5	McKnight Property			Rejected	100	
6	Tompkins Property			Rejected	<10	
7	Golata Canyon Ranch			COMPLETED	50	
8	Gilpin Property			Rejected	<10	
9	Coplin Creek Wetlands		2018		25	Crown
10	BCH Area A	1		IN PROGRESS	36	
11	Cecil Lake Govt Reserve Lake	3		Rejected	100	
12	Cecil Lake Grazing Reserve Pond				20	
13	Sunset Lake				10	
14	Jackfish Lake Roadside Marsh				15	
15	Windy Creek Marsh				115	
16	Graveyard Creek Wetland				75	
17	Farrell Creek Pasture				8	Private
18	Farrell Pasture Marsh		2019		10	Crown
19	Inga Lake				33	
20	Doig Beatton West			COMPLETED	20	
21	Doig Beatton East			COMPLETED	21	
22	Moonlight Lake			Rejected	70	
23	Scott Lake			COMPLETED	27	
24	Favel's Creek Marsh			Potential	25	
25	Cutbank Lake			COMPLETED	152	
26	Trapping Lake			Rejected	23	
27	Septimus Marsh		2020	Needs further assessment	15	
28	Marsh 2100				15	
29	Boucher Lake				112	
30	Upper Cache Beaver Ponds				30	
31	LP/Tembec Wetland				15	
32	West Bond Marsh				20	
33	Sukunka F.S.R. Marsh		2021	Rejected	<10	Private
34	Wilson Property				20	
35	Loiselle Property		2022	Potential	3	
36	Halfway River FN/ARC		2024	Rejected	150	
37	West Mo Wetlands			Needs further assessment	TBD	Crown
38	Wilde Lake			Potential	9	
39	Ocock Marshes	4		Needs further assessment	60	
40	Blue Mountain				60	Private
41	Cale Creek Marsh				40	
42	Burnstead Meadow				80	
43	West Reid Lake				40	
44	Kragt Property				25	

*1: Within the footprint of the Site C Project, 2: Within 1 km of the Project, 3: Within the Peace Lowland Ecosection of British Columbia, 4: Remainder of BC. Defined in detail above in Section 4.1.

DUC addresses these challenges in two ways:

i. DUC prioritizes search effort for wetland compensation opportunities in the Peace Region (Proximity Zones 1-3) but if required, will expand the search to other parts of BC (Proximity Zone 4). Zones 1 to 3 were prioritized to maximize the similarity in ecological functions between impacted and compensated wetlands (i.e., ecological equivalency). Ecological equivalency is a required consideration for biodiversity compensation according to BC Environmental Mitigation Procedures (2014) and the federal Operational Framework for Use of Conservation Allowances (2012). DUC received approval from BCH to explore opportunities in the Prince George area (Omineca Region) if necessary which was agreed to by the regulators. This area is ecologically different from the Peace Region, but potential opportunities to make meaningful contributions to wetland availability exist in that region.

ii. DUC manages many wetland sites in the Peace Region with engineered water control structures, but many of these are aging and require to be either rebuilt or be decommissioned and the land returned to its original state[7]. In the absence of external investment, DUC is sometimes required to return constructed wetlands to what would essentially be their pre-construction condition. Therefore, as part of the Plan, DUC will request that BCH provide the funding necessary to replace aging infrastructure on a selection of DUC-constructed wetlands, which typically have a 30-year lifespan. As with other wetland construction sites that serve as compensation for the Project, BCH's compensation obligation will persist for the lifespan of Site C's disturbance. This approach has several advantages, including a known high likelihood of success. This approach was approved by BCH and the VWTC as it satisfied several requirements for a compensation offset program, including avoided loss, additionality and ecological equivalency. The 'rebuilds' concept was accepted by the Canadian Wildlife Service of Environment and Climate Change Canada on March 15, 2021, and by the BC Ministry of Environment and Climate Change Strategy as being suitable for wetland compensation on March 16, 2021 (see Appendices 3 and 4 respectively). This approach was not the sole mechanism for achieving offsets but one in which DUC was able to develop rebuild proposals for BCH to review including map(s), photos, design plans and cost estimates.

4.4 Incorporation of Rebuilds into Mitigation Plan

The rebuilding (and maintenance) of the wetland controls will result in the avoided loss of wetlands (i.e., additionality) in a quantity that is roughly equivalent to the difference in wetland area between the fully constructed condition and the pre- construction condition. This is the additional wetland area for which BCH will receive credit.

[7]Although technically water control infrastructure can be transferred to the landowner who may choose to replace the infrastructure, most of the sites that serve as Site C compensation have infrastructure on Crown land and typically the Province would not accept that transfer and the associated liability.

4.4.1 Calculation of Additionality for Rebuilds

The following steps are used to calculate area additionality of a reconstructed wetland (DUC, 2021):

i. Compile all available pre- and post-construction engineering information and design tools, including diagrams and plans.

ii. Calculate the vertical drop in water level that would be associated with structure removal, in one of two ways, listed in decreasing order of preference:

   a. Using the as-built engineering diagrams, assess the difference between FSL of the structure and the Natural Invert of the basin;

   b. If as-built drawings contain insufficient information to accurately estimate as above, the water license usually indicates the water volume stored by structure. The volume change can be combined with the known Constructed Area of the wetland to calculate the vertical drop associated with cancelling the water license.

iii. Consult the engineering Area Capacity Curve for the wetland, which shows the relationship between elevation, wetland area and water volume capacity, and use it to determine the Constructed Area and the Residual Area of the wetland following removal of the structure. For example, the Area Capacity Curve was used for the Doig Beatton West marsh (Figure 3) to determine that the FSL was 49.25 m and the Natural Invert Level was 48.3 m, corresponding to a Area of 17.3 ha and a Residual Area of 1.85 ha[8]. If an Area Capacity Curve is not available, bathymetry maps can be used.

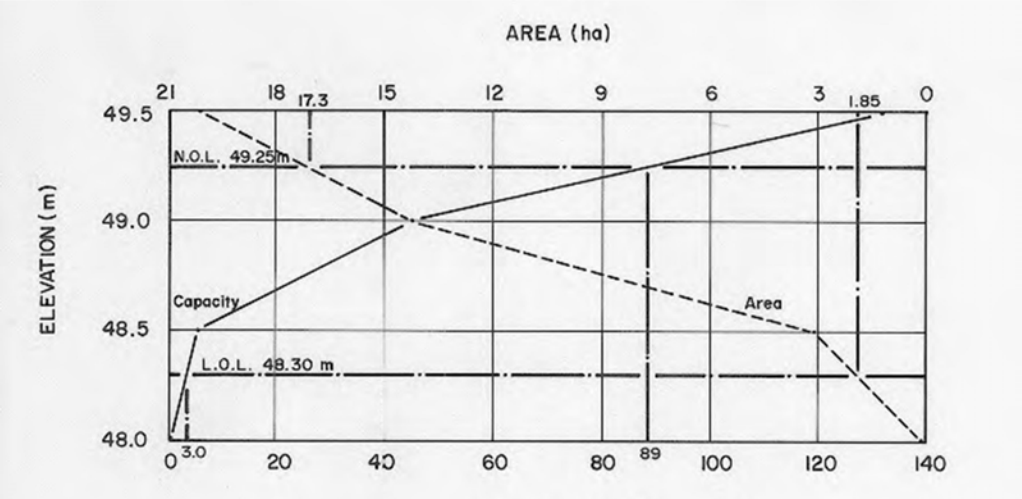

Figure 3. *In the Area Capacity Curve for the Doig Beatton West Marsh site. Normal Operating Level (NOL) is synonymous with Full Supply Level (FSL) (DUC, 2021).*

iv. Calculate the Avoided Loss Ratio (ALR) using the following formula and the estimates of Constructed Area and Residual Area from Step 3:

[8] This is meant as an example and was based on unfinalized design plans – the areas were updated and are presented in Table 9 for Doig-Beatton West Marsh.

v. Refine the estimate of the constructed area of the wetland using recent aerial imagery if available and there is an obvious discrepancy.

$$ALR = \frac{(Constructed\ Area - Residual\ Area)}{Constructed\ Area}$$

vi. Multiply the refined constructed area estimate by the ALR to calculate the avoided loss (i.e., additionality).

Use of the ALR ratio is required because aerial imagery usually cannot be used for making direct comparisons of the pre-construction and post-construction wetland area. Imagery for the earlier time period, if available, may represent a different season than when imagery was collected for the post-construction wetland (i.e., high water versus low water periods), and is typically collected at a small scale, in black and white, and at low resolution.

4.4.2 Incremental Benefits of Rebuilds

The incremental benefits of each rebuild are calculated based on the additionality of wetland areas, broken into wetland types. The WFA (Section 3.0) is then used to calculate the additionality of each wetland function, reflecting the eligible compensation benefits for that offset.

The incremental benefits of each offset vary according to the avoided loss percentage and offset size. As shown in Table 6, the avoided loss of the completed offsets so far range from 30% to 95% with offset size ranging from 22 to 169 ha. This has resulted in a range of incremental benefits from 20 ha to 152 ha per site.

Table 6. Constructed area, avoided loss ratio and incremental area applying completed DUC offset sites

Completed Rebuild Site	Total Constructed Area (ha)	Avoided Loss Ratio	Area of Incremental Benefit (ha)
Doig-Beatton East Marsh	22.3	0.95	21.2
Doig-Beatton West Marsh	22.2	0.9	20.0
Cutbank Lake	169.2	0.9	152.3
Scott Lake	88.2	0.3	26.5

4.5 Completed Offset Sites

As of 2026, five compensatory habitat offset sites have been completed by DUC: Golata Canyon Ranch Wetlands, Doig-Beatton East Marsh, Doig-Beatton West Marsh, Cutbank Lake and Scott Lake. DUC delivered the construction of these offsets under separate agreements. Area A is an additional offset designed by DUC and currently under construction by a BCH contractor. The compensation sites include a combination of newly excavated wetlands, earthen ditch plugs, restoration of drained wetlands, and the rebuilding of existing DUC wetland habitat sites that would have otherwise been decommissioned and lost from the ecological landscape.

Although the completed offset sites are diverse, there are some similarities amongst all the sites. These sites all lie within a productive waterfowl area in the Peace River parklands that overlaps both the Pacific and Central Flyways. The surrounding areas all support a variety of habitat types, including pasture, hay lands, deciduous and mixed wood forests, and shrublands. The completed offset sites all have little fish value due to their hydrologic isolation, position in the watersheds and shallow water depth. The completed offset sites all provide important habitats in a greatly impacted landscape - this region is heavily impacted by agricultural activities, and continued expansion of upland clearing for pasture and haying operations is modifying the watersheds and wetlands. Permanent and seasonal water are lacking. Additionally, the oil and gas sector is putting increased pressure on wetlands through water extraction. These offset sites all provide valuable permanent wetland habitat to the region.

4.5.1 Golata Canyon Ranch Wetlands

Summary

The Golata Canyon Ranch Wetlands are located 40 km east/southeast of Fort St. John, BC and were constructed in 2019. DUC completed construction and restoration activities on 15 basins on four land parcels privately owned by the Golata Canyon Ranch (Figure 4). The main pond (Basin 1) was a new wetland and was constructed via excavation, with a new water control weir (Figure 5). DUC also identified several other wetland basins (2-15) showing evidence of historical drainage to facilitate agricultural improvements. These wetland basins were restored using earthen ditch plugs. Prior to the restoration work, the 14 smaller basins were poorly functional, and had insufficient inundation to maintain significant populations of deep- water emergent wetland plants.

The site lies near the north bank of the Peace River and supports a variety of habitat types, including poplar shrublands, sedge meadows and open grasslands. The site consists primarily of small seasonal wetlands within a matrix of hayland and natural parkland habitats. The wetlands are dominated by sedges (*Carex* spp.) and flood-tolerant grasses. Willows (*Salix* spp.) are common in and around the wetlands. The wetlands drain through seasonal creeks into Golata Canyon or the Peace River.

A wide range of species have been observed on site, including waterfowl (mallard, northern shoveler, green-winged teal, blue-winged teal, bufflehead, ring-necked duck, goldeneye, Canada goose), shorebirds, waterbirds, a diverse songbird community and a few amphibian species. These wetlands provide habitat for waterfowl during breeding, moulting and migratory periods. Observed mammals include elk, white-tailed deer, moose, black bear, coyote, muskrat, and beaver.

Securement

DUC secured conservation water licenses under the landowner's names with DUC as the agent which ensures that the wetlands can be maintained in perpetuity. DUC also secured a 30-year conservation agreement with the landowners which gives DUC the right to maintain and manage the wetlands on behalf of BCH. Finally, DUC and BCH secured a conservation covenant on the property to protect the wetlands in perpetuity.

Figure 4. Golata Canyon Ranch wetland basins

Figure 5. Golata Canyon Ranch excavated wetland (Basin 1)

Compensation Impact

This offset resulted in a total of 49.6 ha eligible for offset. Of those, 35.3 ha were classified as "sedge wetlands," 11.0 ha classified as "sedge-willow wetlands," and 3.3 ha classified as "shallow open water wetlands." These wetlands replaced a variety of functions lost during the Project, principally related to migratory birds and amphibian habitat. Some bat functions, species at risk, floral and aboriginal use functions were also provided (Table 7).

Table 7. Site C wetland functional losses compared to functional gains from Golata Canyon Ranch offset

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	15.1	56
	Migratory Birds - Broods	59.1	8.5	14
	Migratory Birds - Feeding	54.3	10.6	20
	Migratory Birds - Migration	63.9	6.5	10
	Amphibian - Breeding	44.6	10.6	24
	Amphibian - Feeding	28.8	6.6	23
	Amphibian - Hibernation	85.6	4.8	6
	Bats - Feeding	34.7	5.0	14
	Bats - Roosting	62.1	4.1	7
	Species At Risk	43.5	9.0	21
Floral	Prim/Sec Species Preference	27.7	3.7	13
First Nations	Aboriginal Use	34.0	n/a	n/a

4.5.2 Doig-Beatton East Marsh

Summary

Doig-Beatton East Marsh is located 65 km northeast of Fort St. John, BC (in the benchland between the Doig and Beatton rivers) and was constructed in 2022 (Figure 6). The marsh is located on a crown land grazing reserve and was an existing DUC wetland that had reached its life expectancy and was going to be decommissioned. DUC removed the existing half-round culvert drop- inlet control structure and replaced it with a new sheet pile weir, along with a new downstream culvert crossing.

The marsh is primarily a cattail wetland, with minor components of sedge and hydrophilic grasses, and a thin willow fringe. Uplands are mature aspen. The wetland drains through a seasonal creek into the Beatton River. The wetland is also used as an important water source for cattle and therefore the Beatton-Doig Livestock Grazing Association (BDLGA) were in favour of the offset, as it improved water permanence in the basin (Figure 7).

The wetland provides an attraction for spring and fall migrants of Canada goose, mallard, American wigeon, gadwall, teal, northern pintail, northern shoveler, scaup, ring-necked duck, bufflehead, goldeneye and ruddy duck. Many of these remain on the marsh to breed. Other notable birds include dowitchers, yellowlegs, blackbirds, grebes and sandpipers. The marsh areas are also used by other wildlife, such as beavers, moose, bear and deer.

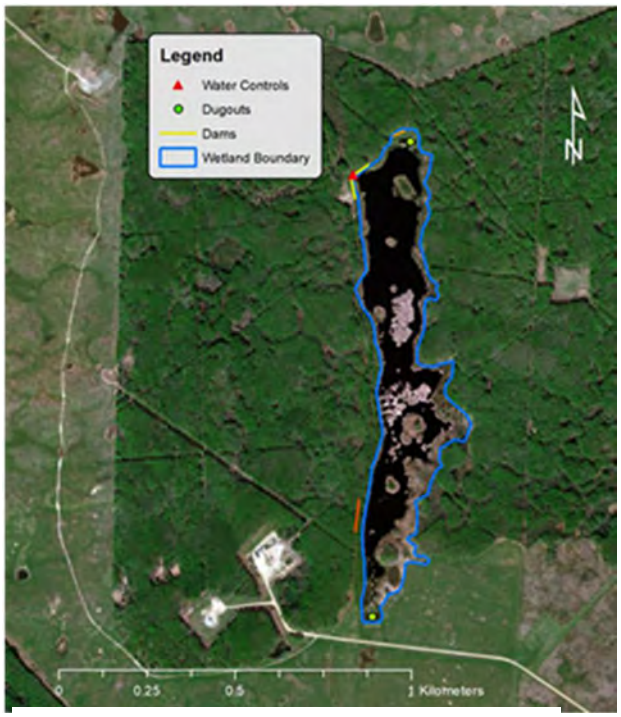

Figure 6. *Doig-Beatton East Marsh wetland basin*

Figure 7. *Looking south over Doig-Beatton East Marsh*

Securement

DUC maintained a conservation water license under the province's name in cooperation with DUC which ensures that the wetland can be maintained in perpetuity. The water license is accompanied by a Permit to occupy Crown Land with no expiry date. DUC also secured a 30-year conservation agreement with the BDLGA which gave DUC the right to maintain and manage the wetland on behalf of BCH.

Compensation Impact

This offset resulted in a total of 21.2 ha eligible for offset. Of those, 12.3 ha was classified as "shallow open water wetlands," 6.9 ha classified as "sedge wetlands" and 2.0 ha classified as "sedge-willow wetlands." The rebuild resulted in the avoided loss of 95% of the entire 22.3 ha wetland. This wetland replaced a variety of functions lost during the Project, principally related to migratory birds and amphibian habitat. Some bat functions, species at risk, floral and aboriginal use functions were also provided (Table 8).

Table 8. Site C wetland functional losses compared to functional gains from Doig-Beatton East offset

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	2.9	11
	Migratory Birds - Broods	59.1	8.2	14
	Migratory Birds - Feeding	54.3	6.7	12
	Migratory Birds - Migration	63.9	7.2	11
	Amphibian - Breeding	44.6	5.0	11
	Amphibian - Feeding	28.8	1.3	5
	Amphibian - Hibernation	85.6	4.8	6
	Bats - Feeding	34.7	2.1	6
	Bats - Roosting	62.1	0.8	1
	Species At Risk	43.5	2.7	6
Floral	Primary/Secondary Species Preference	27.7	0.7	3
First Nations	Aboriginal Use	34.0	0.8	2

4.5.3 Doig-Beatton West Marsh

Summary

Doig-Beatton West Marsh is located 65 km northeast of Fort St. John, BC (in the benchland between the Doig and Beatton rivers) and was constructed in 2022 (Figure 8). The marsh is located on a crown land grazing reserve and was an existing DUC wetland that had reached its life expectancy and was going to be decommissioned. Replacement required significant upgrading to comply with new dam safety requirements, including a new spillway. DUC removed the existing sheet pile weir control structure and replaced it with a new, thicker, sheet pile weir and spillway.

The wetland is a cattail and sedge wetland with good habitat interspersion and a couple of large islands. The uplands are primarily pasture, with some mature aspen to the south. The wetland drains through a seasonal creek into the Beatton River. The wetland is also used as an important water source for cattle and therefore the BDLGA were in favour of the offset, as it improved water permanence in the basin (Figure 9).

The wetland provides an attraction for spring and fall migrants of Canada goose, mallard, American wigeon, gadwall, teal, northern pintail, northern shoveler, scaup, ring-necked duck, bufflehead, goldeneye and ruddy duck. Many of these remain on the marsh to breed. Other notable birds include dowitchers, yellowlegs, blackbirds, grebes and sandpipers. The marsh areas are also used by other wildlife, such as beavers, moose, bear and deer.

Securement

DUC maintained a conservation water license under the province's name in cooperation with DUC which ensures that the wetland can be maintained in perpetuity. The water license is accompanied by a Permit to occupy Crown Land with no expiry date. DUC also secured a 30-year conservation agreement with the BDLGA which gave DUC the right to maintain and manage the wetland on behalf of BCH.

Compensation Impact

This site resulted in a total of 20.0 ha eligible for offset. Of those, 7.5 ha were classified as "sedge wetlands," 7.4 ha classified as "shallow open water wetlands" and 5.1 ha as "sedge-willow wetlands." The rebuild resulted in the avoided loss of 90% of the entire 22.2 ha wetland. This wetland replaced a variety of functions lost during the Project, principally related to migratory birds and amphibian habitat. Some bat functions, species at risk, floral and aboriginal use functions were also provided (Table 9).

Figure 8. Looking north over Doig-Beatton West Marsh

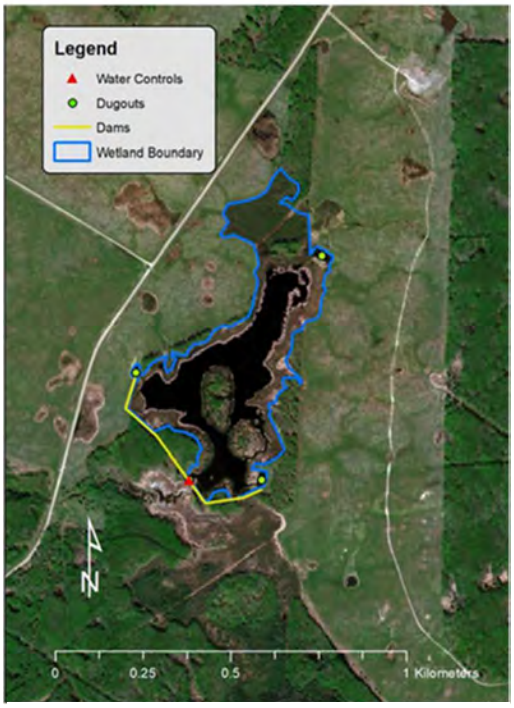

Figure 9. Doig-Beatton West Marsh wetland basin

Table 9. Site C wetland functional losses compared to functional gains from Doig-Beatton West offset

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	3.5	13
	Migratory Birds - Broods	59.1	5.6	9
	Migratory Birds - Feeding	54.3	5.1	9
	Migratory Birds - Migration	63.9	5.0	8
	Amphibian - Breeding	44.6	4.2	9
	Amphibian - Feeding	28.8	1.8	6
	Amphibian - Hibernation	85.6	4.2	5
	Bats - Feeding	34.7	2.0	6
	Bats - Roosting	62.1	1.9	3
	Species At Risk	43.5	2.6	6
Floral	Primary/Secondary Species Preference	27.7	0.9	3
First Nations	Aboriginal Use	34.0	1.4	4

4.5.4 Cutbank Lake

Summary

Cutbank Lake is located 55 km south of Dawson Creek, BC and was constructed in 2022 (Figure 10). Most of the wetland is located on provincial crown land, but the control structure is situated on a private land parcel. This site was an existing DUC wetland; the water control had reached its life expectancy and was going to be decommissioned. Replacement required significant upgrading to comply with new dam safety requirements, including a new spillway (rock chute). DUC constructed a new water control in front of the existing control and pulled out the old controls. The original weir was replaced with a thicker steel weir and stoplog bay.

Cutbank Lake is a shallow, permanent wetland located near the edge of an agricultural area. The lake receives water from Cutbank Creek and local runoff during freshet. The wetland is dominated by sedges, cattail, bulrush and flood-tolerant grasses. Willows are common around the wetland, and there is an extensive wet shrubland zone around almost the entire lake.

Figure 10*. Aerial view of Cutbank Lake wetland basin*

This wetland provides attractive breeding and migration habitat for many species of waterfowl, including mallard, American wigeon, green and blue-winged teal, shoveler, gadwall, scaup, ring-necked duck, bufflehead, Barrow's goldeneye, Canada goose and trumpeter swan. All these species occur in large numbers during spring and fall migration, and we also expect some moulting and staging use of the large pond. An eared grebe colony of 50-100 pairs is also present of which there are only a few known sites in northern BC. A wide range of other species have been observed on site, including shorebirds, waterbirds, a diverse songbird community and a few amphibian species. Observed mammals include muskrat, beaver, mink, mule deer and moose.

In the past, the wetland had operated as a reservoir, fluctuating as water was required for downstream rancher use, but this unlicensed use was abandoned when DUC's wetland was established (Figure 11).

Figure 11. *Cutbank Lake wetland basin looking east*

Securement

A Statutory Right-of-Way (SRW) / conservation agreement was signed with the landowners of the 'control parcel' to ensure the ability of DUC to rebuild and maintain the controls. The SRW has also been registered on the respective land title to ensure the wetland is secured in perpetuity. The landowners also transferred the water license to DUC via the permanent SRW which allows for access, monitoring and maintenance of the structure in perpetuity.

Compensation Impact

This site resulted in a total of 152.3 ha eligible for offset. Of those, 80.8 ha were classified as "shallow open water wetlands," 63.9 ha classified as "sedge-willow wetlands" and 7.6 ha classified as "sedge wetlands." The rebuild resulted in the avoided loss of 90% of the entire 169.2 ha wetland. This wetland replaced a variety of functions lost during the Project, principally related to migratory birds, amphibian habitat, bat habitat, species at risk and aboriginal use. Some floral functions were also provided (Table 10).

Table 10. Wetland functional losses from Site C compared to functional gains from the Cutbank Lake offset

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	9.9	36
	Migratory Birds - Broods	59.1	46.9	79
	Migratory Birds - Feeding	54.3	37.8	70
	Migratory Birds - Migration	63.9	46.5	73
	Amphibian - Breeding	44.6	27.4	61
	Amphibian - Feeding	28.8	10.2	35
	Amphibian - Hibernation	85.6	48.2	56
	Bats - Feeding	34.7	16.3	47
	Bats - Roosting	62.1	24.0	39
	Species At Risk	43.5	12.0	28
Floral	Primary/Secondary Species Preference	27.7	3.4	12
First Nations	Aboriginal Use	34.0	11.9	35

4.5.5 Scott Lake

Summary

Scott Lake is located 50 km west of Dawson Creek, BC and was constructed in 2023 (Figure 12). Most of the wetland and the control structure are located on crown land but a small portion of the basin is located on two private parcels. This site was an existing DUC wetland where the water control had reached its life expectancy and was going to be decommissioned. Replacement required significant upgrading to comply with new dam safety requirements, including the installation of a large rock chute. To access the site, a large culvert was replaced downstream of the wetland outlet and was reinforced with erosion and sediment controls.

Scott Lake is a shallow open water wetland basin with an average depth of about a metre, and a maximum depth of only 1.8 m. The wetland receives water from Wangler Creek, an unnamed stream and local runoff during freshet. The basin drains into Wangler Creek and then into Sunset Creek, which is fish-bearing, greater than 5km downstream of the wetland outlet. The wetland is dominated by sedges and flood-tolerant

grasses, with wider sedge band at the east and west ends. Farther upland, there is a narrower wet shrubland zone around almost the entire wetland. The surrounding uplands are dominated by aspen and mixed wood (aspen-spruce-fir) forest, and shrublands (Figure 13).

The wetlands in this area are mainly shallow lakes or sloughs and are generally very productive for waterfowl, supporting dabbling ducks, diving ducks, Canada geese and trumpeter swans, including at least one pair that breeds regularly. This shallowness provides ample feeding areas. All these species occur in large numbers during spring and fall migration, and we also expect some moulting and staging use. Grebes have been noted, although there does not appear to be an active colony at present. A wide range of other species have been observed on site, including shorebirds, waterbirds, a diverse songbird community and a few amphibian species. Observed mammals include muskrat, beaver, mink, mule deer and moose.

Figure 12. *Looking north over Scott Lake*

Figure 13. *Scott Lake wetland basin*

Securement

DUC maintained a conservation water license under the province's name in cooperation with DUC which ensures that the wetland can be maintained in perpetuity. The water license is accompanied by a Permit to occupy Crown Land with no expiry date. DUC also secured a 30-year conservation agreement with the Provincial Crown to ensure the ability of DUC to maintain and manage the wetland on behalf of BCH.

Compensation Impact

This site resulted in a total of 26.4 ha eligible for offset. Of those, 17.9 ha were classified as "shallow open water wetland," 4.6 ha classified as "sedge-willow wetland," 2.1 ha classified as "tamarack-sedge wetland," and 1.8 ha classified as "sedge wetlands." The rebuild resulted in the avoided loss of 30% of the entire 88.2 ha wetland and replaced a variety of functions lost during the Project, principally related to migratory birds and amphibian habitat with some bat functions, species at risk, floral and aboriginal use functions also provided (Table 11).

Table 11. Wetland functional losses from Site C compared to functional gains from the Scott Lake offset.

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	1.4	5
	Migratory Birds - Broods	59.1	10.4	18
	Migratory Birds - Feeding	54.3	7.8	14
	Migratory Birds - Migration	63.9	9.7	15
	Amphibian - Breeding	44.6	5.5	12
	Amphibian - Feeding	28.8	1.2	4
	Amphibian - Hibernation	85.6	7.5	9
	Bats - Feeding	34.7	2.8	8
	Bats - Roosting	62.1	2.0	3
	Species At Risk	43.5	2.4	6
Floral	Primary/Secondary Species Preference	27.7	1.1	4
First Nations	Aboriginal Use	34.0	1.3	4

4.6 In-Progress Offset Site

4.6.1 Area A

Summary

Area A is situated on the Project site benchlands along the south bank of the Peace River immediately adjacent to dam and power station, encompassing approximately 200 ha in total (Figure 14). It sits on a ledge approximately 20 m above and to the south of a Peace River backchannel.

Area A was mined for granular products used in the construction of the dam and its associated infrastructure and roads, making it an ideal location for excavated wetland basins. The site is in the process of being reclaimed into functioning wetland habitat progressively as the work finishes in the various sections (Figure 15). Once reclamation work is completed, the area will be a mixture of wetlands, riparian areas, grasslands and uplands.

Area A is split into three Sections: Northeast Area, Central Area and West Area. Mining activity is being completed from east to west and reclamation is happening progressively as work finishes in one area. The Northeast Area A wetlands were the first to have the physical earth-shaping works completed at the end of 2024 with planting work still ongoing. The Central and West areas have not yet been shaped, but this should be completed in the Central Area by the end of 2025 and in the West Area by the end of 2026. Planting will take place in both areas in 2027 to complete all the wetland reclamation work.

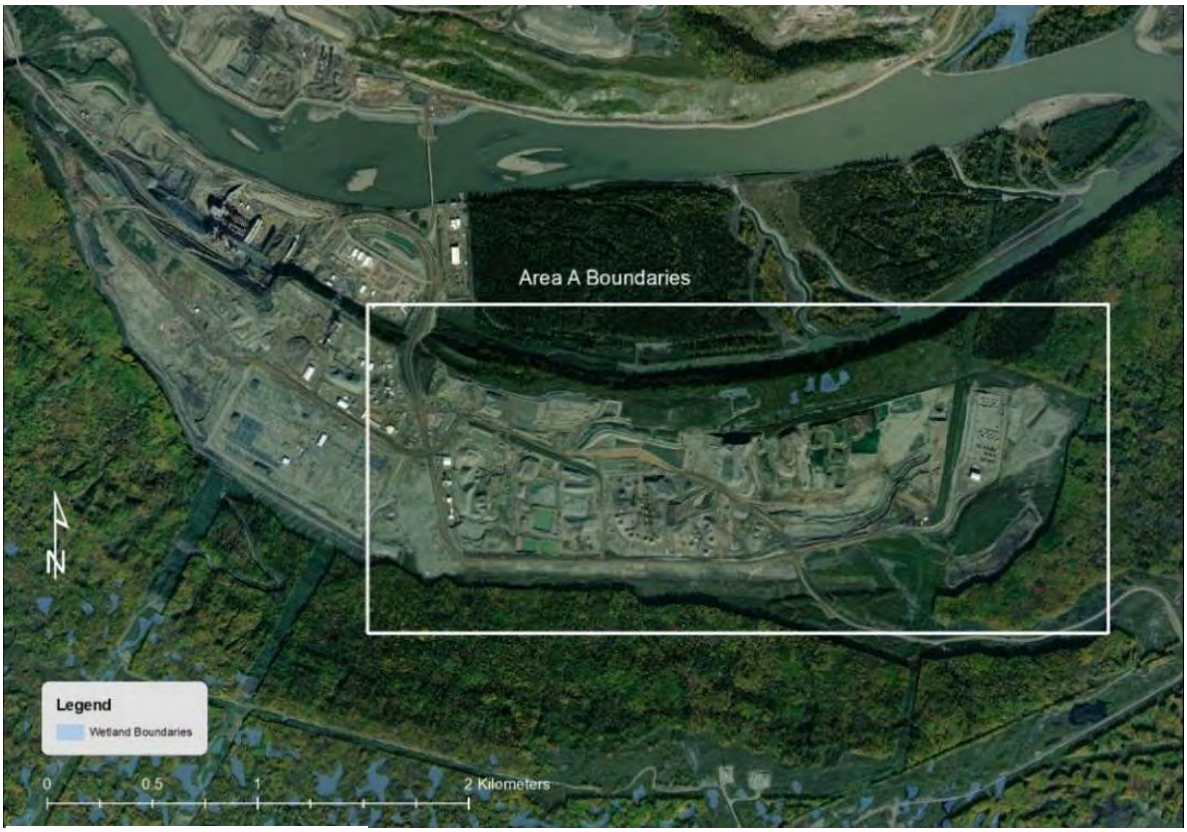

Figure 14. *Area A boundaries*

Figure 15*. Area A looking west towards the Site C dam*

Securement

BCH secured the

lands at Area A via a License of Occupation.

Compensation Impact

Physical reclamation throughout this site has included contouring, topsoil placement, ripping and furrowing, coarse woody debris placement and native grass seeding. This creates a more heterogeneous landscape providing habitat for a diverse array of wildlife while reducing potential negative effects associated with habitat homogeneity such as predator access and mobility, disease outbreaks and invasive species establishment.

Upon completion, this wetland will result in a total of 38.1ha eligible for offset. It is estimated that 21.7 ha will be classified as “shallow open water wetlands” and 16.4 ha classified as “sedge wetlands.” As of October 31, 2025, 34.4 ha have been completed at Northeast Area A and Central Area A. These wetlands will replace a variety of functions lost during the Project, principally related to migratory birds, amphibian habitat, bat habitat, and faunal species at risk. Some floral and aboriginal use functions will also be provided (Table 12).

Figure 16. *Physical reclamation within Area A Basins 1 – 3 which included contouring, topsoil placement, ripping and furrowing, coarse woody debris placement and native grass seeding. This photo was taken in August 2024 showing some of the woody debris placement.*

***Figure 17**. Aerial drone photo of Basin 3 showing the wetland created in this section with distribution of coarse woody debris. This area has also been seeded so vegetation will be expected to grow in over time. Photo taken in August 2024.*

Table 12. Wetland functional losses from Site C compared to functional gains from Area A once completed

Function Category	Function Type	Total loss (ha) due to Site C	Total gain (ha) from this offset	% of total loss offset by this site
Faunal	Migratory Birds - Nesting	27.2	6.5	24
	Migratory Birds - Broods	59.1	15.3	26
	Migratory Birds - Feeding	54.3	12.5	23
	Migratory Birds - Migration	63.9	12.9	20
	Amphibian - Breeding	44.6	9.5	21
	Amphibian - Feeding	28.8	2.3	8
	Amphibian - Hibernation	85.6	7.2	8
	Bats - Feeding	34.7	3.6	10
	Bats - Roosting	62.1	0.0	0
	Species At Risk	43.5	5.5	13
Floral	Primary/Secondary Species Preference	27.7	1.5	5
First Nations	Aboriginal Use	34.0	1.1	3

4.7 Summary of Progress of the Compensation Program

4.7.1 Wetland Area Summary

As of October 31, 2025, 269.5 ha of wetland compensation has been achieved from the five completed wetland offsets, and 34.4 ha completed from the in-progress Area A Basins (Figure 16). Therefore, the total completed mitigated hectares to date is 303.9 ha. Once Area A is completed an additional 3.7 ha will be created resulting in a final compensation total of 307.6 ha.

Compared to the 299 ha wetland impact footprint resulting from the Project and completed mitigation and in-progress offsets, the compensation program has achieved no net loss of wetland area as stipulated in FDS Conditions 11.3 and 11.4 and EAC Condition 12. However, when all wetland types are considered individually, there is a net loss of wetland area for five wetland types (Table 13).

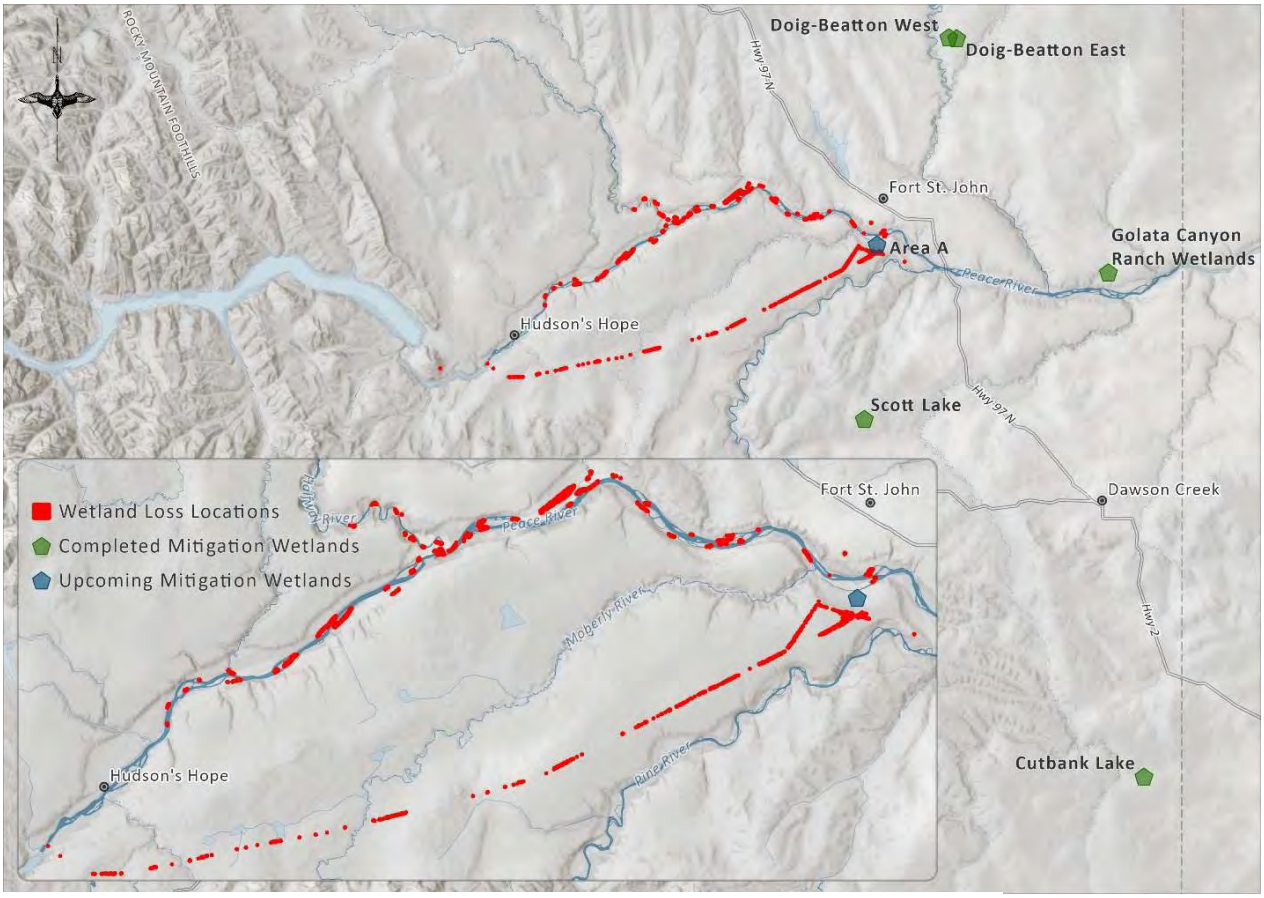

Figure 18. *Wetland loss locations from the Project, completed mitigation wetlands and in-progress or upcoming wetland offset sites.*

Table 13. Total hectare loss from the 299 ha Project Wetland Impact Footprint, total hectare gains from the completed wetland offsets to date plus the estimated gain from completed Area A showing the overall net hectare balance.

	Wetland Types (ha)								
	Labrador Tea – Sphagnum (BT:sb)	Shallow Open Water (OW)	Sedge wetland (SE)	Tamarack Sedge (TS)	Willow-Horsetail-Sedge riparian wetland (WH)	Willow Sedge wetland (WS)	Scrub Birch-Water Sedge (Wf02)	Narrow-leaved Cotton-Grass Shore Sedge (Wf13)	Overall Totals
Total losses from 299 ha Site C Wetland Impact Footprint	**9.1**	**97.3**	**20.8**	**8.8**	**125.6**	**34.0**	**2.2**	**1.3**	**299.1**
Total gain from five completed offset sites	0.0	121.7	59.1	2.1	0.0	86.6	0.0	0.0	269.5
1. Golata Canyon Ranch	0.0	3.3	35.3	0.0	0.0	11.0	0.0	0.0	49.6
2. Doig-Beatton East Marsh	0.0	12.3	6.9	0.0	0.0	2.0	0.0	0.0	21.2
3. Doig-Beatton West Marsh	0.0	7.4	7.5	0.0	0.0	5.1	0.0	0.0	20
4. Scott Lake	0.0	17.9	1.8	2.1	0.0	4.6	0.0	0.0	26.4
5. Cutbank Lake	0.0	80.8	7.6	0.0	0.0	63.9	0.0	0.0	152.3
Estimated gain from Area A once completed	0.0	21.7	16.4	0.0	0.0	0.0	0.0	0.0	38.1
Total gain from all offset sites	**0.0**	**143.4**	**75.5**	**2.1**	**0.0**	**86.6**	**0.0**	**0.0**	**307.6**
Net hectare balance (gains minus losses)	**-9.1**	**46.1**	**54.7**	**-6.7**	**-125.6**	**52.6**	**-2.2**	**-1.3**	**8.5**

4.7.2 Wetland Functional Assessment Summary

Using the WFA methodology, DUC determined the wetland functional losses for the impacted wetlands and gains from the compensation wetlands for each wetland category. Note that these are not spatial hectares, but functional hectares, which are derived by inputting the spatial hectares for each wetland type into a model accounting for wetland functions gained from the various wetland creation and restoration projects completed to date for Site C and entering the data to assess losses and gains for each wetland function.

The calculations provided in Tables 7 through 12 are summarized in Table 14 showing the net functional balance (losses vs gains) from all wetland impacts and mitigation offset sites discussed in this Plan. When compared to the Wetland Impact Footprint provided by BCH (Table 2), the compensatory work has

satisfied the general “no net loss of wetland functions” objective as stated in FDS Approval Conditions 11.3 and 11.4 and EAC Condition 12. The net functional balance row (bottom of Table 14) indicates that based on the Project Impact Footprint, there is a net positive wetland functional score of 23.3 for the program, when all functions are assigned equal weighting and totaled.

Not all wetland functions have been fully compensated by the habitat offsets. Some wetland types (i.e., sedge, open water) are easier to restore, and the functions associated with these types are therefore more readily replaced. For example, migratory bird functions and amphibian breeding functions have been fully compensated for, with a net surplus of 101.4 functional hectares.

Some functions within wetland systems will overlap. For example, amphibians and bats will still feed in breeding and roosting habitats. As wetlands mature, it is anticipated that additional functions will establish over time, likely mitigating some of the currently deficient functions.

Other wetland types (i.e., organic wetlands, bogs, fens) require several years, sometimes decades, to develop and cannot be created in a relatively short time span. Functions associated with these wetland types have a net deficit of 75.5 functional hectares. Specifically, bat roosting had the largest net loss at 29.6 ha, followed by aboriginal land use and plants that each had a net loss of approximately 17 ha. Amphibian feeding, amphibian hibernation, faunal species at risk and bat feeding also each have a net loss ranging from a few hectares up to 10 ha. More work would be needed to get closer to reaching no net loss for all wetland functions which would take several years or extend beyond the Peace and Omineca Regions and at great expense.

Based on the loss-gain accounting framework, some degree of trade-offs in functions is reasonable (BCH, 2023). Other offset programs have allowed proponents to “trade up” where deviations from like-for-like generate better environmental outcomes (i.e., when certain offsets benefit a more threatened ecosystem/species or a more limiting function than those impacted) (BBOP, 2012, IFC, 2019, SADFFE, 2023, VSG, 2023, NSW, 2025). H owever, this was not assessed for the Project.

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Table 14. Total functional hectare loss from the 299 ha Project Wetland Impact Footprint, total functional hectare gains from the completed wetland offsets to date plus the estimated functional gain from completed Area A showing overall net functional balance.

	Wetland Function Types (numerically represented as "functional hectares")												
	Wildlife												
	Migratory Birds - Nesting	Migratory Birds - Brood-rearing	Migratory Birds - Feeding	Migratory Birds - Migration	Amphibians - Breeding	Amphibians - Feeding	Amphib Hibernation	Bats - Feeding	Bats - Roosting	Species-At-Risk	Plants - Primary Secondary Species	Aboriginal Land Use	Overall Functional Balance
Total losses from 299ha Site C Wetland Impact Footprint	**27.2**	**59.1**	**54.3**	**63.9**	**44.6**	**28.8**	**85.6**	**34.7**	**62.1**	**43.5**	**27.7**	**34.0**	
Total gain from five completed offset sites	32.8	79.6	68.0	74.9	52.7	21.1	69.5	28.2	32.8	28.7	9.7	15.4	
1. Golata Canyon Ranch	15.1	8.5	10.6	6.5	10.6	6.6	4.8	5.0	4.1	9.0	3.7	n/a	
2. Doig-Beatton East Marsh	2.9	8.2	6.7	7.2	5.0	1.3	4.8	2.1	0.8	2.7	0.7	0.8	
3. Doig-Beatton West Marsh	3.5	5.6	5.1	5.0	4.2	1.8	4.2	2.0	1.9	2.6	0.9	1.4	
4. Scott Lake	1.4	10.4	7.8	9.7	5.5	1.2	7.5	2.8	2.0	2.4	1.1	1.3	
5. Cutbank Lake	9.9	46.9	37.8	46.5	27.4	10.2	48.2	16.3	24.0	12.0	3.4	11.9	
Estimated gain from Area A once completed	6.5	15.3	12.5	12.9	9.5	2.3	7.2	3.6	0.0	5.5	1.5	1.1	
Total gain from all offset sites	**39.3**	**94.9**	**80.5**	**87.8**	**62.2**	**23.4**	**76.7**	**31.8**	**32.8**	**34.2**	**11.2**	**16.5**	
Net functional balance (gains minus losses)	**12.1**	**35.8**	**26.2**	**23.9**	**17.6**	**-5.4**	**-8.9**	**-2.9**	**-29.3**	**-9.3**	**-16.5**	**-17.5**	**25.9**

5.0 Wetland Monitoring Program

As per FDS conditions 11.4.1, 11.4.3, and EAC condition 12, BC Hydro contracted EcoLogic Consultants Ltd. to conduct a wetland monitoring program which requires monitoring at two- and five- years following commencement of construction activities around a wetland.

The Program consists of two components: baseline wetland monitoring, which is focused on gathering information on the physical, ecological, biogeochemical, and hydrological conditions of wetlands prior to construction activities; and wetland monitoring during construction and operations, which focuses on gathering information to evaluate changes from baseline conditions due to Project activities.

The wetland monitoring program was developed through consultation with and review by MOECCS, MLWRS, and CWS through the VWTC. Based on the requirements for wetland monitoring described in FDS Condition 11, the monitoring program was developed to comprise the following:

- Collection of baseline data on the biogeochemical, hydrological and ecological functioning of the wetlands and associated riparian habitat in the area affected by the Project;
- An evaluation of change to baseline wetland conditions due to the Project;
- Selection of compensation measures for loss of wetland areas and functions, including reclamation, improvement, creation and protection; and
- Flexibility in the monitoring program to allow for further refinement in the characterization of baseline and affected wetlands, as data become available.

The monitoring program includes direct measures of groundwater quality and quantity, surface water quality and quantity, vegetation cover, structure and diversity, and rare plant occurrence. Wetland monitoring also includes wetland delineation to help evaluate and improve wetland mapping. Further data on biotic structure and diversity, and migratory bird and species at risk abundance, density, diversity and use is being gathered through focused monitoring plans (e.g., waterbird surveys). Baseline data regarding current use of wetlands for traditional purposes by Aboriginal people have been gathered by the BC Hydro Indigenous Relations team through ground-truthing with FN groups, who have also been gathering and compiling data regarding changes to use of wetlands for traditional purposes.

In 2022 the field program was initiated focusing on monitoring wetlands that were sampled in 2020 and 2021. That program marked the end of construction monitoring, with all program wetlands sampled. Monitoring occurred again in 2025, and by 2027 all wetlands in the monitoring program will have had a two and five-year monitoring assessment completed, which will allow for an analysis of change in wetland parameters and an assessment of the need to continue monitoring each wetland (i.e., if change is not present and/or not ongoing, then further monitoring is not likely to result in useful additional data).

A total of 128 wetlands have been assessed since the beginning of the wetland monitoring program in 2016. Starting in 2018, with the development of a standard methodology (NPS 2020), wetlands surveyed in 2016 and 2017 were re-sampled so that all data were collected in a consistent manner. As per VWMMP Baseline and Construction Phase Wetland Monitoring (NPS 2020), wetlands are sampled two years after the initial baseline assessment, then every five years after that for up to 30 years of project operations, or when no additional changes are detected. A summary of the total number of wetlands that have been sampled to date are presented in Table 14. This includes: 1) wetlands that have been re-assessed after the baseline visit; and 2) the expected number of wetlands to be sampled from 2025 to 2027. The first

year that the five-year operation monitoring assessments will be completed for all wetlands in the study will be 2027. The reservoir wetlands were only assessed during the baseline and construction period and are now inundated by the reservoir. Following year five, monitoring is scheduled to occur every five years (i.e., 10, 15, 20, etc.), up to the first 30 years of operations, to investigate further changes, if warranted.

As 2025 was the first year of Operations monitoring, no conclusions can yet be made regarding the impact of Project effects on wetlands. The wetland monitoring program annual report for 2025 is included in the 2025 Annual VWMMP Report.

Table 15. Summary of Wetlands Sampled from 2016 to 2021 and Planned Monitoring for 2021 to 2027

General Location	Pre-NPS Methodology		Baseline and/or Construction Monitoring			Construction Monitoring			Operations Monitoring			
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Downstream	-	-	-	5	-	5	-	-	-	-	5	-
Transmission Line	53	-	21	37	40	40	21	-	-	20	38	21
Reservoir	3	6	36	7	-	-	-	-	-	-	-	-
Total:	**56**	**6**	**57**	**49**	**40**	**45**	**21**	**0**	**0**	**20**	**43**	**21**

6.0 Wetland Mitigation and Compensation Program Summary

The WFA determined that there was an overall net gain in wetland functions resulting from the creation, rebuilding, and restoration of wetland habitats which has also resulted in no net loss of wetland area. The wetland compensation offsets completed to date, along with the planned works in Area A, will achieve an overall net positive outcome in both area (Table 13) and function (Table 14).

Based on these results, BC Hydro anticipates that the full implementation of all physical compensation of FDS 11 and EAC Condition 12 will be met by the end of 2027 in terms of replacing lost wetland functions and compensation in terms of area. The only remaining component will be long-term reporting under FDS 11.9, which will continue until Year 30 of operations.

References

BC Hydro (BCH). 2023. Site C Clean Energy Project Vegetation and Wildlife Compensation Accounting Framework, pg 19-23. BC Ministry of the Environment. 2014. Develop With Care.

Business and Biodiversity Offsets Programme (BBOP). 2012. Resource Paper: No Net Loss and Loss-Gain Calculations in Biodiversity Offsets, pg 4-15.

Province of British Columbia. 2014. Procedures for Mitigating Impacts on Environmental Values, pg 16-45. Ministry of Environment.

Ducks Unlimited Canada (DUC). 2021. BC Hydro Site C Clean Energy Project: Additionality for Rebuilding Aging Constructed Wetland Infrastructure, pg 1-2.

Ducks Unlimited Canada (DUC). 2025. BC Hydro Site C Clean Energy Project: Additionality for Rebuilding Aging Constructed Wetland Infrastructure, pg 1-2.

Environment Canada. 2012. Operational Framework for Use of Conservation Allowances (Cat. No. En14-77/2012E-PDF; ISBN 978-1-100-21427-6). Ottawa: Environment Canada.

Hilton, S., L. Andrusiak, R. Krichbaum, L. Simpson, and C. Bjork. 2013. Part 1 Vegetation and Ecological Communities. Terrestrial Vegetation and Wildlife Report. Site C Clean Energy Project. Report to BC Hydro, Vancouver, BC.

International Finance Corporation (IFC). 2019. Guidance Note 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources, pg 8-9.

NPS (Native Plant Solutions). 2018a. Wetland Function Assessment 2017 Monitoring Technical Memo.

NPS (Native Plant Solutions). 2018b. Assessment of Wetland Function for the Site C Clean Energy Project. Prepared for BC Hydro. April 2018 by: L. Ross, P. Rose, J. Raizenne, L. Dupuis, and L. Armstrong.

NPS (Native Plant Solutions). 2020a. BC Hydro Site C Wetland Monitoring Program Field Manual. Baseline and Construction Phase, February 2020. Version 2. Prepared by: L. Dupuis, L. Ross, J. Vitt, and M. Mushanski.

NPS (Native Plant Solutions). 2020b. BC Hydro Site C Vegetation and Wildlife Wetland Monitoring Program. Baseline and Construction Phase Wetland Monitoring, February 2020. Version 2. Prepared by: L. Ross, L. Dupuis, J. Vitt, M. Mushanski.

NSW Government (NSW). 2025. Biodiversity Conservation Regulation.

South Africa Department of Forestry, Fisheries and the Environment (SADFFE). 2023. National Biodiversity Offset Guideline, pg 17 & 37-41.

Victoria State Government (VSG). 2023. Native vegetation removal regulations – Applicant's guide. Department of Energy, Environment and Climate Action.

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Appendix 1: Wetland Functional Assessment Tables for the Site C Wetland Impact Footprint

Table A1. Functional losses associated with Site C for Migratory Birds Nesting.

Indicator Species Assemblage	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Dabbling Ducks	0	0.20	0.20	0.20	0	0.20	0.20	0	1
Diving Ducks	0	0	0	1	0	0	0	0	1
Cavity-nesting Ducks	0	0	0	0	0	0	0	0	0
Swans & Geese	0	0	0	1	0	0	0	0	1
Waterbirds	0	0	0	1	0	0	0	0	1
Terns & Gulls	0	0	0	0.33	0.33	0	0	0.33	1
Forest-nesting Shorebirds	0	0.20	0.20	0	0.20	0.20	0	0.20	1
Marsh-nesting Shorebirds	0	0	0	0.33	0	0.33	0.33	0	1
Rails	0	0	0	0.33	0	0.33	0.33	0	1
Open Habitat Songbirds	0	0	0	0.33	0	0.33	0.33	0	1
Deciduous Songbirds	0	0.50	0.50	0	0	0	0	0	1
Coniferous Songbirds	0	0.20	0.20	0	0.20	0.20	0	0.20	1
Aerial Insectivores	0	0.20	0.20	0.20	0.20	0	0.20	0	1
Total relative preference	0.00	1.30	1.30	4.73	0.93	1.60	1.40	0.73	12
Proportional wetland type preference	0.00	0.11	0.11	0.39	0.08	0.13	0.12	0.06	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	0.00	3.68	13.61	8.19	0.68	0.29	0.16	0.56	27.16
(2.5, 97.5) percentiles for +/- 50% Perturbation	--	(3.70, 7.19)	(28.58, 56.35)	(50.19, 61.93)	(3.78, 6.80)	--	(0.083, 0.15)	(3.81, 7.56)	(101.48, 127.88)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A2. Functional losses associated with Site C to Migratory Birds brood-rearing.

Indicator Species Assemblage	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Dabbling Ducks	0.50	0	0	0.50	0	0	0	0	1
Diving Ducks	1	0	0	0	0	0	0	0	1
Cavity-nesting Ducks	1	0	0	0	0	0	0	0	1
Geese & Swans	1	0	0	0	0	0	0	0	1
Waterbirds	1	0	0	0	0	0	0	0	1
Terns & Gulls	0	0	0	0	0	0	0	0	0
Forest-nesting Shorebirds	0	0	0	0.33	0	0.33	0.33	0	1
Marsh-nesting Shorebirds	0	0	0	0.33	0	0.33	0.33	0	1
Rails	0	0	0	0.33	0	0.33	0.33	0	1
Open Habitat Songbirds	0	0	0	0	0	0	0	0	0
Deciduous Songbirds	0	0	0	0	0	0	0	0	0
Coniferous Songbirds	0	0	0	0	0	0	0	0	0
Aerial Insectivores	0	0	0	0	0	0	0	0	0
Total relative preference	4.50	0	0	1.50	0	1	1	0	8
Proportional wetland type preference	0.56	0	0	0.19	0	0.13	0.13	0	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	54.71	0.00	0.00	3.89	0.00	0.27	0.17	0.00	59.05
(2.5, 97.5) percentiles for +/- 50% Perturbation	(9.03, 10.09)	--	--	(16.27, 36.98)	--	--	(0.083, 0.17)	--	(26.48, 46.11)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A3. Functional losses associated with Site C to Migratory birds feeding.

Indicator Species Assemblage	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Dabbling Ducks	0.50	0	0	0.50	0	0	0	0	1
Diving Ducks	1	0	0	0	0	0	0	0	1
Cavity-nesting Ducks	1	0	0	0	0	0	0	0	1
Geese & Swans	0.50	0	0	0.50	0	0	0	0	1
Waterbirds	1	0	0	0	0	0	0	0	1
Terns & Gulls	0.50	0	0	0.50	0	0	0	0	1
Forest-nesting Shorebirds	0.50	0	0	0.50	0	0	0	0	1
Marsh-nesting Shorebirds	0	0.20	0.20	0.20	0	0.20	0.20	0	1
Rails	0	0	0	0.33	0	0.33	0.33	0	1
Open Habitat Songbirds	0	0	0	0.33	0	0.33	0.33	0	1
Deciduous Songbirds	0	0.33	0.33	0	0	0.33	0	0	1
Coniferous Songbirds	0	0.17	0.17	0.17	0.17	0.17	0	0.17	1
Aerial Insectivores	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Total relative preference	5.13	0.83	0.83	3.16	0.29	1.49	0.99	0.29	13
Proportional wetland type preference	0.39	0.06	0.06	0.24	0.02	0.11	0.08	0.02	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	38.35	2.15	7.97	5.05	0.20	0.25	0.10	0.21	54.27
(2.5, 97.5) percentiles for +/- 50% Perturbation	(5.38, 8.02)	(2.25, 4.10)	(17.46, 32.40)	(23.33, 45.58)	(1.04, 2.01)	--	(0.052, 0.10)	(1.43, 2.75)	(59.89, 85.34)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A4. Functional losses associated with Site C to Migratory birds migration.

Indicator Species Assemblage	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Dabbling Ducks	1	0	0	0	0	0	0	0	1
Diving Ducks	1	0	0	0	0	0	0	0	1
Cavity-nesting Ducks	1	0	0	0	0	0	0	0	1
Geese & Swans	1	0	0	0	0	0	0	0	1
Waterbirds	1	0	0	0	0	0	0	0	1
Terns & Gulls	1	0	0	0	0	0	0	0	1
Forest-nesting Shorebirds	0.50	0	0	0.50	0	0	0	0	1
Marsh-nesting Shorebirds	0	0.20	0.20	0.20	0	0.20	0.20	0	1
Rails	0	0	0	0.33	0	0.33	0.33	0	1
Open Habitat Songbirds	0	0	0	0.33	0	0.33	0.33	0	1
Deciduous Songbirds	0	0.33	0.33	0	0	0.33	0	0	1
Coniferous Songbirds	0	0.25	0.25	0	0.25	0	0	0.25	1
Aerial Insectivores	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Total relative preference	6.63	0.91	0.91	1.49	0.38	1.33	0.99	0.38	13
Proportional wetland type preference	0.51	0.07	0.07	0.11	0.03	0.10	0.08	0.03	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	49.57	2.37	8.78	2.38	0.25	0.22	0.10	0.26	63.94
(2.5, 97.5) percentiles for +/- 50% Perturbation	(8.25, 9.00)	(2.34, 4.55)	(19.62, 35.16)	(10.46, 22.29)	(1.26, 2.66)	--	(0.052, 0.10)	(1.72, 3.64)	(50.99, 69.84)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A5. Functional losses associated with Site C to Amphibian breeding.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Boreal Chorus Frog	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Columbia Spotted Frog	0.50	0	0	0.50	0	0	0	0	1
Western Toad	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Total relative preference	0.75	0.25	0.25	0.75	0.25	0.25	0.25	0.25	3
Proportional wetland type preference	0.25	0.08	0.08	0.25	0.08	0.08	0.08	0.08	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	24.32	2.83	10.47	5.19	0.73	0.18	0.11	0.76	44.59
(2.5, 97.5) percentiles for +/- 50% Perturbation	(2.53, 6.02)	(2.98, 5.36)	(23.33, 42.0)	(20.29, 50.71)	(4.05, 7.29)	--	(0.0007, 0.0015)	(5.54, 9.96)	(72.66, 107.56)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A6. Functional losses associated with Site C to Amphibian feeding.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Boreal Chorus Frog	0	0.14	0.14	0.14	0.14	0.14	0.14	0.14	1
Columbia Spotted Frog	0	0.14	0.14	0.14	0.14	0.14	0.14	0.14	1
Western Toad	0	0.14	0.14	0.14	0.14	0.14	0.14	0.14	1
Total relative preference	0	0.43	0.43	0.43	0.43	0.43	0.43	0.43	3
Proportional wetland type preference	0	0.14	0.14	0.14	0.14	0.14	0.14	0.14	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	0.00	4.85	17.94	2.97	1.25	0.31	0.19	1.31	28.8157
(2.5, 97.5) percentiles for +/- 50% Perturbation	--	(5.56, 8.73)	(43.56, 68.44)	(15.78, 24.79)	(7.56, 11.87)	--	(0.11, 0.17)	(10.33, 16.24)	(95.31, 118.42)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A7. Functional losses associated with Site C to Amphibian hibernation.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Boreal Chorus Frog	0	0.50	0.50	0	0	0	0	0	1
Columbia Spotted Frog	1	0	0	0	0	0	0	0	1
Western Toad	0	0.50	0.50	0	0	0	0	0	1
Total relative preference	1	1	1	0	0	0	0	0	3
Proportional wetland type preference	0.33	0.33	0.33	0	0	0	0	0	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	32.42	11.31	41.87	0.00	0.00	0.00	0.00	0.00	85.60333
(2.5, 97.5) percentiles for +/- 50% Perturbation	(5.67, 5.67)	(8.33, 25.00)	(65.33, 196)	--	--	--	--	--	(96, 210)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A8. Functional losses associated with Site C to Bats feeding.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Little Brown Myotis	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Northern Myotis	0	0	0	0	0.50	0	0	0.50	1
Long-eared Myotis	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Silver-haired Bat	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Eastern Red Bat	0	0.25	0.25	0	0.25	0	0	0.25	1
Hoary Bat	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Long-legged Myotis	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Big Brown Bat	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Total relative preference	0.75	1	1	0.75	1.50	0.75	0.75	1.50	8
Proportional wetland type preference	0.09	0.13	0.13	0.09	0.19	0.09	0.09	0.19	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	9.12	4.24	15.70	1.95	1.64	0.20	0.13	1.71	34.69
(2.5, 97.5) percentiles for +/- 50% Perturbation	(1.37, 1.86)	(5.13, 7.46)	(40.25, 56.88)	(11.09, 15.21)	(9.41, 16.09)	--	(0.078, 0.11)	(12.63, 22.21)	(92.73, 107.52)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A9. Functional losses associated with Site C to Bats roosting.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Little Brown Myotis	0	0	0	0	0	0	0	0	0
Northern Myotis	0	0	0	0	0	0	0	0	0
Long-eared Myotis	0	0	0	0	0	0	0	0	0
Silver-haired Bat	0	0	0	0	0	0	0	0	0
Eastern Red Bat	0	0.50	0.50	0	0	0	0	0	1
Hoary Bat	0	0.25	0.25	0	0.25	0	0	0.25	1
Long-legged Myotis	0	0	0	0	0	0	0	0	0
Big Brown Bat	0	0	0	0	0	0	0	0	0
Total relative preference	0	0.75	0.75	0	0.25	0	0	0.25	2
Proportional wetland type preference	0	0.38	0.38	0	0.13	0	0	0.13	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	0.00	12.73	47.10	0.00	1.10	0.00	0.00	1.14	62.07
(2.5, 97.5) percentiles for +/- 50% Perturbation	--	(9.38, 28.13)	(73.50, 220.50)	--	(4.25, 12.75)	--	--	(5.81, 17.44)	(123.02, 248.73)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A10. Functional losses associated with Site C to Fauna species at risk.

Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Aphrodite fritillary, *manitoba* subspecies	0	0	0.50	0.50	0	0	0	0	1
Assiniboine skipper	0	0	0.50	0.50	0	0	0	0	1
Bronze copper	0	0	0	1	0	0	0	0	1
Common ringlet, *benjamini* subspecies	0	0	0.50	0	0	0	0	0.50	1
Common woodnymph, *nephele* subspecies	0	0	0.50	0.50	0	0	0	0	1
Great spangled fritillary, *pseudocarpenteri* subspeci	0	0	0.33	0.33	0.33	0	0	0	1
Tawny crescent	0	0	0.50	0	0.50	0	0	0	1
Prairie bluet	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0	1
Western Toad	0.04	0.26	0.26	0.09	0.09	0.09	0.09	0.09	1
Northern Myotis	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.50	1
Little Brown Myotis	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Surf scoter	1	0	0	0	0	0	0	0	1
Common Nighthawk	0.08	0.15	0.15	0.15	0.15	0.08	0.15	0.08	1
Barn swallow	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1
Rusty Blackbird	0	0.13	0.13	0	0.30	0.13	0	0.30	1
Olive-sided Flycatcher	0	0	0	0	0.50	0	0	0.50	1
Nelson's Sparrow	0	0	0	0.33	0	0.33	0.33	0	1
Yellow Rail	0	0	0	0.33	0	0.33	0.33	0	1
Short-eared Owl	0	0.20	0.20	0.20	0.20	0	0	0.20	1
Total relative preference	1.52	1.13	3.97	4.33	2.97	1.37	1.30	2.42	19.00
Proportional wetland type preference	0.08	0.06	0.21	0.23	0.16	0.07	0.07	0.13	1.00
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	7.77	2.02	26.21	4.74	1.37	0.15	0.09	1.17	43.52
(2.5, 97.5) percentiles for +/- 50% Perturbation	(1.35, 1.54)	(2.26, 3.57)	(57.27, 104.73)	(25.21, 39.29)	(7.19, 13.52)	--	(0.051, 0.087)	(7.65, 15.87)	(121.94, 157.06)
Restored Wetland Area	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0

Table A11. Functional losses associated with Site C to Flora species at risk.

	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Primary Proportional wetland type preference	0.00	0.00	0.14	0.14	0.50	0.00	0.00	0.21	1
Secondary Proportional wetland type preference	0.00	0.08	0.15	0.04	0.23	0.10	0.06	0.34	1
Average Proportional wetland type preference	0.00	0.04	0.15	0.09	0.36	0.05	0.03	0.28	1
Affected Wetland Area (ha) - Construction	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	298.98
Total Loss Given Habitat Affected - Construction	0.00	1.43	18.55	1.88	3.19	0.11	0.04	2.52	27.72
(2.5, 97.5) percentiles for +/- 50% Perturbation	--	(1.62, 2.81)	(53.04, 61.07)	(12.17, 13.46)	(20.90, 29.02)	--	(0.025, 0.036)	(19.58, 30.86)	(118.43, 126.60)
Restored Wetland Area									0.00
Total Gain Given Habitat Restored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table A12. Functional losses associated with Site C to Species important to Aboriginal land use.

	Habitat Type								
Indicator Species	OW:	WS:	WH:	SE:	TS:	Wf02:	Wf13:	BT: sb	
Labrador Tea	0	0	0	0	0.5	0	0	0.5	1
Highbush Cranberry	0	0.33	0.33	0	0	0	0	0.33	1
Moose	0	0.20	0.20	0.20	0.00	0.20	0.20	0	1
Total relative preference	0.00	0.53	0.53	0.20	0.50	0.20	0.20	0.83	3
Proportional wetland type preference	0.00	0.18	0.18	0.07	0.17	0.07	0.07	0.28	1
Affected Wetland Area (ha) - Updated Footprint	97.27	33.94	125.6	20.77	8.77	2.15	1.34	9.14	299
Total Loss Given Habitat Affected - Construction	0.00	6.03	22.33	1.38	1.46	0.14	0.09	2.54	33.98
(2.5, 97.5) percentiles for +/- 50% Perturbation	--	(5.69, 12.08)	(44.64, 94.73)	(4.73, 14.20)	(5.67, 17.0)	--	(0.033, 0.10)	(12.92, 38.75)	(100.56, 149.76)
Restored Wetland Area									0.00
Total Gain Given Habitat Resored	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0