BC Hydro
Power smart

Vegetation and Wildlife Mitigation and Monitoring Plan 2024 Annual Report

Site C Clean Energy Project

30 March 2025

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1.0 Introduction

The Vegetation and Wildlife Mitigation and Monitoring Plan (VWMMP; the Plan) describes the measures that will be used to mitigate potential adverse effects of the Site C Clean Energy Project (the Project) on vegetation and ecological communities and wildlife resources during the construction and operation of the Project. The Plan was developed in accordance with the conditions of the Project's provincial Environmental Assessment Certificate (EAC #E14-02, or 'the EAC') and the Federal Decision Statement (FDS) issued for the Project in 2014. The draft and first revisions of the VWMMP were submitted to regulatory agencies and Aboriginal Groups for review and feedback on 17 October 2014, and 7 April 2015, respectively. The final VWMMP was submitted to the same recipients on 5 June 2015, with annual updates posted on the Site C Project website at: https://www.sitecproject.com/sites/default/files/Veg_and_Wildlife_Mit_and_Mon_Plan.pdf.

The purpose of this report is to describe the mitigation and monitoring measures that are described in the VWMMP and were implemented in 2024.

2.0 Objective and Scope

The objective of this VWMMP Annual Report (the Report) is to describe the mitigation and monitoring measures implemented in 2024 to meet the requirements of FDS conditions 9, 10, 11, 16 and 18 and EAC conditions 9 to 12, 14 to 16, 19, 21, 23, and 24. These conditions, and where they are addressed in current or past VWMMP Annual Reports are listed in Tables 1 and 2 below.

The requirements of EAC conditions 8 and 13 (for Vegetation and Ecological Communities), and conditions 17, 18, 20, and 22 (for Wildlife Resources) are addressed in the Construction Environmental Management Plan (CEMP) and/or the Vegetation Clearing and Debris Management Plan (VCDMP). Therefore, those conditions are not addressed in this report.

Table 1. Federal Decision Statement conditions and associated annual report sections

FDS Condition	Condition	Report Section
9	Disturbance and destruction of migratory birds	Section 6.1
9.1	The Proponent shall ensure that the Designated Project is carried out in a manner that avoids mortality and disturbance of migratory birds and their nests.	Section 6.1.1
9.2	The Proponent shall prepare and submit to the Agency an annual schedule, describing the location and timing for construction and reservoir filling activities, 90 days prior to initiating any of these activities.	Section 6.1.2
9.3	The Proponent shall develop, in consultation with Environment Canada, a plan to monitor and mitigate potential disturbance of breeding migratory birds in and adjacent to the Project Activity Zone, including the area immediately downstream of the dam where risks to	Section 6.1.3

FDS Condition	Condition	Report Section
	migratory bird nests could occur, during construction, reservoir filling and operation.	
9.9	The Proponent shall address potential risks of bird collisions with the transmission line, in consultation with Environment Canada, by:	
9.9.1	conducting a risk assessment for bird collisions under the current transmission line design;	2016 Annual Report (Section 6.1.3)
9.9.2	determining if additional mitigation measures could be implemented to reduce the risk of bird collisions;	Section 6.1.4
10	Non-wetland migratory bird habitat	Section 6.2
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	The plan shall include:	
10.3.1	non-wetland migratory bird habitat baseline conditions for habitat that would be permanently lost, habitat that would be fragmented and habitat that would remain intact;	Section 6.2.1
10.3.2	migratory bird abundance, distribution and use of non-wetland habitat;	Section 6.2.2
10.3.3	measures to mitigate the changes in aquatic and riparian-related food resources and other habitat features associated with a change from a fluvial to a reservoir system;	Section 6.2.3
10.3.4	compensation measures to address the unavoidable loss of non-wetland migratory bird habitat, including habitat associated with the Canada Warbler, the Cape May Warbler and the Bay-Breasted Warbler;	Section 6.2.4
10.3.5	an analysis of the effects of any compensation measures identified in condition 10.3.4 on the current use of lands and resources for traditional purposes by Aboriginal peoples; and	Section 6.2.5
10.3.6	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.	Section 6.2.6
11	Wetlands used by migratory birds and for current use of lands and resources for traditional purposes	Section 6.3
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.	Section 6.3.1

FDS Condition	Condition	Report Section
11.2	The Proponent shall develop, in consultation with Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups, a plan that addresses 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.	Section 6.3.2
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.	Section 6.3.3
11.4	The plan shall 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	Section 6.3.4
11.4.2	mitigation measures to maintain baseline wetland functions for those wetlands that will not be permanently lost;	Section 6.3.5
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;	Section 6.3.6
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	Section 6.3.7
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.	Section 6.3.8
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.	Section 6.3.9
16	Species at risk, at-risk and sensitive ecological communities, and rare plants	
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.	Section 6.4

FDS Condition	Condition	Report Section
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.	Section 6.4
16.3	The plan shall include:	
16.3.1	field work to verify the modeled results for surveyed species at risk and determine the habitat that would be permanently lost, habitat that would be fragmented and habitat that would remain intact for those species, including the Short-eared Owl, the Western Toad and the Myotis Bat species	2015 Annual Report (Section 6.4.1)
16.3.2	surveys to determine whether the rare plant species potentially facing extirpation in the Project Activity Zone are found elsewhere in the region	2017 Annual Report (Section 6.4.1; Section 7.2.1; Appendix 9)
16.3.3	measures to mitigate environmental effects on species at risk and at-risk and sensitive ecological communities and rare plants;	Section 6.4.1
16.3.4	conservation measures to ensure the viability of rare plants, such as seed recovery and plant relocation;	Section 6.4.2
16.3.5	an approach to avoiding or minimizing the use of herbicides and pesticides in areas that could impact species at risk, at-risk and sensitive ecological communities and rare plants;	2017 Annual Report (Section 6.4.4)
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 ecological communities and rare plants; and	Section 6.4.3
16.3.7	an approach for tracking updates to the status of listed species identified by the Government of British Columbia, Committee on the Status of Endangered Wildlife in Canada (COSEWIC), and the *Species at Risk Act* (SARA), and implementation of additional measures, in accordance with species recovery plans, to mitigate effects of the Designated Project on the affected species should the status of a listed species change during the life of the Designated Project.	Section 6.4.4

Table 2. Environmental Assessment Certificate conditions and associated annual report sections

EAC Condition	Condition	Report Section
Vegetation and Ecological Communities		

EAC Condition	Condition	Report Section
9	The EAC Holder must develop a Vegetation and Invasive Plant Management Plan to protect ecosystems, plant habitats, plant communities, and vegetation with components applicable to the construction phase.	Section 7.1
	The Vegetation and Invasive Plant Management Plan must include at least the following:	
	Invasive Species	
	• Surveys of existing invasive species populations prior to construction.	2015 Annual Report (Section 7.1.1)
	• Invasive plant control measures to manage established invasive species populations and to prevent invasive species establishment.	Section 7.1.1
	Rare Plants and Sensitive Ecosystems	
	• The EAC Holder must expand its modelling, including completing field work, to improve identification of rare and sensitive plant communities and aid in delineation of habitats that may require extra care, 90 days prior to any Project activities that may affect these rare or sensitive plant communities	2015 Annual Report (Section 7.1.3)
	• The EAC Holder must, with the use of a Qualified Environmental Professional (QEP), complete an inventory in areas not already surveyed and use rare plant location information as inputs to final design of access roads and transmission lines. These pre-construction surveys must target rare plants as defined in Section 13.2.2 of the Environmental Impact Statement (EIS) including vascular plants, mosses, and lichens.	Section 7.1.2
	• The EAC Holder must create and maintain a spatial database of known rare plant occurrences in the vicinity of Project components that must be searched to avoid effects to rare plants during construction activities. The database must be updated as new information becomes available and any findings of new rare plant species occurrences must be submitted to Environment Canada[1] and the BC Ministry of Environment (MOE[2]) using provincial data collection standards.	Section 7.1.3
	• The EAC Holder must implement construction	Section 7.1.4

[1] Currently known as Environment and Climate Change Canada (ECCC).

[2] Currently known as the BC Ministry of Ministry of Land, Water and Resource Stewardship (MLWRS).

EAC Condition	Condition	Report Section
	methods to reduce the impact to rare plants, maximize use of existing access corridors, and construct transmission towers and temporary roads away from wetlands and known rare plant occurrences.	
	• Protect known occurrences of Tufa seeps, wetlands and rare plants located adjacent to construction areas. Install signage and flagging where necessary, as determined by the QEP, to indicate the boundaries of the exclusion area.	Section 7.1.5
	• The EAC Holder will engage the services of a Rare Plant Botanist during construction to design and implement an experimental rare plant translocation program following MOE's Guidelines for Translocation of Plant Species at Risk in BC (Maslovat 2009).	Section 7.1.6
10	The EAC Holder must fund or undertake directly with the use of a Rare Plant Botanist the following, during construction:	2017 Annual Report (Section 7.2)
	• Targeted surveys in the Regional Assessment Area (RAA; as defined in the amended EIS) to identify occurrences of the 18 directly affected rare plant species (as defined in the amended EIS), and rare plant species identified by MOE's Conservation Framework requiring additional inventories	2017 Annual Report (Section 7.2.1 and Appendix 9)
	• A study focused on clarifying the taxonomy of *Ochroleucus* bladderwort (*Utricularia ochroleuca*), including field, herbaria, and genetic work in consultation with the BC Ministry of Forests, Lands and Natural Resource Operations (MFLNRO) and the BC Conservation Data Centre of MOE.	2017 Annual Report (Section 7.2.2 and Appendix 10)
11	EAC Holder must compensate for the loss of rare and sensitive habitats and protect occurrences of rare plants by developing, or funding the development and implementation of a compensation program, during construction, that includes:	Section 7.2
	• Assistance (financial or in-kind) to the managing organization of suitable habitat enhancement projects in the RAA (RAA as defined in the amended EIS).	Section 7.2.1
	• Direct purchase of lands in the RAA and manage these lands and suitable existing properties owned by the EAC Holder to enhance or retain rare plant values where opportunities exist.	Section 7.2.2

EAC Condition	Condition	Report Section
	The EAC Holder must engage with MFLNRO, MOE and Aboriginal Groups with regard to the development of the compensation program.	Section 7.2.3
12	The EAC Holder must develop a Wetland Mitigation and Compensation Plan.	Section 7.3
	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.	Section 7.3.1
	The Wetland Mitigation and Compensation Plan must include at least the following:	
	• Information on location, size and type of wetlands affected by the Project	Section 7.3.1.1
	• If roads cannot avoid wetlands, culverts will be installed under access roads to maintain hydrological balance, and sedimentation barriers will be installed;	2017 Annual Report (Section 7.3.1.2)
	• Stormwater management will be designed to control runoff and direct it away from work areas where excavation, spoil placement, and staging activities occur.	2017 Annual Report (Section 7.3.1.3)
	• 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.	2017 Annual Report (Section 7.3.1.4)
	• 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 BMP guidebook Develop with Care (BC MFLNRO and BC MOE 2014) or as amended from time to time.	2017 Annual Report (Section 7.3.1.5)
14	The EAC Holder must develop a Vegetation and Ecological Communities Monitoring and Follow-up Program for the construction phase and first 10 years of the operations phase. The Vegetation and Ecological Communities Monitoring and Follow-up Program must be developed by a QEP. The Vegetation and Ecological Communities	Section 7.4

EAC Condition	Condition	Report Section
	Monitoring and Follow-up Program must include at least the following:	
	• Definition of the study design for the rare plant translocation program (see condition 9).	7.4.1
	• Plan for following-up monitoring of any translocation sites to assess the survival and health of translocated rare plant species, under the supervision of a Rare Plant Botanist.	7.4.2
	• Measurement criteria, including vegetation growth, persistence of rare plants and establishment / spread of invasive plant species, and associated monitoring to document the effectiveness of habitat enhancement and possible compensation programs.	7.4.3
Wildlife Resources		
15	The Wildlife Management Plan must be developed by a QEP.	Section 7.5
	The Wildlife Management Plan must include at least the following:	
	• Field work, conducted by a QEP, to verify the modelled results for surveyed species at risk and determine, with specificity and by ecosystem, the habitat lost or fragmented for those species. The EAC Holder must use these resulting data to inform final Project design and to develop additional mitigation measures, as needed, as part of the Wildlife Management Plan, in consultation with Environment Canada and MFLNRO.	2015 Annual Report (Section 7.3.1)
	• Measures to avoid, if feasible, constructing in sensitive wildlife habitats. If avoiding sensitive wildlife habitats is not feasible, condition 16 applies.	Section 7.5.1
	• If sensitive habitats, such as wetlands, are located immediately adjacent to any work site, buffer zones must be established by a QEP to avoid direct disturbance to these sites.	Section 7.5.2
	• Protocol for the application of construction methods, equipment, material and timing of activities to mitigate adverse effects to wildlife and wildlife habitat.	Section 7.5.3
	• Protocol to ensure that lighting is focused on work sites and away from surrounding areas to manage	Section 7.5.4

EAC Condition	Condition	Report Section
	light pollution and disturbance to wildlife. If lighting cannot be directed away from surrounding areas, the EAC Holder must ensure additional mitigation measures are implemented to reduce light pollution, including light shielding.	
	• A mandatory environmental training program for all workers so that they are informed that hunting in the vicinity of any work site/Project housing site is strictly prohibited for all workers. The EAC Holder must ensure that all workers are familiar with the Wildlife Management Plan.	Section 7.5.5
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.	Section 7.6
	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.	Section 7.6.1
	• Mitigation for the loss of snake hibernacula, artificial dens must be included during habitat compensation.	Section 7.6.2
	• Management of EAC Holder-owned lands adjacent to the Peace River suitable as breeding habitat for Northern Harrier and Short-eared Owl.	2017 Annual Report (Section 7.6.1)
	• Establishment of nest boxes for cavity-nesting waterfowl developed as part of wetland mitigation and compensation plan and established within riparian vegetation zones along the reservoir on BC Hydro-owned properties.	Section 7.6.3
	• Creation of wildlife trees to increase nesting, roosting, and denning habitat supply for cavity-dwelling wildlife over multiple time scales such as woodpeckers, owls, migratory passerines, kestrels, squirrels, bats, and furbearers.	Section 7.6.4
	• A design for bat roosting habitat in HWY 29 bridges to BC Ministry of Transportation and Infrastructure (MOTI) for consideration into new bridge designs located within the Peace River valley.	Section 7.6.5

EAC Condition	Condition	Report Section
	• Following rock extraction at Portage Mountain, creation of hibernating and roosting sites for bats.	Section 7.6.6 VWMMP Section 8.7.6
	• Creation of natural or artificial piles of coarse woody debris dispersed throughout the disturbed landscape to maintain foraging areas and cold-weather rest sites, and arboreal resting sites, for the fisher population south of the Peace River.	Section 7.6.7
19	The EAC Holder must use reasonable efforts to avoid and reduce injury and mortality to amphibians and snakes on roads adjacent to wetlands and other areas where amphibians or snakes are known to migrate across roads including locations with structures designed for wildlife passage	Section 7.7
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.	Section 7.8
	The Vegetation and Wildlife Mitigation and Monitoring Plan must be developed by a QEP.	Section 7.8
	The Vegetation and Wildlife Mitigation and Monitoring Plan must include at least the following:	
	• Monitor Bald Eagle nesting populations adjacent to the reservoir, including their use of artificial nest structures.	Section 7.8.1
	• Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features.	Section 7.8.2
	• Monitor amphibian use of migration crossing structures installed along Project roads.	Section 7.8.3
	• Survey songbird and ground-nesting raptor populations during construction and operations	Section 7.8.4
	• Require annual reporting during the construction phase and during the first 10 years of operations to the Environmental Assessment Office (EAO), beginning 180 days following commencement of construction.	Section 7.8.5
23	The EAC Holder must maintain current knowledge of Project effects on the status of listed species by tracking updates for species identified by the Province, COSEWIC, and SARA.	Section 7.9

EAC Condition	Condition	Report Section
24	The EAC Holder must identify suitable lands for ungulate winter range (UWR) by the end of the first year of construction, on BC Hydro-owned lands, or Crown lands, in the vicinity of the Project in consultation with MFLNRO. If MFLNRO determines that identified winter range is required, the EAC Holder must identify and maintain suitable BC Hydro-owned lands for UWR to the satisfaction of MFLNRO and for the length of time determined by MFLNRO.	Section 7.10

3.0 Consultation

Consultation regarding the development and implementation of individual programs conducted in 2024 is provided below.

3.1 Canadian Wildlife Service

In 2024, BC Hydro continued to consult with the Canadian Wildlife Service (CWS) of Environment and Climate Change Canada (ECCC) during plan development and implementation. Consultation occurred primarily through the Vegetation and Wildlife Mitigation and Monitoring Technical Committee (VWTC), to which CWS, BC Hydro, and provincial agencies belong. The VWTC was established by the provincial Comptroller of Water Rights under Conditional Water Licences 132990 and 132991 (see Section 3.2).

3.2 Consultation with the Province

The VWTC was established by the Comptroller of Water Rights under Conditional Water Licences 132990 and 132991 to provide ongoing engagement between BC Hydro, 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 BC Hydro joint Fish / Hydro Management Committee. CWS joined the VWTC in July 2016.

The VWTC met in person or via conference call quarterly (four) times in 2024 to address the Program Areas listed in Schedule A of Conditional Water Licenses 132990 and 132991. Table 3 summarizes the status of the Schedule A Program Areas as of 31 December 2024.

Table 3. Status of Annual Schedule A Program Area Plans as of 31 December 2024.

Program Area Plans	Status
Completed	
1. Ungulates	Complete
2. Wetlands and Riparian Habitat – Compensation and Mitigation	Ongoing
3. Fisher	Complete
4. Bat Mitigation and Hibernacula Construction	Complete
5. Snakes – Hibernacula Monitoring	Ongoing
6. Amphibians – Mitigation and Monitoring	Ongoing
7. Bald Eagles – Nest Monitoring	Ongoing
8.1 Breeding and Migratory Birds – Songbirds	Ongoing
8.2 Breeding and Migratory Birds – Waterbirds	Ongoing
8.3 Breeding and Migratory Birds – Common Nighthawk	Complete
8.4. Breeding and Migratory Birds – Woodpeckers	Ongoing
8.5. Breeding and Migratory Birds – Nest Monitoring	Complete
8.6. Breeding and Migratory Birds – River to Reservoir memo	Complete
8.7. Breeding and Migratory Birds – Bank Swallow	Ongoing
9. Ground-nesting Raptors	Ongoing
10. Cavity-nesting species	Ongoing

Program Area Plans	Status
11. Rare Plants	Ongoing
12. Sharp-tailed Grouse	Complete
13. Lighting Effects	Complete
14. Carnivore Den Sites	Complete
15. Other Raptors	Complete
16. Other Species at Risk	Ongoing
17. Furbearers	Complete
18. Ungulate calving habitat	Complete
19. Mineral licks	Complete
20. Bear and carnivore habitats	Complete
Notes	
'Complete' refers to programs that were completed by the end of 2024 or in past years. 'Ongoing' refers to programs that were conducted in 2024 and will continue into Project Operations. This table only refers to programs that were conducted in 2024 and do not refer to past or current programs that are scheduled to start or restart after scheduled time lags due to reservoir fill (e.g., bat box construction and monitoring, downstream snake and amphibian monitoring).	

4.0 Qualified professionals

The Qualified Professionals involved in the development and implementation of vegetation and wildlife mitigation and monitoring programs in 2024 are listed in Table 4. This list is not exhaustive as it is possible that some individuals and subcontractors helped with field work or other work phases that we have overlooked in our acknowledgements.

Table 4. Qualified Professionals involved in development and implementation of programs in 2024.

Qualified Professional	Area of Work
Brent Matsuda, M.Sc., R.P.Bio., BC Hydro	Vegetation and Wildlife
Harry van Oort, M.Sc., R.P.Bio., BC Hydro	Vegetation and Wildlife
Brock Simons, M.Sc., R.P.Bio., BC Hydro	Vegetation and Wildlife
Natasha Bush, M.Sc., P.Ag., EcoLogic Consultants Ltd.	Experimental Rare Plant Translocation, Wetland Monitoring Program
Dan McAllister, M.Sc., P.Ag., EcoLogic	Experimental Rare Plant Translocation
Jamie Fenneman, Ph.D., R.P.Bio., EcoLogic	Experimental Rare Plant Translocation
Alice Lee, B.Sc., MLA, BIT, EcoLogic	Experimental Rare Plant Translocation
Ryan Durand, M.Sc., R.P.Bio., EcoLogic	Experimental Rare Plant Translocation, Wetland Monitoring Program
Jason Jones, Ph.D., R.P.Bio., P. Biol., EcoLogic	Experimental Rare Plant Translocation,
Randy Krichbaum, M.Sc., P.Biol., R.P. Bio., Eagle Cap Consulting Ltd.	Pre-construction Rare Plant Surveys and Experimental Rare Plant Translocation

Qualified Professional	Area of Work
Margaret Krichbaum, B.Sc., Eagle Cap Consulting Ltd.	Pre-construction Rare Plant Surveys and Experimental Rare Plant Translocation
Jeff Matheson M.Sc., R.P.Bio., P.Biol., Tetra Tech Canada	Program Manager, Senior Biologist, Breeding bird and raptor monitoring
Elyse Hofs, B.Sc., Dipl.T., Tetra Tech Canada Inc.	Breeding bird, Bank Swallow, and Ground-nesting raptor monitoring
Amanda Lavallee, R.P.Bio., P.Biol., Tetra Tech Inc.	Breeding bird, Waterbird and Cavity-nest bird monitoring
Natasha Gidluck, B.Sc., B.I.T., Tetra Tech Inc.	Cavity nesting bird mitigation, waterbird monitoring
Eric Digel, B.Sc., B.I.T., Tetra Tech Canada Inc.	Cavity nesting bird monitoring, Ground-nesting raptor monitoring
Sarah Boisvert, B.I.T., Tetra Tech Inc.	Cavity nesting bird monitoring
Robert McMahon, M.Sc., Ausenco Sustainability	Project manager, wildlife report management
Felix Martinez-Nunez, M.Sc., R.P.Bio., Ausenco	Portage Mountain bat monitoring report
Tess Forstner, M.Sc., R.P. Bio., Ausenco Sustainability	Portage Mountain bat monitoring report
Lorraine Andrusiak, M.Sc., R.P.Bio., Ausenco Sustainability	Portage Mountain bat monitoring report
David Vardy, Ph.D., P. Biol., Ausenco Sustainability	Senior reviewer, wildlife reports
Dan Webster, B.Sc., P.Ag., R.P.Bio., P.Biol., Eco-Web Ecological Consulting	Mitigation property management plan updates
Brian Paterson, B.Sc., B.E., R.P.Bio., Zonal Ecosystem and Wildlife Consultants Ltd.	Bald eagle nest monitoring
Nathan Dyck, P.Ag., CPESC, DWB Consulting Services Ltd.	Program Manager, Bald Eagle surveys, Bank Swallow Headpond netting
Jason Paul, M.Sc., R.P.Bio., DWB Consulting Services Ltd.	Bank Swallow Headpond netting
Bruce Harrison, M.Sc., R.P.Bio., Ducks Unlimited Canada	Program Manager, Wetland Compensation
Katie Mitchell, M.Sc., R.P.Bio., Ducks Unlimited Canada	Wetland Compensation
Mike Sarell, R.P.Bio., Ophiuchus Consulting	Snake artificial den monitoring, artificial bat hibernacula design consultant

5.0 Structure and Content

The mitigation and monitoring measures discussed in this report are organized into two parts: Section 6.0 describes those mitigation and monitoring measures that were implemented to meet the requirements of the FDS conditions; Section 7.0 describes those measures that were implemented to meet the requirements of the EAC conditions. Cross-references are provided in Section 7.0 where information provided to meet the EAC conditions is the same as that provided for the FDS conditions.

Of the programs outlined in the Vegetation and Wildlife Mitigation Plan, only riparian plantings, which are required by FDS 10.3.3, were not implemented in 2024. Those plantings will be implemented as part of site reclamation, after reservoir filling.

6.0 Implementation of Mitigation and Monitoring Measures – Federal Decision Statement Conditions

Conditions 9, 10, 11, and 16 of the FDS, respectively, set out the mitigation and monitoring requirements for the disturbance and destruction of migratory birds, non-wetland migratory bird habitat, wetlands used by migratory birds and for current use of lands and resources for traditional purposes, and species at risk, at-risk and sensitive ecological communities and rare plants (Table 1).

6.1 Federal Decision Statement Condition 9: Migratory Bird Mitigation and Monitoring

This section of the annual report summarizes the programs conducted in 2024 in accordance with the requirements of FDS Condition 9, shown below.

9. Disturbance and destruction of migratory birds

9.1. The Proponent shall ensure that the Designated Project is carried out in a manner that avoids mortality and disturbance of migratory birds and their nests.

9.2. The Proponent shall prepare and submit to the Agency an annual schedule, describing the location and timing for construction and reservoir filling activities, 90 days prior to initiating any of these activities.

9.3. The Proponent shall develop, in consultation with Environment Canada, a plan to monitor and mitigate potential disturbance of breeding migratory birds in and adjacent to the Project Activity Zone, including the area immediately downstream of the dam where risks to migratory bird nests could occur, during construction, reservoir filling and operation.

9.4. The plan shall include measures to undertake construction, reservoir filling and operation in a manner that avoids or minimizes the risk of disturbance and mortality to migratory birds and their nests.

9.5. The Proponent shall, in preparing the plan, consult:

9.5.1. Environment Canada's policy on Incidental Take of Migratory Birds in Canada; and

9.5.2. Environment Canada's avoidance guidelines on General Nesting Periods of Migratory Birds in Canada.

9.6. The Proponent shall submit to the Agency and Environment Canada a draft copy of the plan for review 90 days prior to initiating construction.

9.7. The Proponent shall submit to the Agency the final plan a minimum of 30 days prior to initiating construction. When submitting the final plan, the Proponent shall provide to the Agency an analysis that demonstrates how it has appropriately considered the input, views or information received from Environment Canada.

9.8. The Proponent shall implement 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 for the first five years of operation.

9.9. The Proponent shall address potential risks of bird collisions with the transmission line, in consultation with Environment Canada, by:

9.9.1. conducting a risk assessment for bird collisions under the current transmission line design;

9.9.2. determining if additional mitigation measures could be implemented to reduce the risk of bird collisions; and

9.9.3. implementing any additional mitigation measures (e.g. line marking and diversions), to minimize impacts.

6.1.1 Condition 9.1

This section summarizes actions taken in accordance with the following requirement of Condition 9.1: *The Proponent shall ensure that the Designated Project is carried out in a manner that avoids mortality and disturbance of migratory birds and their nests.*

In accordance with Condition 9.1, BC Hydro has, where feasible, given Project requirements and constraints, scheduled vegetation clearing outside of the migratory bird nesting period. The Project occurs within Zone B5, for which ECCC describes a general nesting period for migratory birds of 19 April to 29 August[3]. BC Hydro developed Section 4.17 of the CEMP to address the requirements of Condition 9.1 and EAC Condition 17 and provided an outline of the nest survey protocol in Section 3.5.1 of the Vegetation Clearing and Debris Management Plan.

BC Hydro developed a pre-clearing nesting activity survey methodology, which outlines specific field procedures to be followed to determine the likelihood that migratory bird nests are present in areas scheduled to be disturbed. The protocol also describes the approach for determining appropriate situation- and species-specific disturbance setback buffers to be applied around locations where nests are likely to be present. That document was broadly distributed to contractors starting when it was first developed in 2015 and 2016. The document was revised in 2018 and 2019 and inserted as Appendix N of the CEMP, starting with rev.6.1 in 2019.

In 2024, pre-clearing nesting activity surveys were completed between April and August wherever small-scale clearing within the migratory bird nesting period could not be avoided. If active or suspected nest areas were identified, protective buffers were established around active nests, as determined by a Qualified Environmental Professional (QEP). Contractor compliance with appropriate steps for mitigating the risk of incidental take of migratory birds, nests and eggs was monitored by BC Hydro environmental monitors and the Independent Environmental Monitor (IEM).

6.1.2 Condition 9.2

This section summarizes actions taken in accordance with the following requirement of Condition 9.2: *The Proponent shall prepare and submit to the Agency an annual schedule, describing the location and timing for construction and reservoir filling activities, 90 days prior to initiating any of these activities.*

An initial construction schedule was submitted to CEAA on October 17, 2014, and construction of the Site C Project began on July 27, 2015.

As of March 31, 2025, the project was approximately 90% complete, including the realignment of Highway 29 and energization of the transmission lines.

In 2024, the following key milestones were met:

- Reservoir filling was completed between August 25, 2024 and November 7, 2024.
- Three generating units were placed into service on October 27, 2024, December 14, 2024 and February 22, 2025 respectively.

[3] https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#_zoneB_calendar

- The Project is on track to have all six generating units in service by the approved final unit in-service date in November 2025.
- Final construction works within the powerhouse and at the dam site will continue into 2025 including demobilization. Reclamation works are expected to continue through 2026.

6.1.3 Condition 9.3

This section summarizes actions taken in accordance with the following requirement of Condition 9.3: *The Proponent shall develop, in consultation with Environment Canada, a plan to monitor and mitigate potential disturbance of breeding migratory birds in and adjacent to the Project Activity Zone, including the area immediately downstream of the dam where risks to migratory bird nests could occur, during construction, reservoir filling and operation.*

6.1.3.1 Songbird surveys

The songbird monitoring program is focussed on passerines (songbird perching birds), hummingbirds, swifts, doves, kingfisher, and pigeons (all members of the orders Passeriformes, Apodiformes, Columbiformes, and Coraciiformes), which are collectively referred to as songbirds. Songbird baseline surveys were conducted in 2006, 2008, 2011 and 2012 in support of the EIS. Surveys were again conducted annually 2016 through 2024 as part of the monitoring program. The Breeding Bird Follow-up Monitoring – Songbirds 2024 Annual Report can be found in Appendix 1.

In addition, surveys for bank swallow (*Riparia riparia*) which are designated as 'threatened' under Schedule 1 of SARA and COSEWIC were conducted at known colonies in 2024 to assess the presence and breeding status within an area of the construction site called Area A. The observations of this assessment are presented in Appendix 2.

6.1.3.2 Common nighthawk surveys

Common Nighthawk is designated as Special Concern by COSEWIC, Threatened under Schedule 1 of SARA, and listed as Yellow (secure) in BC. Common nighthawk surveys were conducted in 2010 and 2012 in support of the EIS. Surveys again occurred over two years, with approximately half occurring in 2018 and half in 2019 as part of the monitoring program. The Common Nighthawk Follow-up Monitoring 2018 and 2019 annual reports were provided in the 2018 and 2019 VWMMP annual reports.

6.1.3.3 Woodpecker surveys

Woodpecker surveys were conducted in 2010 in support of the EIS. Woodpecker surveys are being completed in the project footprint within the Peace River Valley and in the BC Hydro proposed mitigation properties over a two-year period (2018 and 2019) as part of the monitoring program. The Breeding Bird Follow-up Monitoring – Woodpeckers 2019 Annual Report was provided in the 2019 VWMMP annual report.

6.1.3.4 Waterbird surveys

The waterbirds survey program is focussed on shorebirds, marsh birds, waterfowl, and other birds associated with aquatic and wetland habitats (collectively known as 'waterbirds'). Waterbird surveys were conducted in the Peace River and adjacent wetlands in 2006 and 2008 and 2012 through 2014. Those waterbird surveys were conducted using fixed-wing aircraft and twin-engine helicopter surveys and, to a lesser extent, ground and boat surveys. No shorebirds were documented during helicopter and fixed-wing aircraft surveys between 2012 and 2014 because of the difficulty detecting small birds using aerial surveys. As a result, methods were adapted in 2017 to continue the use of fixed-wing aircraft for aerial surveys, and to add ground, river boat,

unmanned aerial vehicle and autonomous recording unit survey methods. However, aerial surveys make identifying most waterbirds to the species level difficult, and therefore the aerial component of waterbird surveys was discontinued and not applied after 2017. In discussion with CWS, unmanned aerial vehicles were discontinued in 2020 because they were not shown to be efficient for waterbird data collection. The Waterbirds Follow-up Monitoring 2024 Annual Report can be found in Appendix 3.

6.1.3.4 Migratory bird nest monitoring

A migratory bird nest monitoring program was developed and first implemented in 2021 to monitor the potential disturbance to breeding migratory birds from fluctuating water levels caused by construction and then operations activities. In 2022, 39 days of nest searching and monitoring surveys were conducted from June 2 to July 11, 2022. As such, 2021 and 2022 were the first and second years of the program monitoring during construction. Follow-up monitoring was then to occur in alternate years over the first 10 years of operations. However, at the time, reservoir filling was expected to occur in the fall of 2023 and hence the operations phase would begin in 2024. Since the reservoir fill did not occur until fall of 2024, monitoring was not conducted in 2024 as it was not yet operations phase and will be conducted in 2025 as per the Migratory Bird Nest Monitoring Plan (BC Hydro 2022) to conduct surveys in alternate years over the first 10 years of operations.

6.1.4 Condition 9.9.2

This section summarizes actions taken in accordance with the following requirement of Condition 9.9.2: *The Proponent shall address potential risks of bird collisions with the transmission line, in consultation with Environment Canada, by determining if additional mitigation measures could be implemented to reduce the risk of bird collisions.*

A risk assessment for bird collisions with the transmission line was included in Section 6.1.3 of the 2016 VWMMP Annual Report. Since that time, changes have been incorporated in the transmission line design and implemented in construction that further reduce the risk of bird collisions:

- Phase to phase spacing is more than 12 meters, preventing any electrocution hazard that exists on distribution lines;
- Conductor size is approximately 1.25” diameter, therefore easier for birds to see. Each phase of the conductor will be configured in a square-shaped bundle of four, with spacing of 0.5 meters between each conductor, thus further increasing visibility for birds.
- There are no shield wires on most of the line. Shield wires are smaller in diameter and harder for birds to see and will only be installed in the last kilometer of each end of the line.
- Water crossings of the Peace and Moberly rivers will have marker spheres on them, which will increase visibility for birds.
- Guy wires on the structures are relatively low to the ground, as they connect to the tower at 2/3 the height of the tower. The lower height of the guy wires will reduce risk to birds. The bottoms of the guy wires are marked with bright yellow plastic guards, which will increase their visibility, and further reduce risk to birds.

6.2 Federal Decision Statement Condition 10: Non-Wetland Migratory Bird Habitat Mitigation and Monitoring

This section of the annual report summarizes the applicable components of the VWMMP implemented to fulfill FDS Condition 10 in 2024 in accordance with the requirements of FDS Condition 10.8. For context, the complete requirements of FDS Condition 10 are shown below.

10. Non-wetland migratory bird habitat

10.1. The Proponent shall mitigate the potential effects of the Designated Project on non-wetland migratory bird habitat.

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. The plan shall include:

10.3.1. non-wetland migratory bird habitat baseline conditions for habitat that would be permanently lost, habitat that would be fragmented and habitat that would remain intact;

10.3.2. migratory bird abundance, distribution and use of non-wetland habitat;

10.3.3. measures to mitigate the changes in aquatic and riparian-related food resources and other habitat features associated with a change from a fluvial to a reservoir system;

10.3.4. compensation measures to address the unavoidable loss of non-wetland migratory bird habitat, including habitat associated with the Canada Warbler, the Cape May Warbler and the Bay-Breasted Warbler;

10.3.5. an analysis of the effects of any compensation measures identified in Condition 10.3.4 on the current use of lands and resources for traditional purposes by Aboriginal peoples; and

10.3.6. 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.

10.4. The Proponent shall submit to the Agency and Environment Canada a draft copy of the plan for review:

10.4.1. for Conditions 10.3.1, 10.3.2, 10.3.3 and 10.3.6, 90 days prior to initiating construction; and

10.4.2. for Conditions 10.3.4 and 10.3.5, 90 days prior to implementing any component of the compensation plan.

10.5. The Proponent shall submit to the Agency the final plan:

10.5.1. for Conditions 10.3.1, 10.3.2, 10.3.3 and 10.3.6, a minimum of 30 days prior to initiating construction; and

10.5.2. for Conditions 10.3.4 and 10.3.5, a minimum of 30 days prior to implementing any component of the compensation plan.

10.6. When submitting each component of the final plan, the Proponent shall provide to the Agency an analysis that demonstrates how it has appropriately considered the input, views or information received from Environment Canada.

10.7. The Proponent shall commence the implementation of the compensation measures specified in Condition 10.3.4 no later than five years from the initiation of construction.

10.8. The Proponent shall implement each component of the plan and provide to the Agency an analysis and summary of the implementation of the applicable component 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.

6.2.1 Condition 10.3.1

This section summarizes actions taken in accordance with the following requirement of Condition 10.3.1: *The plan shall include non-wetland migratory bird habitat baseline conditions for habitat that would be permanently lost, habitat that would be fragmented and habitat that would remain intact.*

The collection of data on non-wetland migratory bird habitat baseline conditions is done through implementation of the migratory bird monitoring plans, of which the 2024 surveys are discussed in Section 6.1.3 in relation to FDS Condition 9.3 (monitor and mitigate potential disturbance of breeding migratory birds).

6.2.2 Condition 10.3.2

This section summarizes actions taken in accordance with the following requirement of Condition 10.3.2: *The plan shall include migratory bird abundance, distribution, and use of non-wetland habitat.*

The collection of data on non-wetland migratory bird abundance, distribution and use of non-wetland habitat is done through implementation of the migratory bird monitoring plans, of which the 2024 surveys are discussed in Section 6.1.3 in relation to FDS Condition 9.3 (monitor and mitigate potential disturbance of breeding migratory birds).

6.2.3 Condition 10.3.3

This section summarizes actions that are being taken in accordance with the following requirement of Condition 10.3.3: *The plan shall include measures to mitigate the changes in aquatic and riparian-related food resources and other habitat features associated with a change from a fluvial to a reservoir system*.

Mitigation measures have been developed to reduce potential adverse impacts associated with a change from a fluvial to a reservoir system by increasing the area of shallow water habitat at along the reservoir shoreline. These measures are expected to enhance fish habitat and also benefit migratory birds by increasing the abundance and availability of aquatic plants, aquatic invertebrates, and fish.

All habitat enhancements listed in the Fisheries and Aquatic Habitat Management Plan[4] (FAHMP) were completed in 2023. Annual reports describing the status of implementation of these projects are available on the Site C Project website[5].

6.2.4 Condition 10.3.4

This section summarizes actions taken in accordance with the following requirement of Condition 10.3.4: *The plan shall include compensation measures to address the unavoidable loss of non-wetland migratory bird habitat, including habitat associated with the Canada Warbler, the Cape May Warbler and the Bay-Breasted Warbler.*

BC Hydro continues to manage three properties (i.e., Marl Fen, Rutledge and Wilder Creek) that were retained partly to provide habitat for non-wetland migratory birds. These properties comprise three land parcels totaling 637 ha for Marl Fen, five parcels totaling 208 ha for Rutledge, and seven parcels totaling 423 ha for Wilder Creek. Collectively these parcels are being managed for values for rare plants and wildlife, including UWR and non-wetland migratory bird habitat. Management plans for those properties were included in the 2015 annual report. Updates to these management plans commenced at the end of 2023 and the updated plans are included as Appendices 4, 5, 6, respectively.

In 2019, Ducks Unlimited Canada (DUC) conducted the physical works necessary at Golata Canyon Ranch to create approximately 50 ha of sedge wetland (see Section 6.3.2). Vegetation

[4]BC Hydro. 2015. Fisheries and Aquatic Habitat Management Plan. Site C Clean Energy Project. Revision 1: June 1, 2015. Available at: https://www.sitecproject.com/sites/default/files/Fisheries_and_Aquatic_Habitat_Management_Plan.pdf.
[5]Available at: https://www.sitecproject.com/document-library/environmental-and-socio-economic-plans-and-reports

developing on the periphery of this wetland is expected to also help support non-wetland migratory birds.

In 2024, BC Hydro proposed to use BC Hydro-owned properties containing suitable habitat for non-wetland migratory birds, including the three warbler species named above, to contribute to the program by committing to retain and protect the identified habitat. Seven forested land parcels totalling 65 ha near Taylor, BC were initially proposed as a concept approach to VWTC with no objections received. As such, BC Hydro is continuing to work with their Properties Group to identify other land parcels that would be suitable for the program.

6.2.5 Condition 10.3.5

This section summarizes actions taken in accordance with the following requirement of Condition 10.3.4: *The plan shall include an analysis of the effects of any compensation measures identified in condition 10.3.4 on the current use of lands and resources for traditional purposes by Aboriginal peoples.*

To date, compensation measures to address the unavoidable loss of non-wetland migratory bird habitat have been restricted to fee simple lands. Compensation actions enacted on fee simple lands are not expected to affect current use of lands and resources for traditional purposes by Indigenous peoples. Access to fee simple lands is controlled by the owner, or, in the case of BC Hydro, the leaseholder of lands leased by BC Hydro.

6.2.6 Condition 10.3.6

This section summarizes actions taken in accordance with the following requirement of Condition 10.3.6: *The plan shall include 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.*

An approach to monitor the effectiveness of mitigation and compensation measures and to verify the accuracy of the predictions made during the environmental assessment on non-wetland migratory birds is done within the migratory bird monitoring plans. The migratory bird monitoring surveys conducted in 2024 are discussed in Section 6.1.3 in relation to FDS Condition 9.3 (monitor and mitigate potential disturbance of breeding migratory birds).

6.3 Federal Decision Statement Condition 11: Wetland Mitigation and Monitoring

This section of the annual report summarizes the components of the VWMMP implemented to fulfill FDS Condition 11 in 2024 in accordance with the requirements of FDS Condition 11.9. For context, the complete requirements of FDS Condition 11 are listed below.

11.	**Wetlands used by migratory birds and for current use of lands and resources for traditional purposes**
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, in consultation with Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups, a plan that addresses 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.
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.

11.4.	The plan shall 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; 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.
11.5.	The Proponent shall submit to the Agency, Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups a draft copy of the plan for review: 11.5.1. for Conditions 11.4.1, 11.4.2 and 11.4.3, 90 days prior to initiating construction; and 11.5.2. for Conditions 11.4.4 and 11.4.5, 90 days prior to implementing any component of the compensation plan.
11.6.	The Proponent shall submit to the Agency the final plan: 11.6.1. for Conditions 11.4.1, 11.4.2 and 11.4.3, a minimum of 30 days prior to initiating construction; and 11.6.2. for Conditions 11.4.4 and 11.4.5, a minimum of 30 days prior to implementing any component of the compensation plan.
11.7.	When submitting each component of the final plan, the Proponent shall provide to the Agency an analysis that demonstrates how it has appropriately considered the input, views or information received from Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups.
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.

6.3.1 Condition 11.1

This section summarizes actions taken in accordance with the following requirement of Condition 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.*

The CEMP (Section 4.5) states that riparian habitat is to be protected by retaining “a 15 m machine-free riparian buffer from the Ordinary High Water Mark of watercourses and waterbodies during clearing, except where worker safety prohibits manual tree falling and vegetation removal methods, and as addressed in a site specific prescription prepared and endorsed by a QEP.” The CEMP (Section 4.5) also requires that lay-down and material storage areas be located “at least 15 m from the Ordinary High Water Mark.”

The location and boundaries of wetland habitats near construction areas are field-truthed, their boundaries flagged, and coordinates recorded using GPS. This information was also used when determining the location of access roads that are being used to construct the transmission line. Mitigation for loss of wetland habitat is discussed in Section 6.3.2.

6.3.2 Condition 11.2

This section summarizes actions taken in accordance with the following requirement of Condition 11.2: *The Proponent shall develop, in consultation with Environment Canada, Reservoir Area Aboriginal groups and Immediate Downstream Aboriginal groups, a plan that addresses 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.*

Potential effects of Site C on wetland habitat are being addressed within a wetland compensation plan, which has the objective of no net loss of wetland functions, as per FDS Condition 11.3.

This is being conducted through a partnership with DUC, which does not have sufficient funding to rebuild aging water control infrastructure. As a result, they have been required by their respective water licenses to decommission infrastructure at several wetlands in BC since 2009, returning those wetlands to approximately pre-construction conditions and losing functional wetland area. Providing funding to DUC to rebuild aging water control infrastructure saves wetland area from being lost, and therefore meets international best practice standards for biodiversity offsets. DUC continues to identify historically constructed wetlands that are nearing the end of the 30-year water control infrastructure lifespan within the Peace and Omineca Regions to apply as wetland offsets for Site C.

In 2019, DUC conducted the physical works necessary at Golata Canyon Ranch to create approximately 50 ha of sedge wetland. The development of this wetland area, as vegetation establishes and wetland functions increase, will be monitored over time.

The Scott Lake restoration project was completed in 2023 which added 26.5 ha to the program. Due to permitting delays and landowner issues, no new properties were added to the program in 2024, although development of the Site C Area A reclamation wetland commenced which will add approximately 35 ha to the program by completion in late 2025. In 2024, DUC was able to obtain permitting to develop two additional wetlands (Favels Creek and Loiselle) in 2025 which will add approximately 40 ha more to the program.

Water control infrastructure at three wetlands rebuilt by DUC in 2022 (Doig Beatton East, Doig Beatton West, Cutbank Lake) and one in 2023 (Scott Lake), represents about 316 ha of wetland area that would otherwise be lost. Pending permits and access issues, aging water control infrastructure is planned to be rebuilt or created at the other three wetlands in 2025 and 2026 (Favel's Creek, Loiselle, Wilde Lake), which will preserve another 78 ha. In total, rebuilding the infrastructure at the wetlands past and to date is estimated to result in preserving 316 ha of wetland area that would otherwise have been lost.

BC Hydro estimates that a further 35 ha of wetland will be created during reclamation of Area A at the dam site. In total, the wetland compensation opportunities that have been constructed or identified for Site C currently total an estimated 351 ha of wetland. Additional wetland compensation is required beyond what has been constructed or identified, and BC Hydro is working with DUC, land conservancy organizations, private landowners, and local Indigenous Groups to identify further wetland compensation opportunities. The total area that will be required as compensation has yet to be determined due in part to uncertainty regarding total wetland impacts, which is being addressed through wetland monitoring and the re-evaluating the wetland functional assessment now that Project construction is complete. While wetland

compensation opportunities identified so far are primarily sedge wetlands, BC Hydro is working with DUC to explore options to integrate other wetland types into compensation planning.

In addition, BC Hydro continues to manage the Marl Fen property, which was retained in part to protect Marl Fen located on the property. The management plan for that property was included in the 2015 annual report and has since been updated and is included as Appendix 4.

A wetland monitoring program has also been 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 Designated 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 will be gathered through focussed monitoring plans (e.g., see Section 6.1.3 for details on 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 will also gather and compile data regarding changes to use of wetlands for traditional purposes.

In 2022 a field program was conducted 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 will occur 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).The wetland monitoring program annual report for 2022 was included in the 2022 Annual Report.

Through consultation with and review by MOECCS, MLWRS, and CWS through the VWTC, BC Hydro developed the Wetland Function Assessment (WFA) tool to measure progress towards the objective of no net loss of wetland functions. The WFA assesses the unavoidable loss of wetland area and function that supports migratory birds, amphibians, bats, species at risk, and species important to Indigenous land use due to Project activities. In assessing the loss of wetland area and function, the WFA process informs compensation measures for full replacement of wetland area and function. Wetland function is defined as the natural processes that are associated with wetlands but does not refer to the benefits of those processes to humans.

6.3.3 Condition 11.3

This section summarizes actions taken in accordance with the following requirement of Condition 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.*

The mitigation framework has three main steps, as outlined in the Environment Canada's Operational Framework for Use of Conservation Allowances (2012):

- Avoid proposed impacts;
- Minimize proposed impacts; and
- Address any residual environmental effects that cannot be avoided or sufficiently minimized with the use of conservation allowances.

Measures to avoid where feasible, and to minimize impacts to wetlands where avoidance is not feasible, are described in the CEMP and the Site C Vegetation Clearing and Debris Management Plan. For residual impacts to wetlands, BC Hydro is working to create, restore and enhance wetlands with the objective of no net loss of wetland functions. Determining the residual impacts to wetland functions, and the appropriate amount and type of wetlands to develop as conservation allowances, will be done through application of the Wetland Function Assessment, combined with application of the associated wetland monitoring program (see Section 6.3.2 above). The wetland monitoring program is designed to measure residual impacts to wetlands due to Site C, as well as to measure positive changes to wetland functions because of BC Hydro's efforts to create, restore and enhance wetlands.

6.3.4 Condition 11.4.1

This section summarizes actions taken in accordance with the following requirement of Condition 11.4.1: *The plan shall include 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.*

Baseline data on the biogeochemical, hydrological and ecological functioning of wetlands and associated riparian habitat were collected during baseline surveys in support of the EIS, and subsequent surveys of wetlands, including those likely to be impacted by the transmission line RoW. See Section 6.3.2 for a description of the wetland monitoring program.

6.3.5 Condition 11.4.2

This section summarizes actions taken in accordance with the following requirement of Condition 11.4.2: *The plan shall include mitigation measures to maintain baseline wetland functions for those wetlands that will not be permanently lost*.

For wetlands that will not be permanently lost, wetland function will be maintained through the timing of works (e.g., in winter to minimize ground disturbance), maintenance of hydrology through the installation of culverts during road construction as a matter of practice, and approaches to minimize impacts to wetlands through careful construction practices (see Section 6.3.1). The Wetland Function Assessment tool and the associated wetland monitoring program were designed together to identify impacts to wetlands and wetland functions, which will then inform quantitative wetland compensation objectives (see Section 6.3.2).

6.3.6 Condition 11.4.3

This section summarizes actions taken in accordance with the following requirement of Condition 11.4.3: *The plan shall include 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*.

See section 6.3.2 for discussion of the plan for monitoring and evaluating changes to baseline wetland conditions, as defined in Condition 11.4.1, and for identifying improvements based on monitoring data.

6.3.7 Condition 11.4.4

This section summarizes actions taken in accordance with the following requirement of Condition 11.4.4: *The plan shall include 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*.

Please see Section 6.3.2 for details on the wetland mitigation program and the Wetland Function Assessment tool.

6.3.8 Condition 11.8

This section summarizes actions taken in accordance with the following requirement of Condition 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.*

Please refer to Section 6.3.2 for details on implementation of wetland compensation measures in 2015, the first year of construction, and ongoing implementation.

6.3.9 Condition 11.9

This section summarizes actions taken in accordance with the following requirement of Condition 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*.

This annual report represents an analysis and summary of the implementation of the plan, as well as amendments made to the plan through the ongoing development of component mitigation and monitoring plans based on survey results and consultation with CWS, MLWRS, and MOECCS.

6.4 Federal Decision Statement Condition 16: Species at Risk Mitigation and Monitoring

This section of the annual report summarizes the programs as implemented in 2024 in accordance with the requirements of FDS Condition 16.6.

For context, the complete requirements of FDS Condition 16 are listed below.

16.	**Species at risk, at-risk and sensitive ecological communities and rare plants**
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.
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.	The plan shall include:

16.3.1. field work to verify the modeled results for surveyed species at risk and determine the habitat that would be permanently lost, habitat that would be fragmented and habitat that would remain intact for those species, including the Short-eared Owl, the Western Toad and the Myotis Bat species;

16.3.2. surveys to determine whether the rare plant species potentially facing extirpation in the Project Activity Zone are found elsewhere in the region;

16.3.3. measures to mitigate environmental effects on species at risk and at-risk and sensitive ecological communities and rare plants;

16.3.4. conservation measures to ensure the viability of rare plants, such as seed recovery and plant relocation;

16.3.5. an approach to avoiding or minimizing the use of herbicides and pesticides in areas that could impact species at risk, 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 ecological communities and rare plants; and

16.3.7. an approach for tracking updates to the status of listed species identified by the Government of British Columbia, Committee on the Status of Endangered Wildlife in Canada, and the Species at Risk Act, and implementation of additional measures, in accordance with species recovery plans, to mitigate effects of the Designated Project on the affected species should the status of a listed species change during the life of the Designated Project.

16.4. The Proponent shall submit to the Agency and Environment Canada a draft copy of the plan for review 90 days prior to initiating construction.

16.5. The Proponent shall submit to the Agency the final plan a minimum of 30 days prior to initiating construction. When submitting the final plan, the Proponent shall provide to the Agency, an analysis that demonstrates how it has appropriately considered the input, views or information received from Environment Canada.

The requirements of Condition 16.1 and Condition 16.2 are addressed through Condition 16.3. Mitigation and monitoring plans are developed in consultation with the CWS of ECCC through the VWTC (Section 3.1).

6.4.1 Condition 16.3.3

This section summarizes actions taken in accordance with the following requirement of Condition 16.3.3: *The plan shall include measures to mitigate environmental effects on species at risk and at-risk and sensitive ecological communities and rare plants.*

In 2024 the following measures were implemented to mitigate effects on species at risk and at-risk and sensitive ecological communities and rare plants:

- Pre-construction rare plant surveys focussed on the remaining segments of Highway 29 realignment corridors on the north side of the Peace River, access roads on the south side of the Peace River, and on the Area E aggregate extraction site. (Section 6.4.1.1);
- Amphibian mitigation through salvages and dispersal translocation (Section 6.4.1.2);
- Implementation of protection measures for wetland and riparian areas, in which rare plant occurrences are generally concentrated, as required by the CEMP (See Section 6.3.1);
- The Environmental Features Map was updated with 2022 rare plant data on 6 February 2023, when it was available to contractors for use in planning;

- Further development and implementation of the Experimental Rare Plant Translocation program in consultation with MOECCS, MLWRS, and CWS (Sections 7.1.6, 7.4.1 and 7.4.2); and
- Avoidance of bat hibernacula and maternity roosts at Portage Mountain, and the construction and installation of bat boxes on the north side of the Peace River. The 2017 VWMMP Annual Report described how impacts to hibernacula at Portage Mountain are being avoided. Monitoring of bat activity at Portage Mountain began in 2017 for evaluating the effectiveness of mitigation. Ongoing monitoring of bat activity at Portage Mountain is described in Section 6.4.3.3.

6.4.1.1 Pre-construction rare plant surveys

Pre-construction rare plant surveys were conducted in 2024 in areas of the planned Project footprint not previously surveyed. The resulting data serve as inputs to the final design of access roads, help inform mitigation to avoid or minimize impacts to rare plant occurrences near construction sites and identify potential propagule sources for the Experimental Rare Plant Translocation Program (see Sections 7.1.6, 7.4.1 and 7.4.2). The first season of pre-construction surveys was completed in the summer and fall of 2015, and those surveys have been ongoing in each year since. The 2024 pre-construction rare plant survey report, which includes methods and results from surveys conducted in 2015 through 2024, is in Appendix 7.

6.4.1.2 Amphibian dispersal mitigation and salvage

Mitigation for minimizing the impacts of the Project on amphibians and amphibian habitat is required of contractors and specified in part in Section 4.17 and Appendix L of the CEMP. Those mitigations include the following:

- Limit vegetation clearing and avoid road construction in identified amphibian breeding and migration areas, where feasible;
- If construction is required adjacent to any identified amphibian breeding and migration areas, implement appropriate barriers and set-back buffers around the sites in accordance with aquatic and riparian protection measures (i.e., retain a 15 m machine-free riparian buffer from the Ordinary High Water Mark of watercourses and waterbodies during clearing, except where worker safety prohibits manual tree falling and vegetation removal methods, and as addressed in a site specific prescription prepared and endorsed by a QEP [see Section 4.5 of the CEMP]; and avoid where feasible, including through the use of disturbance setback buffers);
- Install crossing structures for amphibians and snakes to avoid and reduce injury and mortality to amphibians on roads that cross or are immediately beside wetland or other areas where amphibians or snakes are known to migrate across roads in accordance with Section 8.8 of the VWMMP. Notify BC Hydro of such installations within 5 days of installation; and
- Implement amphibian salvage and translocation procedures as required. Amphibian salvages could be required when avoidance of areas containing metamorphosing tadpoles cannot be avoided, or prior to the destruction of wetlands supporting amphibians (Wildlife Act Permit FJ24-829902, valid May 13 to September 30, 2024). Amphibian translocation may be required when mass migration events cross access roads and work sites.

It is necessary for each contractor's QEP to conduct amphibian breeding and migration area surveys in advance of ground disturbing activities and alongside active construction roads, where and when appropriate, to determine appropriate mitigation. Revision 5 of the CEMP

includes an explicit requirement for each Contractor and its QEP to follow the Western Toad Management Procedure wherever western toads may exist. The Western Toad Management Procedure was developed through extensive consultation with MLWRS, MOECCS and CWS through the VWTC, and can be found in Appendix 6 of the 2017 Annual Report and is Appendix L of the CEMP. This procedure was finalized June 26, 2017, and since that time has been required for inclusion in all contractors' Environmental Protection Plans (EPPs) for works that could impact amphibians. Appropriate amphibian mitigation is monitored by BC Hydro site Environmental Monitors and the Independent Environmental Monitor (IEM) against commitments within EPPs and CEMP requirements to determine and enforce compliance.

The Western Toad Management Procedure is applicable during construction on access roads, the transmission line, and areas within 250 m of wetlands. It requires daily surveys of all access roads and work sites during the 'core dispersal period' of June 1 to August 15. During the 'caution dispersal periods' of April 1 to May 31 and August 16 to September 30, the protocol requires a minimum of weekly surveys, as well as surveys before travelling to site and before any work commences. The protocol includes a stop work procedure at access roads or construction sites if dispersing toads are confirmed within 20 m of those areas, as well as a requirement for installing temporary barrier fences to prevent toads from being exposed to an increased mortality risk. Trapped toads are then to be translocated safely across work areas in the direction of their dispersal.

6.4.2 Condition 16.3.4

This section summarizes actions taken in accordance with the following requirement of Condition 16.3.4: *The plan shall include conservation measures to ensure the viability of rare plants, such as seed recovery and plant relocation*.

The Experimental Rare Plant Translocation (ERPT) program was developed in consultation with MOECCS, MLWRS, and CWS through the VWTC (see Section 7.4.1 and 7.4.2). Collection of seeds began in 2017. Work to collect seeds and salvage rare plants under this program continued in 2024, along with translocation and monitoring (see Section 7.1.6). The 2024 ERPT final report is in Appendix 8.

6.4.3 Condition 16.3.6

This section summarizes actions taken in accordance with the following requirement of Condition 16.3.6: *The plan shall include 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 ecological communities and rare plants.*

6.4.3.1 Migratory Bird Monitoring

Please see Section 6.1.3 for a summary of migratory bird surveys conducted in 2024. These monitoring programs are designed to meet a number of objectives, including to monitor and evaluate the effectiveness of mitigation measures and to verify the accuracy of predictions made during the environmental assessment regarding migratory bird species at risk. Numerous migratory species that have been observed in those surveys are provincially and / or federally listed. The 2024 Annual Report for songbird surveys can be found in Appendix 1.

6.4.3.2 Ground-nesting Raptor Surveys

Ground-nesting raptor surveys were conducted in 2024 to monitor and evaluate the effectiveness of mitigation measures and to verify the accuracy of predictions made during the environmental assessment on ground nesting raptors, such as short-eared owl (see Section 7.8.4.2). Short-eared owl is a ground-nesting raptor that is provincially Blue-listed, is listed as Threatened by

COSEWIC, and listed as Special Concern on Schedule 1 of SARA. The 2024 Annual Report for Ground-nesting surveys can be found in Appendix 9.

6.4.3.3 Bat Mitigation and Monitoring

To avoid destroying hibernacula at Portage Mountain that may be used by little brown myotis and northern myotis (both of which are federally listed as Endangered on Schedule 1 of SARA), BC Hydro redesigned the Portage Mountain Quarry to the eastern edge of the License of Occupation area. This relocation achieved a 300 m no activity/no access buffer around the 16 documented potential hibernacula. To avoid disturbance to hibernating bats, BC Hydro has also prohibited blasting at Portage Mountain between September 15 and May 15 (see Section 4.2 of the CEMP); this window was established based on data collected at the hibernacula in 2013 and in consultation with bat biologists. This mitigation is summarized in detail in Appendix 8 of the 2016 Annual Report.

To prevent damaging rock structures associated with the hibernacula, MOE[6] recommends noise levels during blasting be kept below certain thresholds at the hibernacula (see Section 7.7.3). BC Hydro conducted noise modelling for blasting at Portage Mountain, which predicted that noise levels at the hibernacula would be below those thresholds.

BC Hydro monitored the noise and vibration caused by activity at Portage Mountain Quarry in 2018 through 2021, which included blasting for haul road construction and aggregate production. Noise monitoring conducted at the site determined that in 2018, 2019 and 2021, noise and vibration caused by blasting did not exceed thresholds at hibernacula locations, as defined in BC MOE Best Management Practices (BMP) Guidelines for Bats in British Columbia (i.e., air overpressure of less than 150 decibels, shock wave less than 15 p.s.i., and peak particle velocity [PPV] less than 15 mm/second; BC MOE 2016). In 2020, noise monitoring was conducted monthly, and so modelling was used to supplement available data. That modelling of noise and vibration showed that also in 2020 blasting was unlikely to have exceeded the BC BMP thresholds for noise or vibration at important bat habitat. Four blasting events occurred at Portage Mountain on September 2, 4, 8, and 14, 2023. No blasting was conducted in 2024.

BC Hydro is also conducting year-round monitoring of bat activity at Portage Mountain, with the following objectives:

- confirm that the bat species previously recorded at Portage Mountain remain present;
- evaluate any changes in the use of the artificial hibernacula established at Portage Mountain through bat activity recorded during the winter and spring-emergence periods;
- evaluate and changes in the use of Portage Mountain by bats by comparing bat activity to previously recorded spring to fall bat activity based on previously monitoring studies conducted at Portage Mountain; and
- help determine whether maternity roosts are present or being established within the artificial hibernacula through emergence counts and bioacoustic monitoring.

Analysis of bat activity data from acoustic detectors and bat emergence counts conducted at Portage Mountain between 2016 to 2023 indicate that bats continue to actively use habitat at Portage Mountain. This included detection of the endangered little brown and Northern myotis with the highest frequency from 2021 to 2023. The big brown & silver-haired bat species groups were detected at the second highest frequency from 2021 to 2023 as well. Comparatively, in contrast, big brown bats were the most commonly detected species at the sentinel sites. This

[6]BC MOE. 2016. Best Management Practices Guidelines for Bats in British Columbia. Chapter 2: Mine Developments and Inactive Mine Habitats. 68 pp.

information was reported in the Portage Mountain Bat Studies: 2023 Annual Report which was included as Appendix 8 in the 2023 VWMMP Annual Report.

A more detailed assessment of the acoustic data from bat detectors, collected continuously from 2017 to 2023 at Portage Mountain and from 2020 to 2023 at sentinel sites, were analyzed to compare bat activity between the two locations. In general, the findings indicated that implementation of the spatial and temporal mitigation measures that exceeded provincial BMPs at Portage Mountain appear to have successfully supported the ongoing use of the Portage Mountain bluffs by bats. This was further supported by the statistically significant increase in detections of big brown & silver-haired bat species groups and myotis bats in the June-July period following operations. This detailed assessment was finalized after release of the 2023 VWMMP Annual Report, so is included with this report in Appendix 10. The bat monitoring of the natural hibernacula at Portage Mountain and the sentinel sites concluded in 2023. So any further monitoring of bat hibernacula at Portage Mountain will be conducted by BC Hydro to assess the use of the four artificially-created hibernacula by bats.

In addition to the 120 bat roost boxes and one large bat house installed by BC Hydro in suitable habitat near the reservoir and dam site (report included as Appendix 9 in the 2023 VWMMP Annual Report), BC Hydro will be installing 12 more bat boxes in the dam site in 2025. Monitoring of bat activity at all the bat box installation locations is planned to occur annually through the first 10 years of operations of Site C.

In 2023, BC Hydro constructed three artificial bat hibernacula at the Portage Mountain Quarry site by drilling holes at least 3 m deep in rock faces on warm aspects that were inaccessible to predators. Small charges were used within the drill holes to create rock fractures to provide a range of microclimatic conditions and insulation for overwintering bats. A fourth hibernaculum using a culvert design as per the recommendation of the bat SME, was completed in 2024. The report describing the design and construction details of all four artificial bat hibernacula established at Portage Mountain is in Appendix 11. Note that the report included is currently a draft to be replaced by a finalized version.

6.4.3.4. Western Toad and Gartersnake Monitoring

The Western Toad and Gartersnake Monitoring Program was developed to identify and describe impacts to western toad and gartersnakes in wetlands downstream of Site C and implemented in 2018 through 2020. Western toad is federally listed as Special Concern under COSEWIC, SARA Schedule 1 – Special Concern, but is considered not at risk in BC. Pre-operations data collection was completed in 2020, and operations data collection is scheduled to begin in 2025.

6.4.3.4. Wetland Function Assessment and Wetland Monitoring

The Wetland Function Assessment has been developed to characterize the impacts of the Project on wetlands in general, and specifically the ecological functions that wetlands provide. A wetland monitoring program was implemented from 2018 to 2022 to monitor and evaluate the effectiveness of wetland mitigation measures and to verify the accuracy of the predictions made during the environmental assessment (see Section 6.3.2). The initial program ended in 2022, the results of which were reported in the 2022 Annual Report. With reservoir inundation, it will recommence with updated assessments in 2025.

6.4.3.5. Downstream Vegetation Monitoring

The Downstream Vegetation Monitoring program was developed to document the response of downstream vegetation, at-risk and sensitive ecosystems, and rare plant occurrences between the dam and the Pine River to changes in the surface water regime during construction and operations. The program was implemented in 2019 and continued in 2020 to complete pre-river

diversion (i.e., baseline) data collection. Data collection occurred in 2022 to capture the river diversion period during the mid-point of the diversion period. There was no need to collect data in 2023. Once Project operations commence, surveys will be conducted every 2 years for the first 10 years and then every 5 years for the next 15 years. The Downstream Vegetation Monitoring 2022 annual report was included with the 2022 VWMMP Annual Report.

6.4.4 Condition 16.3.7

This section summarizes actions taken in accordance with the following requirement of Condition 16.3.7: *The plan shall include an approach for tracking updates to the status of listed species identified by the Government of British Columbia, Committee on the Status of Endangered Wildlife in Canada, and the Species at Risk Act, and implementation of additional measures, in accordance with species recovery plans, to mitigate effects of the Designated Project on the affected species should the status of a listed species change during the life of the Designated Project.*

The Conservation Data Center revisions to the ranking of Species at Risk in 2024 was reviewed. The following documents were reviewed to identify changes to rankings of species documented in the LAA during baseline surveys[7]:

- 2024 BC Conservation Status Rank Review and Changes, Vascular Plants
- 2024 BC Conservation Status Rank Review and Changes, Ecological Communities
- 2024 BC Conservation Status Rank Review and Changes, Animals Summary

Species listed on Schedules 1, 2 and 3 of SARA were reviewed to determine if any species occurring in the Project area had been added or had their rankings changed.

6.4.4.1 Rare Plants

In 2024, there were no changes to the conservation status of plants with potential to occur in the Site C Project area.

6.4.4.2 Wildlife

The SARA status listings for wildlife species likely to occur within the Site C Project area did not change in 2024 nor did any of the COSEWIC classifications.

In August 2024, the BC Conservation Data Centre (CDC) listing changed status for seven wildlife species with potential to occur in the Site C Project area (Table 5). None of these species are listed under SARA or COSEWIC. In addition, the Pacific-slope Flycatcher (*Empidonax difficilis*) was lumped with Cordilleran Flycatcher (*E. occidentalis*) and is now known as the Western Flycatcher (*E. difficilis*).

Provincially species are assigned to lists based on their provincial conservation status. Species on the Red and Blue-lists are considered species at risk. Species on the yellow and unknown lists are not considered species at risk. More details and a summary of the lists can be accessed at http://www.env.gov.bc.ca/atrisk/help/list.htm:

Table 5. BC CDC Status Changes[1] in 2023 for Wildlife likely to occur in the Site C Project Area

Common Name	Scientific Name	2023 BC Status	2024 BC Status

[7] Government of British Columbia. 2023. Recent Data Changes. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/conservation-data-centre/explore-cdc-data/conservation-data-centre-updates. Accessed: 7 March 2023.

Baird's Sandpiper	*Calidris bairdii*	Unknown	Red
Stilt Sandpiper	*Calidris himantopus*	Unknown	Blue
Pectoral Sandpiper	*Calidris melanotos*	Unknown	Yellow
Pacific Golden-Plover	*Pluvialis fulva*	Not Reviewed	Yellow
Long-toed Salamander	*Ambystoma macrodactylum*	S4	S5
Wood Frog	*Lithobates sylvaticus*	S4S5	S5
Boreal Chorus Frog	*Pseudacris maculate*	S4S5	S5?

[1] **Red**: Native species that have, or are candidates for, Extirpated, Endangered, or Threatened status in BC. Endangered species are facing imminent extirpation or extinction. Threatened species are likely to become endangered if limiting factors are not reversed. Not all Red-listed species or ecological communities will necessarily become formally designated. Placing species on these lists flags them as being at risk and requiring investigation.
Blue: Native species considered to be of Special Concern (formerly Vulnerable) in BC. Species of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed species are at risk, but are not Extirpated, Endangered or Threatened.
Yellow: Includes species that are apparently secure and not at risk of extinction. Yellow-listed species may have red- or blue-listed subspecies.
Unknown: Includes species or ecological communities for which the Provincial Conservation Status is unknown due to extreme uncertainty (e.g., S1S4). It will also be 'Unknown' if it is uncertain whether the entity is native (Red, Blue or Yellow), introduced (Exotic) or accidental in B.C. This designation highlights species and ecological communities where more inventory and/or data gathering is needed.
Not Reviewed: Species that have not undergone a conservation status assessment (i.e., Provincial Conservation Status Rank). Species that have Provincial Conservation Status Ranks assigned from National General Status Program but have not been reviewed or verified by the BC CDC.
S4 = apparently secure, S5 = demonstrably widespread, abundant, and secure

7.0 Mitigation and Monitoring Measures-Environmental Assessment Certificate Conditions

Conditions 9 to 12, 14 to 16, 19, 21, 23, and 24 of the Environmental Assessment Certificate, respectively, set out the mitigation and monitoring requirements for the Project's effects on vegetation and ecological communities and wildlife resources.

7.1 EAC Condition 9

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 9. For context, the complete requirements of Condition 9 are shown below.

EAC Condition 9

The EAC Holder must develop a Vegetation and Invasive Plant Management Plan to protect ecosystems, plant habitats, plant communities, and vegetation with components applicable to the construction phase.

The Vegetation and Invasive Plant Management Plan must be developed by a QEP.

The Vegetation and Invasive Plant Management Plan must include at least the following:

Invasive Species

- Surveys of existing invasive species populations prior to construction.
- Invasive plant control measures to manage established invasive species populations and to prevent invasive species establishment.

Rare Plants and Sensitive Ecosystems

- The EAC Holder must expand its modelling, including completing field work, to improve identification of rare and sensitive plant communities and aid in delineation of habitats that may require extra care, 90 days prior to any Project activities that may affect these rare or sensitive plant communities
- The EAC Holder must, with the use of a QEP, complete an inventory in areas not already surveyed and use rare plant location information as inputs to final design of access roads and transmission lines. These pre- construction surveys must target rare plants as defined in Section 13.2.2 of the EIS —including vascular plants, mosses, and lichens.
- The EAC Holder must create and maintain a spatial database of known rare plant occurrences in the vicinity of Project components that must be searched to avoid effects to rare plants during construction activities. The database must be updated as new information becomes available and any findings of new rare plant species occurrences must be submitted to Environment Canada and MOE using provincial data collection standards.
- The EAC Holder must implement construction methods to reduce the impact to rare plants, maximize use of existing access corridors, and construct transmission towers and temporary roads away from wetlands and known rare plant occurrences.
- The EAC Holder must implement construction methods to reduce the impact to rare plants, maximize use of existing access corridors, and construct transmission towers and temporary roads away from wetlands and known rare plant occurrences.
- Protect known occurrences of Tufa seeps, wetlands and rare plants located adjacent to construction areas. Install signage and flagging where necessary, as determined by the QEP, to indicate the boundaries of the exclusion area.
- The EAC Holder will engage the services of a Rare Plant Botanist during construction to design and implement an experimental rare plant translocation program in consultation with MOE using the BC MOE's Guidelines for Translocation of Plant Species at Risk in BC (Maslovat, 2009).

The EAC Holder must provide this draft Vegetation and Invasive Plant Management Plan to Environment Canada, MFLNRO, MOE, and Aboriginal Groups for review a minimum of 90 days prior to construction and operation phases.

The EAC Holder must file the final Vegetation and Invasive Plant Management Plan with the Environmental Assessment Office (EAO), Environment Canada, MFLNRO, MOE, and Aboriginal Groups, a minimum of 30 days prior to construction and operation phases.

The EAC Holder must develop, implement and adhere to the final Vegetation and Invasive Plant Management Plan, and any amendments, to the satisfaction of EAO.

7.1.1 Invasive Plant Control

BC Hydro and its contractors adhered to the invasive plant mitigation measures described in Section 4.15 of CEMP and in the Invasive Weed Mitigation and Adaptive Management Plan (IWMAMP). Numerous invasive plant control measures for the Project continued in 2024:

- invasive plant removal through hand-pulling;
- biocontrol implementation for toadflax along river road
- on-going inventories of invasive plant locations;
- hydroseeding of exposed slopes across the Project area;
- regular vehicle inspections and cleaning through various methods so that vehicles are clean and free of dirt and invasive plants when transitioning between sites and into the Project area;
- BC Hydro and contractors utilise an operational wash station on site during non-frozen conditions;

- An Invasive Species Management Contractor was sourced by BC Hydro in 2018. That contractor will provide specialized support invasive species management support on the dam site, transmission line, reservoir, Hwy 29 realignment and other off-site locations through 2024.

7.1.2 Inventory areas not already surveyed

This section summarizes actions taken in accordance with the following requirement of Condition 9*: The EAC Holder must, with the use of a QEP, complete an inventory in areas not already surveyed and use rare plant location information as inputs to final design of access roads and transmission lines. These pre- construction surveys must target rare plants as defined in Section 13.2.2 of the EIS —including vascular plants, mosses, and lichens.*

Please see Section 6.4.1.1 for pre-construction rare plant surveys conducted in areas not already surveyed. Rare plant location data collected in 2024 was used to update the Environmental Features Map for contractors to access in their planning so that impacts to rare plants could be mitigated.

7.1.3 Spatial database of known rare plant occurrences

This section summarizes actions taken in accordance with the following requirement of Condition 9*: The EAC Holder must create and maintain a spatial database of known rare plant occurrences in the vicinity of Project components that must be searched to avoid effects to rare plants during construction activities. The database must be updated as new information becomes available and any findings of new rare plant species occurrences must be submitted to Environment Canada and MOE using provincial data collection standards.*

The Site C Environmental Features Database and Environmental Features Map was last updated with the 2022 rare plant data on 10 February 2023, when it was available to contractors for use in planning.

After the 2024 field season had ended, data was compiled and verified and submitted to the BCCDC. This dataset contained all the new rare plant occurrences found during 2024, as well as any updates and extensions to previously reported occurrences. The data was provided in a spatial format compatible with BCCDC submission requirements. Voucher specimens were prepared based on MOECCS guidelines (MOECCS 2018) and submitted to the UBC herbarium.

7.1.4 Rare plant avoidance

This section summarizes actions taken in accordance with the following requirement of Condition 9*: The EAC Holder must implement construction methods to reduce the impact to rare plants, maximize use of existing access corridors, and construct transmission towers and temporary roads away from wetlands and known rare plant occurrences.*

General mitigation to minimize impacts to wetlands, where rare plants are often concentrated is described in Section 6.3.1.

Rare plant location data collected in 2022 were used to update the Environmental Features Map for BC Hydro and contractors to access in their planning so that impacts to known occurrences of rare plants could be mitigated in 2024.

The way that BC Hydro fulfilled this part of Condition 9 during the transmission line design phase was described in the 2015 annual report. Tower types selected are capable of supporting longer spans of conductor than those originally planned, which will reduce the overall number of towers required. Tower pad placement has been adjusted to minimize impacts to wetlands within engineering constraints. As a result, the total number of towers was reduced from 433 in the conceptual design down to 409 in the current design. The

number of wetlands impacted was 102 in the conceptual design and is 64 in the current design. Occurrences of rare plants have been avoided through transmission line design and tower placement to the degree feasible.

Further practices for avoidance of rare plant occurrences are described in Section 4.15 of the CEMP. All known rare plant occurrences are stored in the Site C Environmental Features Database and displayed on the Environmental Features Map (see Section 7.1.3). Contractors are required to avoid impacting rare plant occurrences, where feasible. Where complete avoidance is not feasible, contractors are required to employ measures to reduce adverse effects, such as by timing construction activities in winter months and frozen ground conditions, placing ramps or matts over occurrences to reduce soil compaction, using rubber-tired equipment, and implementing designated travel routes to and from work sites. Additional mitigation for rare plant occurrences that cannot be avoided is addressed through the Experimental Rare Plant Translocation program, in which rare plant propagules are collected, propagated, out-planted and monitored (see Sections 7.1.6, 7.4.1 and 7.4.2).

7.1.5 Protect tufa seeps, wetlands and rare plants located adjacent to construction areas

This section summarizes actions taken in accordance with the following requirement of Condition 9*: Protect known occurrences of Tufa seeps, wetlands and rare plants located adjacent to construction areas. Install signage and flagging where necessary, as determined by the QEP, to indicate the boundaries of the exclusion area.*

Mitigation to minimize impacts to wetlands and rare plants adjacent to construction areas is described in the CEMP, and further described in detail in Sections 6.3.1 and 6.3.3 of this report for tufa seeps and wetlands, and Section 7.1.4 for rare plants.

Tufa seeps are present on the south bank of the eastern reservoir, where clearing occurred in 2019. Mitigation to minimize impacts on the tufa seep consisted of no ground equipment within the feature, and trees were directionally felled away from the tufa seep to the degree feasible. Further details on tufa seep mitigation measures were described in the 2022 VWMMP Annual Report. No additional tufa seeps were affected by construction activities in 2024.

7.1.6 Experimental Rare Plant Translocation Program

This section summarizes actions taken in accordance with the following requirement of Condition 9: *The EAC Holder will engage the services of a Rare Plant Botanist during construction to design and implement an experimental rare plant translocation program in consultation with MOE using the BC MOE's Guidelines for Translocation of Plant Species at Risk in BC (Maslovat, 2009).*

The Experimental Rare Plant Translocation program was developed in consultation with MOECCS, MLWRS and CWS through the VWTC, and is described in detail in Section 7.4.1. Collection of seeds began in 2017. Work to collect seeds and salvage rare plants under this program continued in 2024, along with translocation and monitoring. The report detailing the results of the 2024 field program is Appendix 8.

7.2 EAC Condition 11

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 11.

For context, the complete requirements of Condition 11 are shown below.

EAC Condition 11

EAC Holder must compensate for the loss of rare and sensitive habitats and protect occurrences of rare plants by developing, or funding the development and implementation of a compensation program, during construction, that includes:

- Assistance (financial or in-kind) to the managing organization of suitable habitat enhancement projects in the RAA (RAA as defined in the amended EIS).
- Direct purchase of lands in the RAA and manage these lands and suitable existing properties owned by the EAC Holder to enhance or retain rare plant values where opportunities exist.

The EAC Holder must engage with MFLNRO, MOE and Aboriginal Groups with regard to the development of the compensation program.

7.2.1 Habitat Enhancement Projects in the Regional Assessment Area (RAA)

This section summarizes actions taken in accordance with the following requirement of Condition 11: *EAC Holder must compensate for the loss of rare and sensitive habitats and protect occurrences of rare plants by developing, or funding the development and implementation of a compensation program, during construction, that includes assistance (financial or in-kind) to the managing organization of suitable habitat enhancement projects in the RAA (RAA as defined in the amended EIS).*

Habitat enhancement activities to compensate for the loss of rare and sensitive habitats and for protecting occurrences of rare plants are being conducted through DUC for wetland compensation activities (Section 6.3.2), and Ecologic Consultants through the Saulteau-EBA Environmental Services Joint Venture for the Experimental Rare Plant Translocation Program (Section 7.1.6).

7.2.2 Direct purchase of lands in the RAA to enhance or retain rare plant values

This section summarizes actions taken in accordance with the following requirement of Condition 11: *EAC Holder must compensate for the loss of rare and sensitive habitats and protect occurrences of rare plants by developing, or funding the development and implementation of a compensation program, during construction, that includes direct purchase of lands in the RAA and manage these lands and suitable existing properties owned by the EAC Holder to enhance or retain rare plant values where opportunities exist.*

In 2014 BC Hydro purchased the Marl Fen property, located outside Hudson's Hope. This property supports several rare plant species. This property is being managed to maintain rare plants along with other wildlife and vegetation values. Results of surveys documenting species that occur within the property were provided in the 2015 Annual Report of the VWWMP.

7.2.3 Engaging with MLWRS, MOECCS and Indigenous Groups

This section summarizes actions taken in accordance with the following requirement of Condition 11: *The EAC Holder must engage with MFLNRO, MOE and Aboriginal Groups with regard to the development of the compensation program.*

BC Hydro continues to engage with MLWRS and MOECCS through the VWTC regarding the development of the compensation program for the loss of rare and sensitive habitats and to protect occurrences of rare plants. BC Hydro continues to engage with Indigenous Groups through ongoing communications, such as direct requests for assistance in identifying appropriate wetland compensation opportunities. In addition, BC Hydro engages with Indigenous Groups through regularly scheduled permitting and environmental forums. Those forums cover subjects that included rare plants, plants of traditional importance, wetlands, and expected Site C construction impacts on beavers.

7.3 EAC Condition 12

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 12.

Details regarding the Wetland Mitigation and Compensation Plan and wetland mapping are described in Section 7.3.1 and 7.3v.1.1, respectively. Additional details regarding maintaining hydrological balance at wetlands, sedimentation barriers, stormwater management, implementation of approved work practices as per the suggestions of the provincial Develop with Care guidelines (BC MFLNRO and BC MOE 2014) were presented in Section 7.3 of the 2017 VWMMP Annual Report.

For context, the requirements of Condition 12 are shown below.

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:

- Information on location, size and type of wetlands affected by the Project;
- If roads cannot avoid wetlands, culverts will be installed under access roads to maintain hydrological balance, and sedimentation barriers will be installed;
- Stormwater management will be designed to control runoff and direct it away from work areas where excavation, spoil placement, and staging activities occur.

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.

- 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 BMP guidebook Develop with Care (BC Ministry of Environment 2012 or as amended from time to time).
- A defined mitigation hierarchy that prioritizes mitigation actions to be undertaken, including but not limited to:
    - Avoid direct effects where feasible;
    - Minimize direct effects where avoidance is not feasible;
    - 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; and
    - Create new wetland habitat

The EAC Holder must monitor construction and operation activities that could cause changes in wetland functions.

The EAC Holder must provide this draft Wetland Mitigation and Compensation Plan to Environment Canada, MFLNRO, MOE, Aboriginal Groups, Peace River Regional District and District of Hudson's Hope for review a minimum of 90 days prior to any activity affecting the wetlands.

The EAC Holder must file the final Wetland Mitigation and Compensation Plan with EAO, Environment

Canada, MFLNRO, MOE, Peace River Regional District, District of Hudson's Hope and Aboriginal Groups, a minimum of 30 days prior to any activity affecting the wetlands. The EAC Holder must develop, implement and adhere to the final Wetland Mitigation and Compensation Plan, and any amendments, to the satisfaction of EAO.

7.3.1 Wetland Mitigation and Compensation Plan

Condition 12 requires: *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.*

Please see Section 6.3 for a description of the components of the Wetland Mitigation and Compensation Plan:

- Section 6.3.1, 6.3.3 and 6.3.5 describe mitigation to avoid or minimize impacts to wetlands to the degree feasible.
- Section 6.3.2 describes the status of wetland compensation plan development, the wetland monitoring program and the Wetland Function Assessment Tool, which combined represent the measurement and compensation of wetland impacts.

7.3.1.1 Information on location, size and type of wetlands affected by the Project

This section summarizes actions taken in accordance with the following requirement of Condition 12: *Information on location, size and type of wetlands affected by the Project.*

Three spatial datasets are available that describe the location, size and type of wetlands that may be affected by the Project: TEM habitat mapping; detailed wetland mapping; and a dataset produced by Maple Leaf Forestry. The TEM was generated in and around the Project Activity Zone (PAZ) to encompass the Peace River, the transmission line, and other sites within the PAZ. Polygons in the TEM were produced at a 1:20,000 scale, delineated using aerial photography, characterized with aerial photography combined with Vegetation Resources Inventory (VRI) forest cover mapping, and ground-truthed using field sampling. The TEM was used to generate estimates of wetland area to be affected by construction in the PAZ in the EIS and is being updated based on the results of wetland monitoring.

Detailed wetland mapping was created by BC Hydro to be finer scale wetland mapping than the TEM data. Within a TEM polygon, wetland boundaries were delineated using aerial photos that were either at a 1:5,000 or 1:15,000 scale. This allowed for greater detail to delineate the wetland edge. The detailed wetland mapping was completed along the transmission line corridor and the Peace River. It was delineated by first identifying all TEM polygons classified as wetland habitat. Using large scale aerial photographs, the boundaries of any wetland that fell within a TEM wetland polygon were then delineated and the habitat type of the TEM wetland polygon was assigned to the newly delineated wetland(s). In some cases, the TEM wetland was divided up into several smaller wetlands while in others the edge of the TEM wetland was only modified based on the higher detail aerial photographs used. Also, in some cases, wetlands have been delineated outside of TEM wetland polygons. A Field-Truthing-Required (FTR) label was assigned to any wetland where wetland classification needed refining. Because the detailed wetland mapping polygons follow wetland edge, this GIS dataset is useful for characterizing wetlands that may be affected.

In October 2017, Maple Leaf Forestry Ltd. conducted an assessment and classification of wetlands impacted by the transmission line RoW. This consisted of field visits to identify all the

wetlands in the RoW, categorize them into a wetland type, and delineate the boundaries of the wetland. Wetlands were categorized into the same wetland types as in the TEM while also classified into a Wetland Riparian Class of the Forest Practices and Planning Regulation (FPPR) under the Forest and Range Practices Act (FRPA). All wetlands in the transmission line were classified as W1, W3, W5, or a non-classified wetland. The Wetland Riparian Class was used to identify the minimum riparian management area width, riparian reserve zone width and riparian management zone width for the wetland. Because the Maple Leaf Forestry dataset has field-verified wetland edges and type, there is a greater level of accuracy associated with this dataset; however, wetland mapping and characterization was only conducted along the transmission line RoW, and therefore its usefulness for characterizing wetlands that may be affected by the Project is limited.

Although each dataset has its limitations, the TEM, detailed and Maple Leaf wetland habitat mapping can be used in association with each other. Additional wetland delineation is also being conducted through the ongoing wetland monitoring program (Section 6.3.2).

With reservoir fill and corresponding construction activities completed by December 2024, mapping of impacted wetlands is currently being re-assessed incorporating the previous methods described above but will provide a more reliable amount as it will also be based on ground-truthed clearing maps and as-completed closure reports outlining wetland features as various activities finished throughout the construction site.

7.4 EAC Condition 14

This section of the annual report summarizes the programs as implemented in 2024 in accordance with the requirements of Condition 14.

For context, the complete requirements of Condition 14 are shown below.

EAC Condition 14

The EAC Holder must develop a Vegetation and Ecological Communities Monitoring and Follow-up Program for the construction phase and first 10 years of the operations phase. The Vegetation and Ecological Communities Monitoring and Follow-up Program must be developed by a QEP.

The Vegetation and Ecological Communities Monitoring and Follow-up Program must include at least the following:

- Definition of the study design for the rare plant translocation program (see condition 9).
- Plan for following-up monitoring of any translocation sites to assess the survival and health of translocated rare plant species, under the supervision of a Rare Plant Botanist.
- Measurement criteria, including vegetation growth, persistence of rare plants and establishment / spread of invasive plant species, and associated monitoring to document the effectiveness of habitat enhancement and possible compensation programs.

The Vegetation and Ecological Communities Monitoring and Follow-up Program reporting must occur annually during construction and the first 10 years of operations, beginning 180 days following commencement of construction.

7.4.1 Definition of the study design for the Experimental Rare Plant Translocation Program

As outlined in the VWMPP, the study design for the Experimental Rare Plant Translocation program will follow a five-step approach, as outlined in Maslovat (2009)[8]. The goals of the experimental rare plant translocation program are to contribute to the following:

- the viability of target rare plant species through propagule collection, propagation and translocation; and
- the field of plant translocation based on the findings from the seeding, propagation, translocation, management, and monitoring measures.

The primary objective of the ERPT is to establish new populations or augment extant populations of target rare plant species using established and, where necessary, experimental techniques.

The ERPT program also has the following secondary objectives:

- support the conservation of the target species by promoting a self-sustaining population;
- maintain local genetic diversity of target species;
- re-establish individuals of target species in high-risk areas into secure, analogous habitat; and
- produce a secondary supply of viable plant stock in the case that supplementing translocated populations is required.

There are four strategies that will be employed in achieving the goals and objectives of the program:

1. Translocate rare plant species through plant salvage, collection of vegetative propagules, and/or seeds from populations that will or may be lost (e.g., lost due to clearing activities or creation of the reservoir).
2. Document the survival of the translocated rare plants through population monitoring at re-location sites through the Site C construction period and up to the first 10 years of the operations phase.
3. Manage translocated populations as needed depending on the results of monitoring.
4. Improve the theory and practice of rare plant translocation and increase knowledge of the biology and ecology of targeted rare plant species.

The results of the study will be made publicly available as part of the annual Vegetation and Wildlife Mitigation and Monitoring Program report so that learnings are accessible to others, thereby adding to the relevant knowledge base and improving the theory/practice of rare plant translocation. Details of the Experimental Rare Plant Translocation program activities in 2024 is presented in Appendix 5.

The program at its current state of development consists of four main phases over nine years of study (2016 to 2024):

[8]Maslovat, C. 2009. Guidelines for translocation of plant species at risk in British Columbia. British Columbia Ministry of Environment, Victoria, BC.

1. **Literature review and program development (2016-2024).** The literature review and program development is underway and will continue throughout the duration of the ERPT program. A review of existing guidance, methodologies, and results of previous rare plant translocation projects worldwide is ongoing. The lessons learned through these studies and analyses are being used to inform the structure and methods of the ERPT program.
2. **Propagule collection (2017 to 2024).** The standards for collecting and storing propagules for *ex situ* conservation (e.g., timing, sampling, labelling, cleaning, processing, stratification, sowing, and provenance) incorporate guidance outlined in Maslovat (2009) and by the European Native Seed Conservation Network (ENSCONET; 2009)[9]. The program is designed to collect seeds and cuttings or whole plants and to characterize the site conditions at the source locations. The level of risk to each plant population is being used to prioritize sites for the collection program and will be used for future collection activities, as appropriate. The level of risk is determined based on the expected clearing date, rarity of the plant, and predicted propagule collection timing.

   Propagule collection is occurring throughout the growing season and takes into consideration local plant phenology and propagation. Field teams are conducting multiple site visits to collect seeds on several occasions as appropriate based on seed availability and readiness.
3. **Ex-situ propagation (2017 to 2024).** This phase of the ERPT Program involves the evaluation of methods and implementation of seed cleaning, drying, storage, stratification, and ex-situ propagation for each individual taxon. Depending on the species and seed type, seeds are either being dried or cleaned following collection to ensure maximum viability. Cleaning includes the removal of waste material from the seed itself and involves the use of sieves, hand separation, and water baths and drying, as appropriate. Stratification is conducted as needed, whereby seeds are treated with cold or moist heat to simulate natural germination conditions. Stratification is the term for the series of controlled external conditions a seed is exposed to in order to break dormancy, and is designed to emulate the environmental conditions that a seed would be exposed to in nature. Many (but not all) seeds require stratification to break seed dormancy and permit germination. Some seeds also require a pre-treatment, such as mechanical or acid scarification, to weaken the seed coat prior to stratification. Seeds that do not require stratification are stored until spring. Propagation methods for asexual and sexual propagation for each species are being investigated in the context of the ecological conditions observed at the source populations.
4. **Translocation implementation (2018 to 2025).** The detailed methods for translocation implementation are being refined based on data collected during field activities. Translocation implementation involves site selection, site preparation and seeding and/or planting at recipient sites. Efforts will be made to determine if any site preparation (for intact habitats) or site engineering (for restoration sites) is required before translocation and to identify if habitat manipulation after the translocation will be required. Recipient sites will be prepared as necessary prior to the translocation, including invasive plant species removal (and implementation of steps to minimize introduction during the translocation process), soil amendment, and sculpting microcatchments. Specific planting techniques for founder plants (i.e., those plants

[9]ENSCONET. 2009. Seed Collecting Manual for Wild Species. Main editors: Royal Botanic Gardens (UK) & Universidad Politécnica de Madrid (Spain). Edition 1: 17 March 2009.

initially transplanted at a recipient site) are being developed for each species. The specific timing windows for planting will be determined based on the plant phenology, the development stage of the propagated plants, and the local weather and soil moisture conditions. Initial translocation occurred in September 2018. Additional planting was completed annually from 2019 through 2024. Planting efforts are incorporating the key findings from previous planting efforts. Some stock is being withheld from planting as insurance should inclement conditions negatively affect the initial out-planting stock.

5. **Post-translocation care, maintenance and monitoring (2018 to 2035).** Post-translocation care, maintenance, and monitoring commences immediately after each translocation event is completed. Post-translocation plant care and site management assesses the survival of translocated populations and addresses factors affecting the survival or health of the translocated plants. The first two to three years of follow-up site visits and data collection (i.e., short-term monitoring) will inform the frequency and level of effort required for post-translocation care and additional monitoring in subsequent years (i.e., long-term monitoring). Translocated populations that are achieving identified targets will still require long-term monitoring but may require less frequent follow-up visits than populations that are not achieving key metrics and require more active management. Monitoring the success or failure of the methods will assist in identifying opportunities for improvement within an adaptive management framework. This information can also help to inform other translocation projects, thereby improving the overall success of rare plant translocation as a tool for biodiversity conservation.

7.4.2 Plan for monitoring translocations

Experimental Rare Plant Translocation Program monitoring will document a suite of parameters designed to evaluate the efficacy of translocation methods in relation to the stated objectives of the program. All actions associated with the translocation (see Section 7.5.1) will be fully documented to retain as much information as possible on the pathway of a given plant (e.g., from seed collection to planting) to facilitate post-hoc assessments of success. Specifically, the monitoring program will measure, document, and evaluate the following:

1. the efficacy of the methods used to a) characterize donor and recipient sites, b) collect and store plant propagules, c) conduct ex-situ propagation; and d) translocate the rare plant species from the host site to the recipient sites;
2. the efficacy of the techniques used for managing the translocated plant propagules (e.g. site preparation, watering, weeding, fertilizing);
3. the survival of the translocated rare plant species through monitoring of population size, extent, threats, resilience, and persistence; and
4. the success of follow up procedures applied to address any declines in survival or fitness of the translocated plants.

7.4.3 Measurement criteria for effectiveness monitoring of habitat enhancement and compensation programs

Please see Section 7.5.2 for how the effectiveness of the rare plant translocation program will be measured.

7.5 EAC Condition 15

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 15.

For context, the complete requirements of Condition 15 are shown below.

EAC Condition 15

The EAC Holder must develop a Wildlife Management Plan. The Wildlife Management Plan must be developed by a QEP.

The Wildlife Management Plan must include at least the following:

- Field work, conducted by a QEP, to verify the modelled results for surveyed species at risk and determine, with specificity and by ecosystem, the habitat lost or fragmented for those species. The EAC Holder must use these resulting data to inform final Project design and to develop additional mitigation measures, as needed, as part of the Wildlife Management Plan, in consultation with Environment Canada and MFLNRO.
- Measures to avoid, if feasible, constructing in sensitive wildlife habitats. If avoiding sensitive wildlife habitats is not feasible, condition 16 applies.
- If sensitive habitats, such as wetlands, are located immediately adjacent to any work site, buffer zones must be established by a QEP to avoid direct disturbance to these sites.
- Protocol for the application of construction methods, equipment, material and timing of activities to mitigate adverse effects to wildlife and wildlife habitat.
- Protocol to ensure that lighting is focused on work sites and away from surrounding areas to manage light pollution and disturbance to wildlife. If lighting cannot be directed away from surrounding areas, the EAC Holder must ensure additional mitigation measures are implemented to reduce light pollution, including light shielding.
- A mandatory environmental training program for all workers so that they are informed that hunting in the vicinity of any work site/Project housing site is strictly prohibited for all workers.

The EAC Holder must ensure that all workers are familiar with the Wildlife Management Plan.

The EAC Holder must submit this draft Wildlife Management Plan to Environment Canada, MFLNRO, MOE and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.

The EAC Holder must file the final Wildlife Management Plan with EAO, Environment Canada, FLN, MOE and Aboriginal Groups, a minimum of 30 days prior to commencement of construction.

The EAC Holder must develop, implement and adhere to the final Wildlife Management Plan, and any amendments, to the satisfaction of EAO.

7.5.1 Measures to avoid, if feasible constructing in sensitive wildlife habitats

This section summarizes actions taken in accordance with the following requirement of Condition 15: *Measures to avoid, if feasible, constructing in sensitive wildlife habitats. If avoiding sensitive wildlife habitats is not feasible, condition 16 applies.*

Measures to avoid impacts to sensitive wildlife habitats are described in Section 4.17 of Revision 5 of the CEMP:

- Avoid construction activity within Important Wildlife Areas, including designated setback buffers determined by a QEP, where feasible. Important Wildlife Areas are defined in the CEMP as habitat areas that animals use around the same time each year, such as the following:
    - wetlands;
    - snake hibernacula;
    - bat hibernacula;

    - sharp-tailed grouse leks;
    - beaver lodges, dams and food caches;
    - active furbearer and large carnivore den sites;
    - active bird nests;
    - mineral licks;
    - habitat used by ungulates for winter range; and
    - amphibian breeding sites and migration routes.
- Except within the dam site area, on designated access roads and during clearing, construction activities are prohibited within 15 m of the Ordinary High Water Mark of streams or wetlands, unless the activity was described in the EIS and is accepted by BC Hydro (CEMP Section 4.5);
- Guidance to minimize impacts to raptor nests;
- Protocol for conducing sharp-tailed grouse lek monitoring and a decision tree for various lek activity scenarios to minimize impacts to sharp-tailed grouse leks (see also Appendix 7 of the 2016 Annual Report); and
- Measures for minimizing impacts to amphibian breeding and migration areas (see also Section 6.4.1.2).

7.5.2 Setback buffers to avoid direct impacts to sensitive habitats

This section summarizes actions taken in accordance with the following requirement of Condition 15*: If sensitive habitats, such as wetlands, are located immediately adjacent to any work site, buffer zones must be established by a QEP to avoid direct disturbance to these sites*

As specified above in Section 7.6.1, Revision 5 of the CEMP (Section 4.17), construction activity is to be avoided within Important Wildlife Areas, including in designated setback buffers as determined by a QEP, where feasible. Wetland avoidance measures are discussed further in Section 6.3.1.

Procedures for determining appropriate situation- and species-specific disturbance setback buffers to be applied around locations where bird nests are present are discussed in Section 6.1.1 (migratory birds).

7.5.3 Mitigation of adverse effects to wildlife and wildlife habitat

This section summarizes actions taken in accordance with the following requirement of Condition 15*: Protocol for the application of construction methods, equipment, material and timing of activities to mitigate adverse effects to wildlife and wildlife habitat.*

Mitigation of adverse effects to wildlife is discussed in Sections 7.6.1 and 7.6.2. Section 6.4.1.2 provides a summary of mitigation applied to minimize adverse impacts to amphibians. Revisions 5 and 6 of the CEMP (Section 4.17) specify that, where feasible, vegetation clearing will take place during Peace Region terrestrial wildlife least-risk windows. Least risk timing windows for wildlife are described in Table 5 of the CEMP.

Where clearing outside of least-risk timing windows cannot be avoided, pre-clearing surveys are required, with disturbance setback buffers determined by a QEP.

7.5.4 Protocol to ensure that lighting is focused on work sites

This section summarizes actions taken in accordance with the following requirement of Condition 15*: Protocol to ensure that lighting is focused on work sites and away from surrounding areas to manage light pollution and disturbance to wildlife. If lighting cannot be directed away from surrounding areas, the EAC Holder must ensure additional mitigation measures are implemented to reduce light pollution, including light shielding.*

Section 4.17 of the CEMP requires contractors to focus lighting on work sites and away from surrounding areas to minimize light. CEMP requirements are audited by site Environmental Monitors and the Independent Environmental Monitor to determine and enforce compliance.

7.5.5 Environmental training of workers

This section summarizes actions taken in accordance with the following requirement of Condition 15*: A mandatory environmental training program for all workers so that they are informed that hunting in the vicinity of any work site/Project housing site is strictly prohibited for all workers. The EAC Holder must ensure that all workers are familiar with the Wildlife Management Plan.*

All workers are required to attend both a BCH orientation and a contractor specific orientation prior to starting work on-site. A component of these training sessions is environmental training for workers. Completion of these sessions is required prior to the issuance of site access cards for BC Hydro employees and contractors.

7.6 EAC Condition 16

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 16.

For context, the complete requirements of Condition 16 are shown below.

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.
- Mitigation for the loss of snake hibernacula, artificial dens must be included during habitat compensation.
- Management of EAC Holder-owned lands adjacent to the Peace River suitable as breeding habitat for Northern Harrier and Short-eared Owl.
- 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.
- A design for bat roosting habitat in HWY 29 bridges to BC Ministry of Transportation and Infrastructure (MOTI) for consideration into new bridge designs located within the Peace River valley.
- Following rock extraction at Portage Mountain, creation of hibernating and roosting sites for bats.
- Creation of natural or artificial piles of coarse woody debris dispersed throughout the disturbed landscape to maintain foraging areas and cold-weather rest sites, and arboreal resting sites, for the fisher population south of the Peace River.

The EAC Holder must provide this draft Vegetation and Wildlife Mitigation and Monitoring Plan to Environment Canada, MFLNRO, MOE, and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.

The EAC Holder must file the final Vegetation and Wildlife Mitigation and Monitoring Plan with EAO, Environment Canada, MFLNRO MOE, and Aboriginal Groups, a minimum of 30 days prior to commencement of construction.

The EAC Holder must develop, implement and adhere to the final Vegetation and Wildlife Mitigation and Monitoring Plan, and any amendments, to the satisfaction of EAO.

7.6.1 Wetland compensation that includes fish-free areas

As of the end of 2024, BC Hydro has purchased one property for wetland compensation (i.e., the Marl Fen property) and has constructed or saved from imminent loss 316 ha across five wetlands that are all fish-free. Three additional wetland compensation opportunities are being implemented for development in 2025 and 2026 with DUC and will include fish-free areas.

7.6.2 Mitigation for the loss of snake hibernacula

Six artificial hibernacula for gartersnake overwintering were constructed in 2020 on the north side of the Peace River. In 2023, one additional snake den was constructed near Cache Creek. Occupancy monitoring of the first six artificial snake hibernacula occurred from 2021 to 2023. Two were considered to be occupied in 2022: Snake Den 21.4 (Dam View), and Snake Den48 (Wilder Creek) and a shed snakeskin was found beneath a patio stone within 10 m of the entrance to Snake Den 21.4. However, no signs of snake use of the den sites were observed in 2023. The Cache Creek snake den was monitored for snake activity in September 2024. Snakes were observed in the vicinity of the artificial hibernaculum, but it could not be determined if the den was being used for overwintering. Monitoring for snake use will continue in 2025 and 2026 as per the monitoring plan stating that artificial hibernacula will be monitored for three years upon den construction completion. The report detailing monitoring of the Cache Creek snake den in 2024 is in Appendix 12.

7.6.3 Nest boxes for cavity-nesting waterfowl

Thirteen different nest box designs were constructed to accommodate 21 species of cavity nesting birds, with some box designs intended to support multiple species. Between 2017 and 2022, 277 nest boxes were installed on trees and structures on BC Hydro owned and managed lands, and on private lands where permission was granted. Nest boxes were strategically placed along the reservoir shoreline in areas determined to be most beneficial to each species group, while also considering availability of land and suitable access for installation and future mitigation effectiveness monitoring.

Monitoring of nest boxes began in the breeding season of 2020 and continued in 2024. The Cavity Nesting Mitigation and Monitoring Program 2024 Annual Report is in Appendix 13.

7.6.4 Creation of Wildlife Trees

Between 2022-2023, 300 wildlife trees were created or enhanced at the Site C project area by fungal inoculation and mechanical stem manipulation (e.g., tree girdling and topping) to enhance cavity-causing decay and followed up by effectiveness monitoring (medium-term strategy for primary cavity excavators). This will increase nesting, roosting, and denning habitat supply for cavity-dwelling wildlife over multiple time scales such as woodpeckers, owls, migratory passerines, kestrels, squirrels, bats, and furbearers.

The Wildlife Tree Habitat Enhancement program was completed in 2023 with the Final Report detailing the program presented in the 2023 VWMMP Annual Report. BC Hydro is providing funding for graduate student research as a follow-up to monitoring these trees to the University of Northern BC beginning in 2026.

7.6.5 A design for bat roosting habitat in HWY 29 bridges

This section summarizes actions taken in accordance with the following requirement of Condition 16: *A design for bat roosting habitat in HWY 29 bridges to BC Ministry of Transportation and Infrastructure (MOTI) for consideration into new bridge designs*

located within the Peace River valley.

During baseline surveys bats were documented using the Farrell Creek, Halfway River and Cache Creek bridges as night roosts. These three bridges and the bridge at Lynx Creek were inundated by reservoir fill. New bridges were constructed at these locations.

BC Hydro had previously reached an agreement with MOTI to install bat roost structures on newly constructed bridges along re-aligned sections of Highway 29 to offset the losses of night roosts on existing bridges. However, on 25 October 2018, BC Hydro received notification from the Regional Manager of Environmental Services, MOTI, that MOTI no longer supports the placement of bat roosting boxes on bridges. Therefore, bat boxes were not integrated into the designs of any new bridges, including those at Farrell Creek, Halfway River, Cache Creek and Lynx Creek.

7.6.6 Creation of hibernating and roosting sites for bats

This section summarizes actions taken in accordance with the following requirement of Condition 16: *Following rock extraction at Portage Mountain, creation of hibernating and roosting sites for bats.*

In February of 2016 the BC Ministry of Environment released Best Management Practices Guidelines for Bats in British Columbia "Bat BMPs"[10]. These guidelines recommend that a 100 m buffer be established around the core area of bat habitat, which for Portage Mountain is defined as all the suspected hibernacula entrances that had been documented. Within this 100 m, no activities that modify the above or below ground habitat are allowed. The guidelines also recommend a 1 km special management zone, within which blasting activities are permitted if the following can be achieved:

- No blasting to occur between October and May;
- Blasting must be conducted within the following parameters (to avoid damage to the rock structures associated with the hibernacula):
    - the sound concussion is less than 150 dB;
    - the shock wave is less than 15 p.s.i.; and
    - the peak particle velocity is less than 15 mm/s.

To avoid impacting the hibernacula at Portage Mountain that are being used by little brown myotis and northern myotis, BC Hydro moved the quarry to the eastern edge of the License of Occupation area prior to the commencement of construction activities. This relocation achieved a 300 m buffer around 16 documented hibernacula, where no activities or access were permitted. This mitigation is described in detail in Appendix 8 of the 2016 Annual Report.

To avoid disturbance to hibernating bats, BC Hydro has also prohibited blasting at Portage Mountain between September 15 and May 15 (see Section 4.2 of the CEMP); this window was based on data collected at the hibernacula in 2013 and in consultation with bat biologists (see the 2016 Annual Report).

For planned activities at Portage Mountain Quarry, noise modelling was conducted, from which it was determined that at 300m:

- the sound concussion would be 120 dB (below BMP limit of 150 dB);
- the shock wave would be 0.002 p.s.i (1 kPa) and (below BMP limit of 15 p.s.i (104 kPa); and
- the peak particle velocity would be 2.84 mm/s (below BMP limit of 15 mm/s).

[10] BC MOE. 2016. Best Management Practices Guidelines for Bats in British Columbia. Chapter 2: Mine Developments and Inactive Mine Habitats. 68 pp.

As described in Section 6.4.3.3, BC Hydro monitored the noise and vibration caused by activity at Portage Mountain Quarry in 2018, 2019 and 2021, and found that blasting within the re-designed quarry boundaries did not exceed the thresholds for noise and vibration defined within the BC MOE Best Management Practices Guidelines for Bats in British Columbia (i.e., air overpressure of less than 150 decibels, shock wave less than 15 p.s.i., and peak particle velocity (PPV) less than 15 mm/second; BC MOE 2016). Noise and vibration modelling were used to supplement available data to determine that also in 2020 blasting likely did not exceed the BC BMP thresholds for noise or vibration at important bat habitat. No blasting occurred at Portage Mountain in 2024. As described in Section 6.4.3.3, BC Hydro is also conducting year-round monitoring of bat use at the established Portage Mountain artificial bat hibernacula.

Through the broader Site C bat mitigation and monitoring program, BC Hydro has constructed and installed 120 bat roost boxes and one large bat house in suitable habitat near the future reservoir and dam site. Monitoring of bat activity at the bat box installation locations including 12 new ones to be installed in 2025 will occur annually through the first 10 years of operations of Site C. The report describing the results of the last bat activity monitoring at Portage Mountain over multiple years and compared to sentinel (control) sites from 2017 to 2023 is in Appendix 10.

In 2023, BC Hydro constructed three artificial bat hibernacula at the Portage Mountain Quarry site by drilling holes at least 3 m deep in rock faces on warm aspects that were inaccessible to predators. Small charges were used within the drill holes to create rock fractures to provide a range of microclimatic conditions and insulation for overwintering bats. A fourth hibernaculum using a culvert design as per the recommendation of the bat SME, was completed in 2024. The report describing the design and construction details of all four artificial bat hibernacula established at Portage Mountain is in Appendix 11. Note that the report included is currently a draft to be replaced by a finalized version.

7.6.7 Resting sites for Fisher

This section summarizes actions taken in accordance with the following requirement of Condition 16: *Creation of natural or artificial piles of coarse woody debris dispersed throughout the disturbed landscape to maintain foraging areas and cold-weather rest sites, and arboreal resting sites, for the fisher population south of the Peace River.*

A total of 98 coarse woody debris (CWD) piles to maintain foraging areas and cold-weather rest sites for fisher have been created within the dam site area, along the transmission line, and along the cleared edge of Ice Bridge Road towards Area E. Signs were installed at CWD piles to indicate that they were designated fisher habitat and to prevent their inadvertent disturbance by construction activities.

In addition to CWD piles, BC Hydro constructed and installed 88 fisher den boxes between 2018 and 2020 to help mitigate the loss of denning habitat due to reservoir clearing. In 2023, all 88 den boxes were monitored by visiting all den boxes to install game cameras, checking and replacing hair snaggers at the box entrances, and applying lure at the structures to help attract fishers (February – March 2023). A total of 106,946 photographs were reviewed from the 2023 reproductive season (March – July) with fishers detected at eight den boxes. However, no prolonged use or evidence of reproduction was observed in 2023. This program is now closed with details of the fisher monitoring program presented in the 2023 VWMMP Annual Report.

7.7 EAC Condition 19

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 19.

For context, the complete requirements of Condition 19 are shown below.

EAC Condition 19

The EAC Holder must use reasonable efforts to avoid and reduce injury and mortality to amphibians and snakes on roads adjacent to wetlands and other areas where amphibians or snakes are known to migrate across roads including locations with structures designed for wildlife passage.

The EAC Holder must consult with Environment Canada, MFLNRO and MOE with regard to the size and number of the proposed structures prior to construction.

Appropriate amphibian mitigation is monitored by BC Hydro site Environmental Monitors and the Independent Environmental Monitor against commitments within EPPs to determine and enforce compliance. Amphibian mitigation activities are summarized in Section 6.4.1.2. Work sites are being regularly monitored during the spring and summer for western toad migration and dispersal, as per the Western Toad Management Procedure. Western toad movement patterns have not yet resulted in mass movements across access roads such that specific structures designed for amphibian passage have been required. However, due to specific concerns regarding western toad mitigation at Portage Mountain Quarry during a BC Environmental Assessment Office (EAO) inspection in 2016, a suitable location for installation of an amphibian crossing structure was identified based on a habitat assessment and observations of western toad movement patterns. A 15 m long 1,000 mm diameter culvert was installed along the access road to Portage Mountain, following guidance described in *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia. A companion document to Develop with Care* (BC MMFLNROO and BC MOE 2014).

7.8 EAC Condition 21

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 21.

For context, the complete requirements of Condition 21 are shown below.

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 Bald Eagle nesting populations adjacent to the reservoir, including their use of artificial nest structures.
- Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features.
- Monitor amphibian use of migration crossing structures installed along Project roads.
- Survey songbird and ground-nesting raptor populations during construction and operations.
- Survey the distribution of western toad and garter snake populations downstream of the Site C dam to the Pine River.
- Require annual reporting during the construction phase and during the first 10 years of operations to EAO, beginning 180 days following commencement of construction.

The EAC Holder must provide this draft Vegetation and Wildlife Mitigation and Monitoring Plan to MFLNRO, MOE, Environment Canada and Aboriginal Groups for review a minimum of 90 days prior to the commencement of construction.

The EAC Holder must file the final Vegetation and Wildlife Mitigation and Monitoring Plan must with

EAO, MFLNRO, MOE, Environment Canada and Aboriginal Groups a minimum 30 days prior to the commencement of construction.

The EAC Holder must develop, implement and adhere to the final Vegetation and Wildlife Mitigation and Monitoring Plan, and any amendments, to the satisfaction of EAO.

7.8.1 Monitoring of Bald Eagle nesting populations

Known bald eagle nest locations along the Peace River and at natural wetlands adjacent to the Site C transmission line right-of-way were surveyed by helicopter over three days in May and June 2024. Of special significance was the successful use of an artificial nest platform by a bald eagle pair resulting in a chick prior to reservoir fill. A summary of the methods and results of bald eagle nest aerial monitoring in 2024 is presented in Appendix 14.

7.8.2 Monitoring waterfowl and shorebird populations

This section summarizes actions taken in accordance with the following requirement of Condition 21: *Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features.*

A summary of the waterbird survey program is presented in Section 6.1.3.4 and Waterbirds Follow-up Monitoring 2024 Annual Report can be found in Appendix 3.

7.8.3 Monitor amphibian use of migration crossing structures installed along Project roads

This section summarizes actions taken in accordance with the following requirement of Condition 21: *Monitor amphibian use of migration crossing structures installed along Project roads*.

A 15 m long 1,000 mm diameter culvert has been installed along the access road to Portage Mountain, following guidance described in *Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia. A companion document to Develop with Care* (BC MMFLNROO and BC MOE 2014). Monitoring of amphibian use of the crossing structure was conducted following the requirements of the Site C Western Toad Management Procedure. Western toad activity along the area around the access road in general has been low, and no western toad use of the crossing structure has yet been documented.

7.8.4 Survey songbird and ground-nesting raptor populations during construction and operations

This section summarizes actions taken in accordance with the following requirement of Condition 21: *Survey songbird and ground-nesting raptor populations during construction and operations.*

7.8.4.1 Songbirds

A summary of the songbird monitoring program is presented in Section 6.1.3.1 and the Breeding Bird Follow-up Monitoring – Songbirds 2024 Annual Report can be found in Appendix 1.

7.8.4.2 Ground-nesting raptors

Ground nesting raptor surveys in 2024 were conducted at cleared portions of the Site C reservoir. Ground nesting raptor surveys were completed up to four times per site over May and June 2024 to capture early, middle, and late stages of their breeding season. The ground-nesting raptor monitoring 2024 annual report can be found in Appendix 9.

7.8.5 Annual reporting beginning 180 days following commencement of construction

This section summarizes actions taken in accordance with the following requirement of Condition 21: *Require annual reporting during the construction phase and during the first 10 years of operations to EAO, beginning 180 days following commencement of construction.*

Submission of this report satisfies the requirement this portion of Condition 21 for 2024 during the construction phase of the Site C Clean Energy Project.

7.9 Status of listed species

This section of the annual report summarizes the programs implemented in 2024 in accordance with the requirements of Condition 23. For context, the complete requirements of Condition 23 are shown below.

EAC Condition 23

The EAC Holder must maintain current knowledge of Project effects on the status of listed species by tracking updates for species identified by the Province, the Committee on the Status of Endangered Wildlife in Canada, and the Species at Risk Act.

Should the status of a listed species change for the worse during the course of the construction of the Project due to Project activities, the EAC Holder, must work with Environment Canada MFLNRO and MOE to determine if any changes to the associated management plans or monitoring programs are required to mitigate effects of the Project on affected listed species.

7.9.1 Rare Plants

Please see Section 6.4.4.1 for a summary of ranking changes to rare plants.

7.9.2 Wildlife

Please see Section 6.4.4.2 for a summary of ranking changes to wildlife.

7.10 Ungulate Winter Range

The complete requirements of Condition 24 are shown below.

EAC Condition 24

The EAC Holder must identify suitable lands for ungulate winter range by the end of the first year of construction, on BC Hydro-owned lands, or Crown lands, in the vicinity of the Project in consultation with MFLNRO. If MFLNRO determines that identified winter range is required, the EAC Holder must identify and maintain suitable BC Hydro- owned lands for ungulate winter range to the satisfaction of MFLNRO and for the length of time determined by MFLNRO.

The plan for the identification, retention and maintenance of ungulate winter range was developed through the VWTC and determined to be complete by the Comptroller of Water Resources in 2016. After reservoir filling, it is anticipated that lands identified by BC Hydro as ungulate winter range for elk and deer will total about 515 ha at commencement of operation. A summary of these lands and maps and their locations were provided in the June 5, 2015 VWMMP. These lands are on the north bank of the Peace River between the Halfway River to the west and the dam site to the east.

MLWRS was in the process of identifying appropriate lands for moose winter range as mitigation for expected Project impacts on moose habitat. BC Hydro provided $10,000 to MLWRS to support the Indigenous consultation necessary to identify and protect appropriate moose winter range.

8.0 References

BC Hydro. 2022. Vegetation and Wildlife Mitigation and Monitoring Plan 2022 Annual Report, Site C Clean Energy Project, 30 March 2022. Available at: https://www.sitecproject.com/sites/default/files/Vegetation-and-Wildlife-Mitigation-and-Monitoring-Plan-2022-Annual-Report-Part-1.pdf.

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ENSCONET (European Native Seed Conservation Network). 2009. Seed Collecting Manual for Wild Species. Main editors: Royal Botanic Gardens (UK) & Universidad Politécnica de Madrid (Spain). Edition 1: 17 March 2009. Available at: https://www.publicgardens.org/resource/ensconet-seed-collecting-manual-wild-species/.

Maslovat, C. 2009. Guidelines for translocation of plant species at risk in British Columbia. British Columbia Ministry of Environment, Victoria, BC. Available at: https://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do;jsessionid=8120EEA29A5E1D4AF9BB59918A15A4E2?subdocumentId=8321.

Appendix 1. 2024 Songbird Annual Report

Site C Clean Energy Project
Breeding Bird Follow-up Monitoring - Songbirds
2024 Annual Report

PRESENTED TO

British Columbia Hydro and Power Authority

MARCH 26, 2025
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Site C Clean Energy Project
Breeding Bird Follow-up Monitoring - Songbirds
2024 Annual Report

FILE: 704-ENW.PENW03042-02.SONG24
March 26, 2025

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Senior Biologist

EXECUTIVE SUMMARY

Saulteau EBA Environmental Services Joint Venture (SEES JV) completed breeding bird point count surveys in the area of British Columbia Hydro and Power Authority's (BC Hydro) Site C Clean Energy Project ("Site C", the Project) in spring and summer 2024. The surveys were part of BC Hydro's Breeding Bird Follow-up Monitoring Program for songbirds [1]. Songbirds are passerines, hummingbirds, swifts, doves, kingfisher, and pigeons (i.e., all members of the orders *Passeriformes*, *Apodiformes*, *Columbiformes*, and *Coraciiformes*). Songbird baseline surveys were conducted in 2006, 2008, 2011 and 2012. Surveys were again conducted in 2016 through 2024 as part of the follow-up monitoring program. This report describes the methods used to conduct the 2024 surveys and a summary of the results.

Surveys were conducted June 5 - 27, 2024 at 102 stations in the Peace River Valley and around the Project footprint. Each station was surveyed two times to maximize the detection of early and late breeders. Birds were surveyed using unlimited-radius point counts.

A total of 85 bird species were detected, of which 74 were songbirds. Seven species listed under the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), the *Species at Risk Act* (SARA) and/or British Columbia's Red and Blue lists were observed during the surveys. The median number of songbird species detected per point count survey was 10 (range 2 to 17).

Surveys conducted in 2024 represent a continuation in monitoring of semi-permanent monitoring stations that will be monitored through to 10 years post-construction.

[1] Woodpecker and Common Nighthawk surveys are also included under BC Hydro's Breeding Bird Follow-up Monitoring Program.

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1.0 INTRODUCTION

Saulteau EBA Environmental Services Joint Venture (SEES JV) completed breeding bird point count surveys in the area of British Columbia (BC) Hydro and Power Authority's (BC Hydro) Site C Clean Energy Project ("Site C", the Project) in spring and summer 2024. The surveys were part of BC Hydro's Breeding Bird Follow-up Monitoring Program for Songbirds[2]. Songbirds are passerines, hummingbirds, swifts, doves, kingfisher, and pigeons (i.e., all members of the orders *Passeriformes*, *Apodiformes*, *Columbiformes*, and *Coraciiformes*). Songbird baseline surveys were conducted in 2006, 2008, 2011 and 2012. Surveys were again conducted annually between 2016 and 2024 as part of the follow-up monitoring program.

The objectives of the Breeding Bird Follow-up Monitoring Program for songbirds are to:

1. Determine the distribution and abundance of songbirds within habitat lost or otherwise affected by the Project to verify the predictions made in the Environmental Impact Statement (EIS; Hilton et al. 2013).

2. Identify species-habitat relationships to help identify areas for offsetting impacts.

3. Conduct effectiveness monitoring to determine the degree to which mitigation areas offset impacts to songbirds and their habitat and determine further songbird mitigation requirements.

4. Determine changes to the songbird community in the Peace River valley (to 10 years post-construction).

The annual report prepared in 2019 (SEES JV 2019) provided an analysis of the data collected 2006-2019 in support of objectives 1 and 2. Mitigation areas (currently the Marl Fen, Rutledge and Wilder Creek properties) were surveyed in 2016 and 2017. BC Hydro intends to conduct the next surveys of the mitigation properties after the reservoir has been inundated or when there are land-use changes or habitat modification in the mitigation properties, whichever occur first. The point count data obtained from surveys in 2024 were primarily in support of objective 4 and will form part of the long-term monitoring data to assess changes in the songbird community over time (baseline to 10 years post-construction).

2.0 METHODS

2.1 Survey Locations

Point counts for the baseline and the follow-up monitoring programs have been conducted throughout the Peace River valley (and its tributaries) and in the adjacent plateau areas, both inside and outside the Project footprint (Figure 1; Hilton et al. 2013; Tetra Tech 2017; Tetra Tech 2018; Tetra Tech 2019; Tetra Tech 2020a; Tetra Tech 2020b; Tetra Tech 2022a; Tetra Tech 2022b; Tetra Tech 2024). Clearing of the dam site area was completed in 2016. Clearing of the reservoir commenced in 2017 and incrementally progressed westward from the dam site in each year. By May 2021, most portions of the reservoir footprint along the Peace River from the dam site to the mouth of the Halfway River, including the Moberly River and Cache Creek reservoir footprints, and some islands west of the Halfway River had been cleared. The Watson Slough area along Highway 29 was cleared over the winter of 2022/2023. Point counts in 2024 were predominantly located outside the reservoir footprint because they are intended as long-term monitoring locations, though a small number were in cleared portions of the footprint, including the recently cleared Watson Slough area (Figures 2 to 5; Appendix A).

[2] Woodpecker and Common Nighthawk surveys are also included under BC Hydro's Breeding Bird Follow-up Monitoring Program.

560000 580000 600000 620000 640000 660000 680000

6240000 6220000 6200000

Hwy 97
Hwy 29
Charlie Lake
Halfway River
Cache Creek
Wilder Creek Lands
Fort St. John
Beatton River
Moberly River
Taylor
Rutledge Property
Peace River
Marl Fen Property
Hudson's Hope
Pine River
Kiskatinaw River
ALBERTA
BRITISH COLUMBIA
N
W
E
S

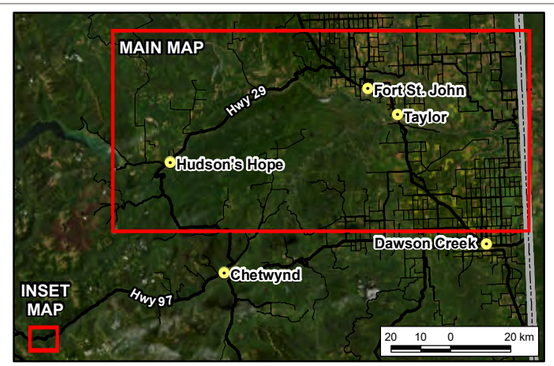
INSET
2 1 0 2 km

LEGEND

Survey Year
- 2024
- 2006 to 2023
- Project Footprint
- Potential Mitigation Property

- Populated Place
- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Residential Area

- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Wooded Area
- Provincial Boundary



NOTES
Base data source: CanVec 1:250,000.

STATUS
ISSUED FOR USE

SITE C SONGBIRD 2024 ANNUAL REPORT

Songbird Survey Locations

PROJECTION: UTM Zone 10	DATUM: NAD83				CLIENT: BC Hydro Power smart
Scale: 1:350,000 (5 2.5 0 5 Kilometres)					TETRA TECH
FILE NO.: PENW03042-02_Fig01_SONG_Overview.mxd					
OFFICE: Tt-VANC	DWN: SL	CKD: MRB	APVD: EH	REV: 0	Figure 1
DATE: March 26, 2025	PROJECT NO.: ENW.PENW03042-02				

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Surveys conducted in 2024 were a continuation of monitoring 97 semi-permanent, randomly located stations within the Peace River valley established in 2020. Each station was located in accessible areas (slopes that can be traversed on foot) and stratified by bird habitat class in proportion to the mapped area of each class in the Peace River valley (Table 1). Bird habitat classes were derived from the detailed ecosystem units used in the Terrestrial Ecosystem Mapping and are generalized groups of similar ecosystems. Candidate locations were then manually adjusted to be 100 m from a habitat edge (e.g., forest-wetland transition) where possible and some locations were linked to form a sequence of survey locations that could be visited on foot.

Table 1: Bird Habitat Classes Derived from Terrestrial Ecosystem Mapping

Coniferous-shrub	Deciduous-mature forest	Wetland-graminoid
Coniferous-young forest	Riparian-mixed shrub	Wetland-shrub
Coniferous-mature forest	Riparian-mixed young forest	Dry slopes-grassland
Deciduous-shrub	Riparian-mixed mature forest	Dry slopes-shrubland
Deciduous-young forest	Fen/bog-shrub	Cultivated

To allow for sampling of all bird habitat classes, some stations were located within uncleared portions of the footprint west of the Halfway River for bird habitat classes that do not exist outside the footprint (e.g., riparian forest that currently only exists in the valley bottom footprint). Additionally, some survey stations were located within the Rutledge and Wilder Creek mitigation properties located within the Peace River valley.

2.2 Point Count Surveys

Point counts were conducted on June 5 - 27, 2024 by two teams. Each team was composed of a biologist with songbird survey experience and either a First Nations assistant or wildlife technician (Appendix B). Each station was surveyed (visited) two times, with at least two weeks between visits, to maximize the detection of early and late breeders.

Point count survey methodology was adapted from the Resource Inventory Standards Committee (RISC) *Inventory Methods for Forest and Grassland Songbirds* (RISC 1999). Surveyors conducted unlimited-radius point counts with distance-to-detection intervals set at 0-50 m, 51-100 m and >100 m. Each point count survey was conducted over ten minutes and bird detections were recorded in three intervals: 0-3 minutes, 3-5 minutes and 5-10 minutes. Point counts took place from sunrise to approximately four hours after sunrise, and only during acceptable weather conditions for songbird surveys (Table 2). After arriving at each station, the surveyor waited one minute, then commenced the 10-minute survey period and recorded all birds seen and/or heard. Data were recorded on a modified version of the RISC Songbird Point Count data form (RISC 1999).

Table 2: Acceptable and Unacceptable Weather Conditions for Songbird Surveys (RISC 1999)

	Acceptable	Unacceptable
Wind	▪ Beaufort 0 (< 2 km/hr). Calm. ▪ Beaufort 1 (2-5 km/hr). Light air. ▪ Beaufort 2 (6-12 km/hr). Light breeze, leaves rustle.	▪ Beaufort 3 (12-19 km/hr). Gentle breeze, leaves and twigs constantly move. ▪ Beaufort 4 (20-29 km/hr). Moderate breeze, small branches move, dust rises. ▪ Beaufort 5 (30-39 km/hr). Fresh breeze, small trees sway. ▪ Beaufort > 5
Precipitation	▪ None ▪ Fog ▪ Misty drizzle ▪ Drizzle	▪ Light rain ▪ Hard rain ▪ Snow
Temperature	▪ > 3 ºC during the breeding season in central & northern interior of BC	▪ < 3 ºC during the breeding in central & northern interior of BC

Incidental observations were recorded when non-songbird species were observed during surveys, or when any bird species at risk were observed outside of survey stations (e.g., when surveyors were traveling between stations) or survey periods (e.g., before or after daily observations have started/finished). For each incidental observation, date, time, GPS location, behaviour and habitat were recorded.

For the purposes of this report, bird species at risk included:

1. Species considered endangered, threatened or special concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC);
2. Species considered endangered, threatened or special concern under *Species at Risk Act* (SARA); and/or
3. Species listed as red (endangered, threated) or blue (special concern) on the BC List.

608000 610000 612000 614000 616000 618000 620000 622000 624000 626000

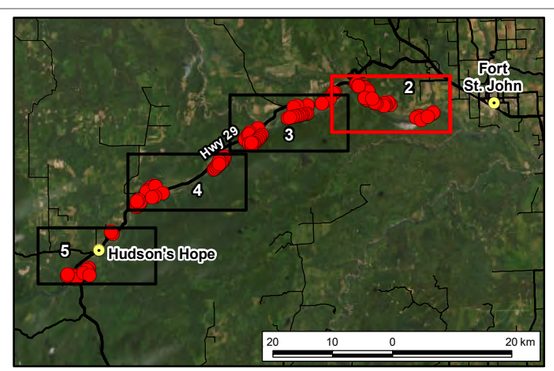
6238000 6236000 6234000 6232000 6230000

Cache Creek
Hwy 29 N
Wilder Creek
Peace River
Hilltop Dr
Alaska Hwy
244 Rd
242 Rd
Old Hope Rd
277 Rd
275 Rd
273 Rd
N
S
E
W

PC24-201
PC24-202
PC24-203
PC24-210
PC24-204
PC24-205
PC24-206
PC24-208
PC24-207
PC24-209
PC24-PR-38
PC24-PR-39
PC24-502
PC24-501
PC24-500
PC24-608
PC24-607
PC24-606
PC24-008
PC24-010
PC24-007
PC24-009
PC24-011
Wilder Creek Lands
PC24-602
PC24-601
PC24-605
PC24-604
PC24-603
PC24-611
PC24-610

LEGEND

- 2024 Songbird Survey Location
- Project Footprint
- Potential Mitigation Property
- Peace River Valley
- Highway
- Local Road
- Main Road
- Watercourse
- Waterbody



NOTES
Base data source:
CanVec 1:50,000 (2019)
Imagery from ESRI; Maxar

STATUS
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SITE C SONGBIRD 2024 ANNUAL REPORT

2024 Songbird Survey Locations Dam Site to Watson Slough

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FILE NO.: PENW03042-02_Fig02-05_SONG_2024.mxd				
OFFICE: Tt-VANC	DWN: SL	CKD: MRB	APVD: EH	REV: 0
DATE: March 26, 2025	PROJECT NO.: ENW.PENW03042-02			Figure 2

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590000 592000 594000 596000 598000 600000 602000 604000 606000 608000

6236000 6234000 6232000 6230000 6228000

Upper Cache Rd

Halfway River

Hwy 29

Peace River

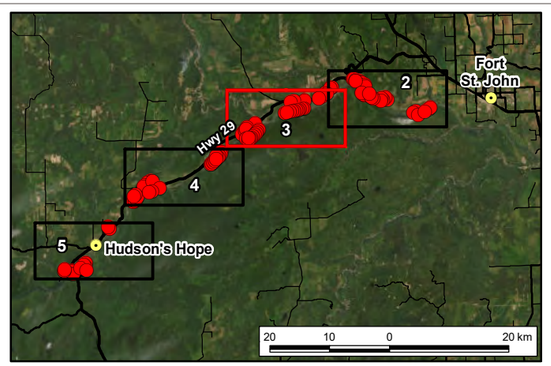
PC24-144
PC24-PR-46
PC24-027
PC24-PR-56
PC24-021
PC24-024
PC24-019
PC24-A3
PC24-A1
PC24-A5
PC24-A2
PC24-A7
PC24-A4
PC24-A6
PC24-A9
PC24-A8
PC24-A10
PC24-032
PC24-035
PC24-050
PC24-040
PC24-038
PC24-039
PC24-B1
PC24-B2
PC24-B3
PC24-B4
PC24-B5
PC24-B6
PC24-B9
PC24-B10
PC24-B7
PC24-B8

N W E S

590000 592000 594000 596000 598000 600000 602000 604000 606000 608000

LEGEND

- 2024 Songbird Survey Location
- Project Footprint
- Peace River Valley
- Highway
- Local Road
- Watercourse
- Waterbody



NOTES
Base data source:
CanVec 1:50,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C SONGBIRD 2024 ANNUAL REPORT

2024 Songbird Survey Locations Watson Slough to Halfway River

PROJECTION	DATUM	CLIENT
UTM Zone 10	NAD83	BC Hydro Power smart

Scale: 1:50,000
1 0.5 0 1
Kilometres

TETRA TECH

FILE NO.
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Tt-VANC	SL	MRB	EH	0

DATE
March 26, 2025

PROJECT NO.
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Figure 3

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574000 576000 578000 580000 582000 584000 586000 588000 590000 592000

6226000 6224000 6222000 6220000 6218000

Farrell Creek Rd

Farrell Creek

Peace River

Hwy 29

Dry Creek

Rutledge Property

PC24-C1-1
PC24-C1-2
PC24-C1-3
PC24-C1-4
PC24-C1-5
PC24-C2-5
PC24-C2-4
PC24-C2-3
PC24-C2-2
PC24-C2-1

PC24-069
PC24-104
PC24-070
PC24-071
PC24-072
PC24-073

PC24-D2-1B
PC24-D2-2B
PC24-D2-3
PC24-D2-4
PC24-D2-5
PC24-D1-5
PC24-D1-4
PC24-D1-1
PC24-D1-3
PC24-D1-2

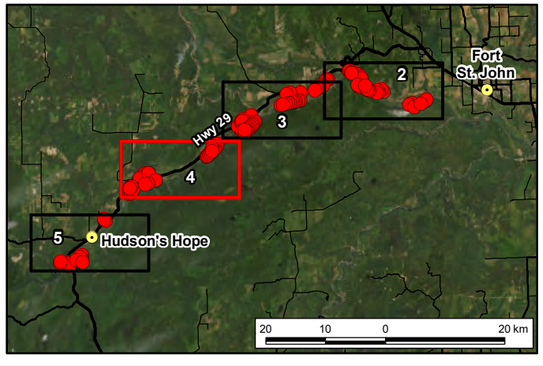
N W E S

574000 576000 578000 580000 582000 584000 586000 588000 590000 592000

6226000 6224000 6222000 6220000 6218000

LEGEND

- 2024 Songbird Survey Location
- Project Footprint
- Potential Mitigation Property
- Peace River Valley
- Highway
- Local Road
- Watercourse
- Waterbody



NOTES
Base data source:
CanVec 1:50,000 (2019)
Imagery from ESRI; Maxar

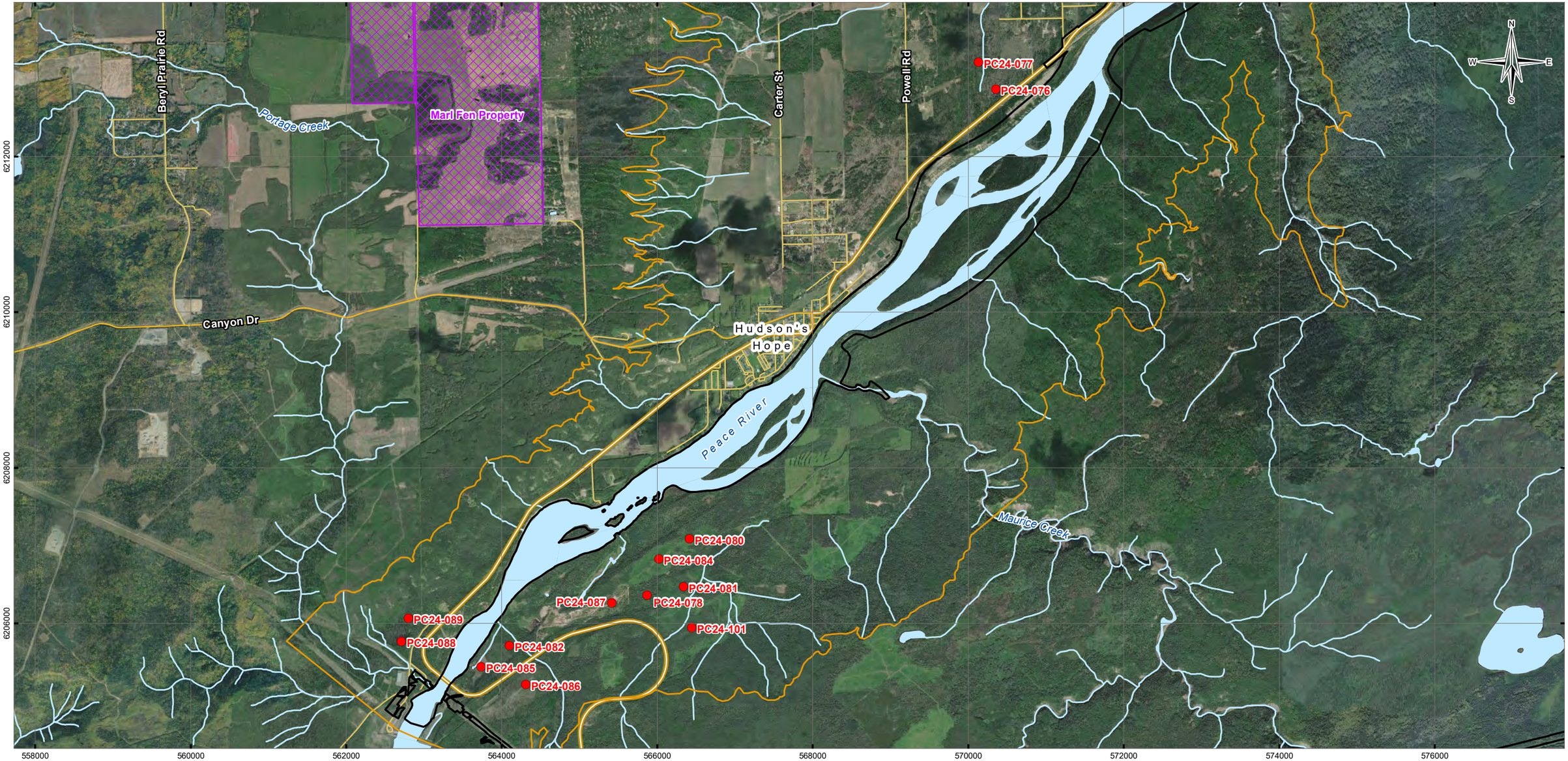
STATUS
ISSUED FOR USE

SITE C SONGBIRD 2024 ANNUAL REPORT

2024 Songbird Survey Locations Halfway River to Rutledge Property

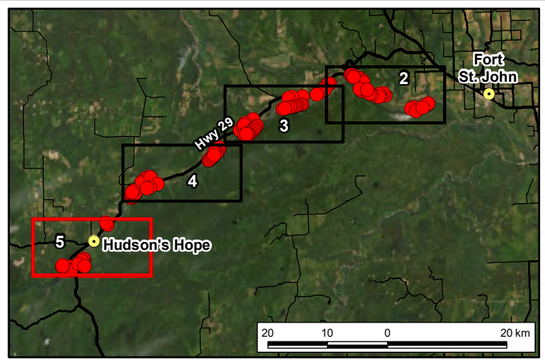
PROJECTION: UTM Zone 10	DATUM: NAD83			CLIENT: BC Hydro Power smart
Scale: 1:50,000 (1 0.5 0 1 Kilometres)				TETRA TECH
FILE NO.: PENW03042-02_Fig02-05_SONG_2024.mxd				
OFFICE: Tt-VANC	DWN: SL	CKD: MRB	APVD: EH	REV: 0
DATE: March 26, 2025	PROJECT NO.: ENW.PENW03042-02			Figure 4

G:\ENVIRONMENTAL\PENW\PENW03042-02\Maps\SONG_2024\PENW03042-02_Fig02-05_SONG_2024.mxd modified 3/26/2025 by Stephanie Leusink



LEGEND

- 2024 Songbird Survey Location
- Project Footprint
- Potential Mitigation Property
- Peace River Valley
- Highway
- Local Road
- Main Road
- Watercourse
- Waterbody



NOTES
Base data source:
CanVec 1:50,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C SONGBIRD 2024 ANNUAL REPORT

2024 Songbird Survey Locations Rutledge Property to Hudson's Hope

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT** BC Hydro Power smart
Scale: 1:50,000 (1 0.5 0 1 Kilometres)					TETRA TECH
FILE NO. PENW03042-02_Fig02-05_SONG_2024.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** MRB	**APVD** EH	**REV** 0	**Figure 5**
DATE March 26, 2025	**PROJECT NO.** ENW.PENW03042-02				

G:\ENVIRONMENTAL\PENW\PENW03042-02\Maps\SONG_2024\PENW03042-02_Fig02-05_SONG_2024.mxd modified 3/26/2025 by Stephanie Lesunk

3.0 RESULTS

Surveys were conducted at 102 point count stations within 15 bird habitat classes (Table 3; Figures 2 to 5; Appendix A). A total of 204 surveys were conducted in 2024.

Table 3: Point Count Stations and Surveys Conducted in 2024 by Bird Habitat Class

Bird Habitat Class	Stations	Surveys
Coniferous-shrub	5	10
Coniferous-young forest	8	16
Coniferous-mature forest	16	32
Deciduous-shrub	13	26
Deciduous-young forest	13	26
Deciduous-mature forest	12	24
Riparian-mixed shrub	7	14
Riparian-mixed young forest	3	6
Riparian-mixed mature forest	1	2
Fen/bog-shrub	2	4
Wetland-graminoid	3	6
Wetland-shrub	5	10
Dry slopes-grassland	2	4
Dry slopes-shrubland	8	16
Cultivated	4	8
Total	**102**	**204**

Surveys were conducted in appropriate weather conditions with temperatures ranging from 5.0 ºC to 21.0 ºC and wind speed between zero and two on the Beaufort scale. There was one survey where winds gusted as high as 3 on the Beaufort scale. The majority of surveys were conducted in the absence of precipitation with only nine surveys conducted in fog, misty drizzle, or drizzle (Appendix A).

A total of 85 bird species were detected, of which 74 were songbirds (Table 4). Seven species listed under COSEWIC, SARA and/or British Columbia's Red and Blue lists were observed during the surveys. The median number of songbird species detected per point count survey was 10 (ranging from 2 to 17). Other bird species not classified as songbirds were recorded as incidental observations and are listed in Appendix C. Bird species detected outside of survey periods are included in Appendix C.

Table 4: Songbird Species Observed During The 2024 Point Count Surveys, Listed In Taxonomic Order

English Name	Scientific Name	BC List	COSEWIC	SARA Status	Survey Detections	Flyovers
Northern Flicker*	*Colaptes auratus*	Yellow	-	-	9	1
Downy Woodpecker*	*Dryobates pubescens*	Yellow	-	-	3	0
Hairy Woodpecker*	*Dryobates villosus*	Yellow	-	-	0	1
Pileated Woodpecker*	*Dryocopus pileatus*	Yellow	-	-	3	1
Yellow-bellied Sapsucker*	*Sphyrapicus varius*	Yellow	-	-	31	0
Olive-sided Flycatcher	*Contopus cooperi*	Yellow	Special Concern	Special Concern	7	0
Western Wood-Pewee	*Contopus sordidulus*	Yellow	-	-	43	0
Alder Flycatcher	*Empidonax alnorum*	Yellow	-	-	60	0
Western Flycatcher	*Empidonax difficilis*	Yellow	-	-	10	0
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Yellow	-	-	1	0
Least Flycatcher	*Empidonax minimus*	Yellow	-	-	163	0
Dusky Flycatcher	*Empidonax oberholseri*	Yellow	-	-	1	0
Eastern Phoebe	*Sayornis phoebe*	Yellow	-	-	1	0
Eastern Kingbird	*Tyrannus tyrannus*	Yellow	-	-	5	0
Warbling Vireo	*Vireo gilvus*	Yellow	-	-	41	0
Red-eyed Vireo	*Vireo olivaceus*	Yellow	-	-	259	0
Blue-headed Vireo	*Vireo solitarius*	Yellow	-	-	9	0
American Crow	*Corvus brachyrhynchos*	Yellow	-	-	71	3
Common Raven	*Corvus corax*	Yellow	-	-	22	4
Blue Jay	*Cyanocitta cristata*	Yellow	-	-	3	0
Canada Jay	*Perisoreus canadensis*	Yellow	-	-	1	0
Black-billed Magpie	*Pica hudsonia*	Yellow	-	-	11	0
Cedar Waxwing	*Bombycilla cedrorum*	Yellow	-	-	54	36
Black-capped Chickadee	*Poecile atricapillus*	Yellow	-	-	43	0
Boreal Chickadee	*Poecile hudsonicus*	Yellow	-	-	2	0
Bank Swallow	*Riparia riparia*	Yellow	Threatened	Threatened	8	4
Tree Swallow	*Tachycineta bicolor*	Yellow	-	-	2	0
Violet-green Swallow	*Tachycineta thalassina*	Yellow	-	-	28	4
Ruby-crowned Kinglet	*Corthylio calendula*	Yellow	-	-	11	0
Golden-crowned Kinglet	*Regulus satrapa*	Yellow	-	-	16	0
Red-breasted Nuthatch	*Sitta canadensis*	Yellow	-	-	65	0

English Name	Scientific Name	BC List	COSEWIC	SARA Status	Survey Detections	Flyovers
White-breasted Nuthatch	*Sitta carolinensis*	Yellow	-	-	2	0
House Wren	*Troglodytes aedon*	Yellow	-	-	11	0
Gray Catbird	*Dumetella carolinensis*	Yellow	-	-	14	0
Hermit Thrush	*Catharus guttatus*	Yellow	-	-	28	0
Swainson's Thrush	*Catharus ustulatus*	Yellow	-	-	126	0
Townsend's Solitaire	*Myadestes townsendi*	Yellow	-	-	1	0
American Robin	*Turdus migratorius*	Yellow	-	-	128	1
Purple Finch	*Haemorhous purpureus*	Yellow	-	-	11	0
White-winged Crossbill	*Loxia leucoptera*	Yellow	-	-	1	0
Pine Siskin	*Spinus pinus*	Yellow	-	-	38	7
Canada Warbler	*Cardellina canadensis*	Blue	Special Concern	Threatened	15	0
Mourning Warbler	*Geothlypis philadelphia*	Yellow	-	-	7	0
Common Yellowthroat	*Geothlypis trichas*	Yellow	-	-	61	0
Orange-crowned Warbler	*Leiothlypis celata*	Yellow	-	-	48	0
Tennessee Warbler	*Leiothlypis peregrina*	Yellow	-	-	10	0
Black-and-white Warbler	*Mniotilta varia*	Yellow	-	-	19	0
Northern Waterthrush	*Parkesia noveboracensis*	Yellow	-	-	30	0
Ovenbird	*Seiurus aurocapilla*	Yellow	-	-	112	0
Bay-breasted Warbler	*Setophaga castanea*	Red	-	-	2	0
Yellow-rumped Warbler	*Setophaga coronata*	Yellow	-	-	117	0
Magnolia Warbler	*Setophaga magnolia*	Yellow	-	-	22	0
Yellow Warbler	*Setophaga petechia*	Yellow	-	-	208	0
American Redstart	*Setophaga ruticilla*	Yellow	-	-	39	0
Blackpoll Warbler	*Setophaga striata*	Yellow	-	-	1	0
Black-throated Green Warbler	*Setophaga virens*	Blue	-	-	6	0
Red-winged Blackbird	*Agelaius phoeniceus*	Yellow	-	-	109	0
Brewer's Blackbird	*Euphagus cyanocephalus*	Yellow	-	-	14	0
Baltimore Oriole	*Icterus galbula*	Blue	-	-	2	0
Brown-headed Cowbird	*Molothrus ater*	Yellow	-	-	21	1
Common Grackle	*Quiscalus quiscula*	Yellow	-	-	2	0
LeConte's Sparrow	*Ammospiza leconteii*	Yellow	-	-	2	0
Nelson's Sparrow	*Ammospiza nelsoni*	Red	Not at Risk	-	1	0

English Name	Scientific Name	BC List	COSEWIC	SARA Status	Survey Detections	Flyovers
Dark-eyed Junco	*Junco hyemalis*	Yellow	-	-	49	0
Swamp Sparrow	*Melospiza georgiana*	Yellow	-	-	29	0
Lincoln's Sparrow	*Melospiza lincolnii*	Yellow	-	-	46	0
Song Sparrow	*Melospiza melodia*	Yellow	-	-	107	0
Savannah Sparrow	*Passerculus sandwichensis*	Yellow	-	-	14	0
Vesper Sparrow	*Pooecetes gramineus*	Yellow	-	-	7	0
Clay-colored Sparrow	*Spizella pallida*	Yellow	-	-	153	0
Chipping Sparrow	*Spizella passerina*	Yellow	-	-	32	0
White-throated Sparrow	*Zonotrichia albicollis*	Yellow	-	-	331	0
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Yellow	-	-	34	0
Western Tanager	*Piranga ludoviciana*	Yellow	-	-	80	0

* Includes woodpeckers. Although not songbirds, woodpeckers are part of the Breeding Bird Follow-up Monitoring Program (surveyed separately from songbirds) and are regularly detected during points counts.

4.0 DISCUSSION

Surveys in 2024 were conducted at the same 102 stations surveyed in 2023 (SEES JV 2023). The total number of bird species detected was similar between the two years with 86 species detected in 2023 and 85 species detected in 2024. In 2023, 73 species were songbirds and in 2024, 74 species were songbirds. The number of species listed under COSEWIC, SARA and/or BC's Red and Blue lists were comparable, with six listed species detected in 2023, and seven listed species detected in 2024. The median number of songbirds detected per point count survey was 9.5 in 2023 and 10 in 2024. In both years, the most detected bird was White-throated Sparrow (*Zonotrichia leucophrys*) and the second-most detected bird was Red-eyed Vireo (*Vireo olivaceus*).

All 74 songbird species detected during the 2024 point count surveys (Table 4) had been previously detected in songbird surveys conducted in prior monitoring years. This year (2024) was the first year that Yellow-headed Blackbird (*Xanthocephalus xanthocephalus*), observed incidentally at Watson Slough after completing a survey at PC24-027, had been detected during the breeding-bird monitoring program (Appendix C). Although Fort St. John is near the northern extent of their range and observations are infrequent, Yellow-headed Blackbird regularly occurs in the area (eBird 2021).

Surveys conducted in 2024 represent a continuation in monitoring of semi-permanent monitoring stations that will be monitored through to 10 years post-construction. In future years, some stations may be lost to land use changes or access, and others will be added as needed to address the objective to characterize changes in the bird community of the Peace River Valley over time.

5.0 REFERENCES

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APPENDIX A

SONGBIRD POINT COUNT STATIONS SURVEYED IN 2024

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-007	10	616913	6234543	1	6/5/2024	08:14	VH	1	3	N	9.0	Dry slopes-grassland
PC23-007	10	616913	6234543	2	6/21/2024	07:54	VH	1	0	N	16.0	Dry slopes-grassland
PC23-008	10	616553	6234827	1	6/5/2024	07:38	VH	1	2	N	9.0	Dry slopes-shrubland
PC23-008	10	616553	6234827	2	6/21/2024	07:23	VH	1	1	N	16.0	Dry slopes-shrubland
PC23-009	10	616192	6234479	1	6/5/2024	08:47	VH	1	3	N	9.0	Cultivated
PC23-009	10	616192	6234479	2	6/21/2024	08:28	VH	1	1	N	17.0	Cultivated
PC23-010	10	615902	6234745	1	6/5/2024	07:07	VH	2	2	N	9.0	Dry slopes-shrubland
PC23-010	10	615902	6234745	2	6/21/2024	06:53	VH	1	1	N	13.0	Dry slopes-shrubland
PC23-011	10	615862	6234301	1	6/5/2024	06:41	VH	2	1	N	8.0	Cultivated
PC23-011	10	615862	6234301	2	6/21/2024	06:25	VH	1	0	N	12.0	Cultivated
PC23-019	10	603014	6234339	1	6/9/2024	04:44	H	4	1	N	6.0	Dry slopes-grassland
PC23-019	10	603014	6234339	2	6/26/2024	04:53	VH	4	2	N	10.0	Dry slopes-grassland
PC23-021	10	601274	6234292	1	6/9/2024	05:20	H	4	1	N	6.0	Deciduous-shrub
PC23-021	10	601274	6234292	2	6/26/2024	04:15	H	4	1	N	10.0	Deciduous-shrub
PC23-024	10	600679	6234123	1	6/9/2024	05:53	H	4	2	N	7.0	Deciduous-shrub
PC23-024	10	600679	6234123	2	6/26/2024	05:26	VH	4	3	N	11.0	Deciduous-shrub
PC23-027	10	605811	6234955	1	6/10/2024	06:54	VH	3	1	N	8.0	Fen/bog-shrub
PC23-027	10	605811	6234955	2	6/27/2024	04:56	H	4	1	N	15.0	Fen/bog-shrub
PC23-032	10	594779	6230591	1	6/9/2024	06:25	H	4	1	N	8.0	Coniferous-shrub
PC23-032	10	594779	6230591	2	6/26/2024	06:15	VH	4	2	N	12.0	Coniferous-shrub
PC23-035	10	593385	6229860	1	6/9/2024	07:00	H	4	0	N	8.0	Deciduous-shrub
PC23-035	10	593385	6229860	2	6/26/2024	06:48	VH	4	1	N	11.0	Deciduous-shrub
PC23-038	10	592767	6229065	1	6/9/2024	08:20	H	4	1	N	8.0	Dry slopes-shrubland
PC23-038	10	592767	6229065	2	6/26/2024	08:07	VH	4	2	N	12.0	Dry slopes-shrubland
PC23-039	10	592553	6228662	1	6/9/2024	09:15	H	4	0	N	9.0	Cultivated
PC23-039	10	592553	6228662	2	6/26/2024	08:35	VH	4	2	N	13.0	Cultivated
PC23-040	10	593058	6229341	1	6/9/2024	07:55	H	4	0	N	8.0	Dry slopes-shrubland
PC23-040	10	593058	6229341	2	6/26/2024	07:43	VH	4	2	N	12.0	Dry slopes-shrubland
PC23-050	10	593202	6229554	1	6/9/2024	07:28	H	4	0	N	8.0	Dry slopes-shrubland
PC23-050	10	593202	6229554	2	6/26/2024	07:15	VH	4	2	N	11.0	Dry slopes-shrubland

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-069	10	577259	6220860	1	6/8/2024	09:22	VH	4	1	N	10.0	Dry slopes-shrubland
PC23-069	10	577259	6220860	2	6/25/2024	09:08	VH	2	2	N	13.0	Dry slopes-shrubland
PC23-070	10	576921	6220683	1	6/8/2024	08:55	VH	4	0	N	9.0	Dry slopes-shrubland
PC23-070	10	576921	6220683	2	6/25/2024	08:40	H	2	2	N	12.0	Dry slopes-shrubland
PC23-071	10	576686	6220531	1	6/8/2024	08:32	VH	4	0	N	8.0	Deciduous-shrub
PC23-071	10	576686	6220531	2	6/25/2024	08:20	H	2	2	N	12.0	Deciduous-shrub
PC23-072	10	576256	6220108	1	6/8/2024	07:54	VH	4	0	N	7.0	Riparian-mixed young forest
PC23-072	10	576256	6220108	2	6/25/2024	07:42	H	4	2	N	12.0	Riparian-mixed young forest
PC23-073	10	576001	6219985	1	6/8/2024	07:31	VH	3	1	N	7.0	Cultivated
PC23-073	10	576001	6219985	2	6/25/2024	07:22	H	4	1	N	11.0	Cultivated
PC23-076	10	570355	6212864	1	6/8/2024	06:14	VH	4	0	N	7.0	Coniferous-young forest
PC23-076	10	570355	6212864	2	6/25/2024	06:10	H	4	0	N	9.0	Coniferous-young forest
PC23-077	10	570134	6213209	1	6/8/2024	06:37	VH	4	0	M	7.0	Coniferous-young forest
PC23-077	10	570134	6213209	2	6/25/2024	06:34	H	4	0	N	9.0	Coniferous-young forest
PC23-078	10	565870	6206360	1	6/8/2024	06:45	AR	4	0	D	8.0	Deciduous-mature forest
PC23-078	10	565870	6206360	2	6/25/2024	06:42	H	4	0	N	10.0	Deciduous-mature forest
PC23-080	10	566416	6207084	1	6/8/2024	04:27	H	4	0	N	7.0	Deciduous-shrub
PC23-080	10	566416	6207084	2	6/25/2024	07:18	VH	3	0	N	9.0	Deciduous-shrub
PC23-081	10	566341	6206470	1	6/8/2024	05:21	H	4	0	N	8.0	Wetland-shrub
PC23-081	10	566341	6206470	2	6/25/2024	08:20	VH	3	0	N	10.0	Wetland-shrub
PC23-082	10	564101	6205711	1	6/8/2024	07:50	H	3	0	N	8.0	Deciduous-mature forest
PC23-082	10	564101	6205711	2	6/25/2024	05:36	H	4	0	N	9.0	Deciduous-mature forest
PC23-084	10	566021	6206826	1	6/8/2024	04:58	H	4	0	N	7.0	Deciduous-shrub
PC23-084	10	566021	6206826	2	6/25/2024	07:55	H	3	1	N	9.0	Deciduous-shrub
PC23-085	10	563734	6205440	1	6/8/2024	09:08	H	3	0	N	10.0	Fen/bog-shrub
PC23-085	10	563734	6205440	2	6/25/2024	04:24	H	4	0	N	8.0	Fen/bog-shrub
PC23-086	10	564312	6205213	1	6/8/2024	08:29	H	4	0	N	8.0	Deciduous-shrub
PC23-086	10	564312	6205213	2	6/25/2024	05:00	H	4	0	N	8.0	Deciduous-shrub
PC23-087	10	565416	6206263	1	6/8/2024	07:05	H	3	0	D	10.0	Deciduous-shrub
PC23-087	10	565416	6206263	2	6/25/2024	06:10	H	4	0	N	9.0	Deciduous-shrub

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-088	10	562713	6205763	1	6/8/2024	04:45	VH	4	0	N	8.0	Deciduous-mature forest
PC23-088	10	562713	6205763	2	6/25/2024	04:34	H	4	1	N	8.0	Deciduous-mature forest
PC23-089	10	562800	6206063	1	6/8/2024	05:17	VH	4	0	N	8.0	Deciduous-mature forest
PC23-089	10	562800	6206063	2	6/25/2024	05:20	H	4	0	N	9.0	Deciduous-mature forest
PC23-101	10	566447	6205946	1	6/8/2024	05:49	AR	4	0	D	8.0	Coniferous-young forest
PC23-101	10	566447	6205946	2	6/25/2024	09:06	VH	3	0	N	10.0	Coniferous-young forest
PC23-104	10	577541	6220783	1	6/8/2024	10:00	VH	4	0	N	11.0	Deciduous-young forest
PC23-104	10	577541	6220783	2	6/25/2024	09:33	VH	2	1	N	13.0	Deciduous-young forest
PC23-144	10	606558	6235589	1	6/10/2024	06:16	VH	3	1	N	8.0	Wetland-graminoid
PC23-144	10	606558	6235589	2	6/27/2024	06:06	H	3	1	N	15.0	Wetland-graminoid
PC23-201	10	611065	6238042	1	6/9/2024	04:15	H	4	0	N	6.0	Dry slopes-shrubland
PC23-201	10	611065	6238042	2	6/26/2024	04:07	H	4	1	N	13.0	Dry slopes-shrubland
PC23-202	10	611295	6238013	1	6/9/2024	04:33	H	4	0	N	6.0	Deciduous-young forest
PC23-202	10	611295	6238013	2	6/26/2024	04:24	H	4	1	N	13.0	Deciduous-young forest
PC23-203	10	611606	6237736	1	6/9/2024	05:23	H	3	0	N	7.0	Deciduous-mature forest
PC23-203	10	611606	6237736	2	6/26/2024	05:06	H	4	1	N	14.0	Deciduous-mature forest
PC23-204	10	611968	6237681	1	6/9/2024	06:00	H	4	1	N	7.0	Deciduous-young forest
PC23-204	10	611968	6237681	2	6/26/2024	05:35	H	3	1	N	14.0	Deciduous-young forest
PC23-205	10	612332	6237495	1	6/9/2024	06:28	H	4	1	N	7.0	Deciduous-mature forest
PC23-205	10	612332	6237495	2	6/26/2024	06:02	H	4	1	N	14.0	Deciduous-mature forest
PC23-206	10	612573	6237329	1	6/9/2024	07:02	VH	4	1	N	7.0	Wetland-shrub
PC23-206	10	612573	6237329	2	6/26/2024	06:28	H	4	1	N	14.0	Wetland-shrub
PC23-207	10	613084	6236953	1	6/9/2024	08:24	AR	4	0	D	8.0	Wetland-shrub
PC23-207	10	613084	6236953	2	6/26/2024	07:37	H	4	1	N	14.0	Wetland-shrub
PC23-208	10	612820	6236955	1	6/9/2024	07:41	H	4	1	N	8.0	Deciduous-shrub
PC23-208	10	612820	6236955	2	6/26/2024	06:53	H	4	1	N	13.0	Deciduous-shrub
PC23-209	10	613174	6236752	1	6/9/2024	08:00	AR	4	0	D	8.0	Deciduous-young forest
PC23-209	10	613174	6236752	2	6/26/2024	07:13	H	4	1	N	13.0	Deciduous-young forest
PC23-210	10	611575	6237602	1	6/9/2024	05:00	H	3	0	N	6.0	Wetland-shrub
PC23-210	10	611575	6237602	2	6/26/2024	04:44	H	4	1	N	13.0	Wetland-shrub

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-500	10	613140	6235203	1	6/5/2024	07:56	VH	2	2	N	10.0	Deciduous-young forest
PC23-500	10	613140	6235203	2	6/21/2024	07:53	VH	1	0	N	14.0	Deciduous-young forest
PC23-501	10	612849	6235419	1	6/5/2024	08:28	VH	2	2	N	12.0	Deciduous-mature forest
PC23-501	10	612849	6235419	2	6/21/2024	08:28	VH	1	1	N	14.0	Deciduous-mature forest
PC23-502	10	612581	6235611	1	6/5/2024	08:52	VH	1	2	N	12.0	Deciduous-mature forest
PC23-502	10	612581	6235611	2	6/21/2024	09:00	VH	1	0	N	15.0	Deciduous-mature forest
PC23-601	10	623773	6232892	1	6/5/2024	04:25	VH	1	0	N	6.0	Riparian-mixed young forest
PC23-601	10	623773	6232892	2	6/21/2024	04:20	VH	1	0	N	10.0	Riparian-mixed young forest
PC23-602	10	624125	6233158	1	6/5/2024	04:20	VH	1	1	N	5.0	Riparian-mixed shrub
PC23-602	10	624125	6233158	2	6/21/2024	04:24	VH	1	0	F	11.0	Riparian-mixed shrub
PC23-603	10	621827	6232349	1	6/5/2024	05:00	VH	1	1	N	6.0	Riparian-mixed shrub
PC23-603	10	621827	6232349	2	6/21/2024	04:53	VH	1	0	F	11.0	Riparian-mixed shrub
PC23-604	10	621685	6232571	1	6/5/2024	05:20	VH	1	1	N	6.0	Riparian-mixed shrub
PC23-604	10	621685	6232571	2	6/21/2024	05:14	VH	1	0	F	11.0	Riparian-mixed shrub
PC23-605	10	621248	6232354	1	6/5/2024	05:44	VH	1	1	N	7.0	Riparian-mixed shrub
PC23-605	10	621248	6232354	2	6/21/2024	05:40	VH	1	0	N	10.0	Riparian-mixed shrub
PC23-606	10	614571	6234696	1	6/5/2024	06:32	VH	2	0	N	10.0	Coniferous-shrub
PC23-606	10	614571	6234696	2	6/21/2024	06:23	VH	1	1	N	11.0	Coniferous-shrub
PC23-607	10	614201	6234874	1	6/5/2024	06:57	VH	2	2	N	10.0	Riparian-mixed shrub
PC23-607	10	614201	6234874	2	6/21/2024	06:47	VH	1	0	N	12.0	Riparian-mixed shrub
PC23-608	10	613880	6235428	1	6/5/2024	07:18	VH	2	2	N	10.0	Riparian-mixed shrub
PC23-608	10	613880	6235428	2	6/21/2024	07:09	VH	1	0	N	12.0	Riparian-mixed shrub
PC23-610	10	622131	6231923	1	6/5/2024	05:25	VH	1	0	N	8.0	Deciduous-young forest
PC23-610	10	622131	6231923	2	6/21/2024	05:24	VH	1	0	N	11.0	Deciduous-young forest
PC23-611	10	623167	6232457	1	6/5/2024	04:55	VH	1	0	N	6.0	Deciduous-shrub
PC23-611	10	623167	6232457	2	6/21/2024	04:53	VH	1	0	N	10.0	Deciduous-shrub
PC23-A1	10	602990	6233046	1	6/6/2024	04:44	VH	1	0	N	6.0	Deciduous-mature forest
PC23-A1	10	602990	6233046	2	6/22/2024	04:40	VH	2	0	N	14.0	Deciduous-mature forest
PC23-A10	10	599738	6232286	1	6/6/2024	08:43	VH	1	0	N	12.0	Coniferous-mature forest
PC23-A10	10	599738	6232286	2	6/22/2024	08:22	VH	1	0	N	18.0	Coniferous-mature forest

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-A2	10	602661	6232990	1	6/6/2024	04:22	VH	1	0	N	6.0	Deciduous-shrub
PC23-A2	10	602661	6232990	2	6/22/2024	04:22	VH	2	0	N	14.0	Deciduous-shrub
PC23-A3	10	602233	6232962	1	6/6/2024	05:17	VH	1	0	N	8.0	Deciduous-shrub
PC23-A3	10	602233	6232962	2	6/22/2024	05:08	VH	2	0	N	15.0	Deciduous-shrub
PC23-A4	10	601952	6232770	1	6/6/2024	05:53	VH	1	0	N	8.0	Coniferous-mature forest
PC23-A4	10	601952	6232770	2	6/22/2024	05:31	VH	1	0	N	15.0	Coniferous-mature forest
PC23-A5	10	601607	6232742	1	6/6/2024	06:19	VH	1	0	N	10.0	Coniferous-mature forest
PC23-A5	10	601607	6232742	2	6/22/2024	06:02	VH	1	0	N	15.0	Coniferous-mature forest
PC23-A6	10	601260	6232688	1	6/6/2024	06:55	VH	1	0	N	10.0	Coniferous-mature forest
PC23-A6	10	601260	6232688	2	6/22/2024	06:35	VH	1	0	N	15.0	Coniferous-mature forest
PC23-A7	10	600890	6232601	1	6/6/2024	07:21	VH	1	0	N	10.0	Coniferous-mature forest
PC23-A7	10	600890	6232601	2	6/22/2024	06:59	VH	1	0	N	15.0	Coniferous-mature forest
PC23-A8	10	600496	6232512	1	6/6/2024	07:48	VH	1	0	N	10.0	Coniferous-mature forest
PC23-A8	10	600496	6232512	2	6/22/2024	07:27	VH	1	0	N	15.0	Coniferous-mature forest
PC23-A9	10	600121	6232427	1	6/6/2024	08:16	VH	1	0	N	10.0	Coniferous-mature forest
PC23-A9	10	600121	6232427	2	6/22/2024	07:55	VH	1	1	N	17.0	Coniferous-mature forest
PC23-B1	10	595349	6229423	1	6/6/2024	04:29	VH	1	0	N	6.0	Coniferous-young forest
PC23-B1	10	595349	6229423	2	6/22/2024	04:15	VH	1	0	N	11.0	Coniferous-young forest
PC23-B10	10	593197	6227928	1	6/6/2024	09:42	VH	2	2	N	13.0	Coniferous-shrub
PC23-B10	10	593197	6227928	2	6/22/2024	09:08	VH	2	1	N	20.0	Coniferous-shrub
PC23-B2	10	595098	6229182	1	6/6/2024	05:04	VH	1	0	N	6.0	Coniferous-mature forest
PC23-B2	10	595098	6229182	2	6/22/2024	04:44	VH	1	0	N	12.0	Coniferous-mature forest
PC23-B3	10	594882	6228865	1	6/6/2024	05:39	VH	1	0	N	7.0	Coniferous-young forest
PC23-B3	10	594882	6228865	2	6/22/2024	05:12	VH	1	0	N	12.0	Coniferous-young forest
PC23-B4	10	594639	6228571	1	6/6/2024	06:15	VH	1	0	N	6.0	Coniferous-young forest
PC23-B4	10	594639	6228571	2	6/22/2024	05:46	VH	1	0	N	14.0	Coniferous-young forest
PC23-B5	10	594340	6228348	1	6/6/2024	06:55	VH	1	0	N	7.0	Deciduous-young forest
PC23-B5	10	594340	6228348	2	6/22/2024	06:17	VH	1	0	N	14.0	Deciduous-young forest
PC23-B6	10	594087	6228135	1	6/6/2024	07:30	VH	1	0	N	8.0	Deciduous-young forest
PC23-B6	10	594087	6228135	2	6/22/2024	06:56	VH	1	0	N	14.0	Deciduous-young forest

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-B7	10	593863	6227915	1	6/6/2024	08:05	VH	1	0	N	9.0	Deciduous-young forest
PC23-B7	10	593863	6227915	2	6/22/2024	07:24	VH	1	0	N	14.0	Deciduous-young forest
PC23-B8	10	593646	6227692	1	6/6/2024	08:40	VH	1	0	N	10.0	Coniferous-young forest
PC23-B8	10	593646	6227692	2	6/22/2024	07:57	VH	1	0	N	15.0	Coniferous-young forest
PC23-B9	10	593609	6228086	1	6/6/2024	09:20	VH	1	1	N	12.0	Coniferous-shrub
PC23-B9	10	593609	6228086	2	6/22/2024	08:45	VH	2	1	N	16.0	Coniferous-shrub
PC23-C1-1	10	589114	6225713	1	6/7/2024	08:45	VH	1	0	N	12.0	Deciduous-shrub
PC23-C1-1	10	589114	6225713	2	6/23/2024	07:57	VH	2	1	N	15.0	Deciduous-shrub
PC23-C1-2	10	589021	6225353	1	6/7/2024	09:06	VH	1	0	N	12.0	Coniferous-mature forest
PC23-C1-2	10	589021	6225353	2	6/23/2024	08:22	VH	2	1	N	15.0	Coniferous-mature forest
PC23-C1-3	10	588775	6225032	1	6/7/2024	09:30	VH	1	0	N	14.0	Coniferous-mature forest
PC23-C1-3	10	588775	6225032	2	6/23/2024	08:50	VH	2	2	N	17.0	Coniferous-mature forest
PC23-C1-4	10	588528	6224817	1	6/7/2024	09:50	VH	1	1	N	14.0	Coniferous-mature forest
PC23-C1-4	10	588528	6224817	2	6/23/2024	09:14	VH	2	2	N	17.0	Coniferous-mature forest
PC23-C1-5	10	588244	6225026	1	6/7/2024	10:12	VH	1	1	N	14.0	Riparian-mixed mature forest
PC23-C1-5	10	588244	6225026	2	6/23/2024	09:40	VH	2	1	N	19.0	Riparian-mixed mature forest
PC23-C2-1	10	587264	6223631	1	6/7/2024	08:37	VH	1	1	N	11.0	Deciduous-young forest
PC23-C2-1	10	587264	6223631	2	6/23/2024	07:52	VH	2	0	N	18.0	Deciduous-young forest
PC23-C2-2	10	587483	6223815	1	6/7/2024	09:01	VH	1	1	N	12.0	Deciduous-young forest
PC23-C2-2	10	587483	6223815	2	6/23/2024	08:22	VH	2	1	N	18.0	Deciduous-young forest
PC23-C2-3	10	587687	6224007	1	6/7/2024	09:18	VH	1	1	N	12.0	Deciduous-young forest
PC23-C2-3	10	587687	6224007	2	6/23/2024	08:48	VH	3	1	N	19.0	Deciduous-young forest
PC23-C2-4	10	587990	6224257	1	6/7/2024	09:38	VH	1	1	N	12.0	Coniferous-young forest
PC23-C2-4	10	587990	6224257	2	6/23/2024	09:16	VH	3	2	N	20.0	Coniferous-young forest
PC23-C2-5	10	588205	6224535	1	6/7/2024	10:01	VH	1	1	N	14.0	Coniferous-mature forest
PC23-C2-5	10	588205	6224535	2	6/23/2024	09:50	VH	2	1	N	21.0	Coniferous-mature forest
PC23-D1-1	10	574352	6217752	1	6/7/2024	04:40	VH	1	0	N	5.0	Riparian-mixed young forest
PC23-D1-1	10	574352	6217752	2	6/23/2024	04:38	VH	3	0	N	11.0	Riparian-mixed young forest
PC23-D1-2	10	574335	6217385	1	6/7/2024	05:09	VH	1	0	N	5.0	Coniferous-mature forest
PC23-D1-2	10	574335	6217385	2	6/23/2024	05:10	VH	3	0	N	11.0	Coniferous-mature forest

Table A1: Songbird Point Count Stations Surveyed in 2024

Station	UTM Zone	UTM Easting	UTM Northing	Survey Number	Survey Date	Survey Time	Cloud Ceiling[1]	Cloud Cover[2]	Wind Speed	Precipitation[3]	Temperature (ºC)	Bird Habitat Class
PC23-D1-3	10	574574	6217605	1	6/7/2024	05:30	VH	1	0	N	6.0	Coniferous-mature forest
PC23-D1-3	10	574574	6217605	2	6/23/2024	05:29	VH	2	0	N	11.0	Coniferous-mature forest
PC23-D1-4	10	574823	6217844	1	6/7/2024	06:00	VH	1	1	N	6.0	Deciduous-mature forest
PC23-D1-4	10	574823	6217844	2	6/23/2024	05:56	VH	2	0	N	12.0	Deciduous-mature forest
PC23-D1-5	10	575018	6218149	1	6/7/2024	06:21	VH	1	1	N	6.0	Coniferous-mature forest
PC23-D1-5	10	575018	6218149	2	6/23/2024	06:19	VH	2	0	N	12.0	Coniferous-mature forest
PC23-D2-1B	10	578738	6219672	1	6/7/2024	04:30	VH	1	0	N	6.0	Deciduous-young forest
PC23-D2-1B	10	578738	6219672	2	6/23/2024	07:09	VH	2	0	N	11.0	Deciduous-young forest
PC23-D2-2B	10	577450	6219145	1	6/7/2024	05:15	VH	1	0	N	6.0	Coniferous-shrub
PC23-D2-2B	10	577450	6219145	2	6/23/2024	04:57	VH	2	1	N	9.0	Coniferous-shrub
PC23-D2-3	10	576950	6218948	1	6/7/2024	05:45	VH	1	0	N	6.0	Riparian-mixed shrub
PC23-D2-3	10	576950	6218948	2	6/23/2024	04:35	VH	1	0	N	8.0	Riparian-mixed shrub
PC23-D2-4	10	574657	6218563	1	6/7/2024	06:43	VH	1	1	N	7.0	Deciduous-mature forest
PC23-D2-4	10	574657	6218563	2	6/23/2024	05:45	VH	2	1	N	10.0	Deciduous-mature forest
PC23-D2-5	10	574463	6218308	1	6/7/2024	07:20	VH	1	1	N	9.0	Deciduous-mature forest
PC23-D2-5	10	574463	6218308	2	6/23/2024	06:18	VH	2	1	N	12.0	Deciduous-mature forest
PC23-PR-38	10	607605	6236561	1	6/10/2024	04:57	VH	2	0	N	7.0	Wetland-graminoid
PC23-PR-38	10	607605	6236561	2	6/27/2024	06:39	VH	3	1	N	16.0	Wetland-graminoid
PC23-PR-39	10	607396	6236515	1	6/10/2024	05:20	VH	3	0	N	7.0	Wetland-shrub
PC23-PR-39	10	607396	6236515	2	6/27/2024	07:00	H	4	2	N	16.0	Wetland-shrub
PC23-PR-46	10	606770	6235559	1	6/10/2024	05:50	VH	3	1	N	8.0	Wetland-graminoid
PC23-PR-46	10	606770	6235559	2	6/27/2024	05:18	AR	4	1	N	15.0	Wetland-graminoid
PC23-PR-56	10	605447	6234696	1	6/10/2024	07:17	VH	3	1	N	8.0	Coniferous-mature forest
PC23-PR-56	10	605447	6234696	2	6/27/2024	04:30	H	4	1	N	15.0	Coniferous-mature forest

Table Notes:

[1] Codes for Cloud Ceiling: Above Tree Tops (ATT), Below Tree Tops (BTT), Above Ridges (AR), Below Ridges (BR), High (H), and Very High (VH)

[2] Codes for Cloud Cover: Clear (1), Scattered Clouds <50% (2), Scattered Clouds >50% (3), and Unbroken Clouds (4)

[3] Codes for Precipitation: No Precipitation (N), Fog (F), Misty Drizzle (M), Drizzle (D)

APPENDIX B
PROJECT QUALIFIED ENVIRONMENTAL PROFESSIONALS

Name and Affiliation	Project Role
Jeff Matheson, M.Sc., R.P.Bio., P.Biol. Tetra Tech Canada Inc.	Project Manager, Report Author
Elyse Hofs, B.Sc., R.P.Bio. Tetra Tech Canada Inc.	Field Data Collection, Data Entry, Report Author
Natasha Gidluck, B.Sc., B.I.T. Tetra Tech Canada Inc.	Field Data Collection

APPENDIX C

INCIDENTAL OBSERVATIONS OF BIRDS RECORDED DURING POINT COUNTS THAT ARE NOT SONGBIRDS AND BIRDS RECORDED OUTSIDE OF SURVEY PERIODS

Table C.1: Incidental observations of non-songbirds recorded during the point count surveys and birds recorded outside of survey periods, listed in taxonomic order

English Name	Scientific Name	BC List	COSEWIC	SARA Status	Detections
Canada Goose	*Branta canadensis*	Yellow	-	-	2
Trumpeter Swan	*Cygnus buccinator*	Yellow	Not at Risk	-	1
Ruffed Grouse	*Bonasa umbellus*	Yellow	-	-	3
Sora	*Porzana carolina*	Yellow	-	-	7
Sandhill Crane	*Antigone canadensis*	Yellow	Not at Risk	-	2
Killdeer	*Charadrius vociferus*	Blue	-	-	1
Spotted Sandpiper	*Actitis macularius*	Yellow	-	-	1
Wilson's Snipe	*Gallinago delicata*	Yellow	-	-	11
Northern Harrier	*Circus hudsonius*	Yellow	Not at Risk	-	1
Bald Eagle	*Haliaeetus leucocephalus*	Yellow	Not at Risk	-	3
Belted Kingfisher	*Megaceryle alcyon*	Yellow	-	-	1
American Three-toed Woodpecker	*Picoides dorsalis*	Yellow	-	-	1
Merlin	*Falco columbarius*	Yellow	Not at Risk	-	1
American Kestrel	*Falco sparverius*	Yellow	-	-	1
Olive-sided Flycatcher	*Contopus cooperi*	Yellow	Special Concern	Special Concern	1
Varied Thrush	*Ixoreus naevius*	Yellow	-	-	1
American Robin	*Turdus migratorius*	Yellow	-	-	1
Baltimore Oriole	*Icterus galbula*	Blue	-	-	1
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Yellow	-	-	1

APPENDIX D

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

NATURAL SCIENCES

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

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The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

1.8 NOTIFICATION OF AUTHORITIES

TETRA TECH professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by TETRA TECH of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

Appendix 2. 2024 Bank Swallow Monitoring Memo Area A

TETRA TECH

TECHNICAL MEMO

ISSUED FOR USE

To:	Brent Matsuda, BC Hydro	**Date:**	March 12, 2025
		Memo No.:	001
From:	Elyse Hofs, Jeff Matheson	**File:**	704-ENW.PENW03042-02
Subject:	Site C 2024 Bank Swallow Survey Memo		

1.0 INTRODUCTION

Saulteau EBA Environmental Joint Venture (SEES JV) completed surveys for Bank Swallow (*Riparia riparia*) at BC Hydro and Power Authority's (BC Hydro) Site C Clean Energy Project ("Site C") in the summer of 2024. The purpose of the surveys were to determine the presence and breeding status of Bank Swallow (BKSW) at five locations within an area of the construction site referred to as Area A.

BKSW are federally designated as 'threatened' under the *Species at Risk Act* (SARA) and by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Within British Columbia, BKSW are yellow-listed (i.e., secure and not at risk of extinction).

2.0 SURVEY SITES

In 2024, BKSW surveys were conducted at five sites within Area A (Table 2-1; Figure 1). This was the first year of monitoring for four of the sites (i.e., Colonies 1, 2, 3, and 4) which were discovered on-site by BC Hydro staff in spring of 2024. This was the fourth year of monitoring for Colony 5 (referred to as "Batch Plant" or "Area A" in memos from previous years[1,2]).

Table 2-1. 2024 Area A Bank Swallow Survey Sites

Survey Site	UTM Coordinates	Elevation (metres above sea level)
Colony 1	10 V 630668 m E 6227893 m N	469 m
Colony 2	10 V 630664 m E 6227751 m N	474 m
Colony 3	10 V 630677 m E 6227813 m N	470 m
Colony 4	10 V 630729 m E 6227692 m N	477 m
Colony 5 (Batch Plant)	10 V 630607 m E 6227669 m N	478 m

2.1 Colony 1

Colony 1 occurred in an aggregate storage area located on the south bank of the Site C construction site, immediately east of the batch plant along Septimus Road (Figure 1). This year (2024) was the first year of monitoring at this site. In early May, BC Hydro environmental staff had located the colony on a near-vertical, north-facing slope of a sand stockpile, and requested that it be included in the BKSW monitoring program (Photos 1 & 2).

[1] Tetra Tech. 2023. Site C 2023 Bank Swallow Survey Memo – Revised. Consultants report prepared for BC Hydro dated March 6, 2024.
[2] Tetra Tech. 2022. Site C 2022 Bank Swallow Survey Memo. Consultants report prepared for BC Hydro dated November 17, 2022.

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Vancouver, BC V6C 1N5 CANADA
Tel 604.685.0275 Fax 604.684.6241

2.2 Colony 2

Colony 2 occurred in an aggregate storage area located on the south bank of the Site C construction site, immediately east of the batch plant along Septimus Road (Figure 1). This year (2024) was the first year of monitoring at this site. In early May, BC Hydro environmental staff had located the colony on a near-vertical, east/north-facing slope of a sand stockpile and requested that it be included in the BKSW monitoring program (Photos 3 & 4).

2.3 Colony 3

Colony 3 occurred in an aggregate storage area located on the south bank of the Site C construction site, immediately east of the batch plant along Septimus Road (Figure 1). This year (2024) was the first year of monitoring at this site. In early May, BC Hydro environmental staff had located the colony on a near-vertical, south-facing slope of a sand stockpile, and requested that it be included in the BKSW monitoring program (Photos 5 & 6).

2.4 Colony 4

Colony 4 was on the southeastern edge of the aggregate storage area located east of the batch plant on the south bank of the construction site on a 50 m long, near-vertical, west-facing slope on the face of an old soil stockpile (Figure 1). This colony was situated on the east bank of the drainage ditch that surrounds the perimeter of the aggregate storage area which is assumed to be outside of the active work area. This year (2024) was the first year of monitoring at this site. BC Hydro environmental staff had located the colony in early June and requested that it be included in the BKSW monitoring program (Photos 7 & 8).

2.5 Colony 5 (Batch Plant)

Colony 5 (referred to as the “Batch Plant” or “Area A” monitoring site in previous memos[1,2]) was a temporary habitat compensation site established in 2021 that has now undergone four years of monitoring for BKSW. Colony 5 was located on the south bank of the Site C construction site, between Septimus Road to the south and an aggregate storage area to the north (Figure 1). The BKSW cavities were located along a previously excavated pit face / slope that that follows the alignment of Septimus Road. The slope face was approximately 190 m long and faces to the north/northeast (Photos 9 to 11). The soils along the slope appeared to be stable and the slope faces were near vertical (>75º).

3.0 SURVEY METHODS

Survey methodology was adapted from the Resource Inventory Standards Committee (RISC) *Inventory Methods for Swallows and Swifts*[3]. Standwatch surveys were conducted at the five survey sites three times throughout June of 2024. During each standwatch survey, the surveyor observed the potential nesting site for 30 minutes to record BKSW entering and exiting the nest cavity sites. The 30-minute observation period was considered to be a sufficient duration to establish Bank Swallow activity at each colony. As per the RISC protocol, surveys were conducted after 10 a.m. (when insect prey are more likely to be active), and always under clear weather conditions (i.e., no surveys were conducted in rain or inclement weather).

[3] Resources Information Standards Committee (RISC). 1998. Inventory Methods for Swallows and Sifts, Standards for Components of British Columbia’s Biodiversity No. 16. Province of British Columbia. 32 pp.

4.0 SURVEY RESULTS

4.1 Colony 1

BKSW nesting activity was observed at the Colony 1 survey site during all three visits (Table 4-1; Photos 1 & 2). Fifty-five BKSW cavities were counted in Colony 1 with at least 20 cavities confirmed as active.

Table 4-1. Survey Results for the 2024 Bank Swallow Surveys at Colony 1

Observation Date / Time	Observer(s)	Observations
June 5, 2024 12:51 – 13:21	Elyse Hofs & Natasha Gidluck	▪ 55 BKSW cavities were located on a vertical, north-facing slope of a sand stockpile. ▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 19 BKSW individuals were observed flying above Colony 1 during this survey. ▪ By the end of the survey, four cavities were confirmed to be active.
June 9, 2024 12:17 – 12:47	Elyse Hofs & Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 30+ BKSW individuals were observed flying above Colony 1. ▪ By the end of the survey 12 cavities were confirmed to be active.
June 21, 2024 12:19 – 12:49	Elyse Hofs & Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ By the end of the survey 20 cavities were confirmed to be active.

4.2 Colony 2

BKSW nesting activity was observed at the Colony 2 survey site during all three visits (Table 4-2; Photos 3 & 4). Seventy-five BKSW cavities were counted in Colony 2 with at least 18 cavities were confirmed as active.

Table 4-2. Survey Results for the 2024 Bank Swallow Surveys at Colony 2

Observation Date / Time	Observer(s)	Observations
June 5, 2024 13:25 – 13:55	Elyse Hofs	▪ 75 BKSW cavities were located on vertical, north/east-facing slopes of a sand stockpile. ▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 10+ BKSW individuals were observed flying above Colony 2 and foraging over stagnant water nearby. ▪ By the end of the survey four cavities were confirmed to be active.
June 9, 2024 12:50 – 13:20	Elyse Hofs	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ By the end of the survey 17 cavities were confirmed to be active.
June 21, 2024 12:50 – 13:20	Elyse Hofs	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ By the end of the survey 18 cavities were confirmed to be active.

4.3 Colony 3

BKSW nesting activity was observed at the Colony 3 survey site during all three visits (Table 4-3; Photos 5 & 6). Sixty BKSW cavities were counted in Colony 3 with at least 17 cavities confirmed as active.

Table 4-3. Survey Results for the 2024 Bank Swallow Surveys at Colony 3

Observation Date / Time	Observer(s)	Observations
June 5, 2024 13:25 – 13:55	Natasha Gidluck	▪ 60 BKSW cavities were located on vertical, south-facing slope of a sand stockpile. ▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ 7 BKSW individuals were observed flying above Colony 3. ▪ By the end of the survey four cavities were confirmed as active.
June 9, 2024 12:50 – 13:20	Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 34 BKSW individuals were observed flying above Colony 3 throughout the survey. ▪ By the end of the survey 15 cavities were confirmed as active.
June 21, 2024 12:50 – 13:20	Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 38 BKSW individuals were observed flying above Colony 3. ▪ By the end of the survey 17 cavities were confirmed as active.

4.4 Colony 4

BKSW nesting activity was observed at the Colony 4 survey site during all three visits (Table 4-4; Photos 7 & 8). One hundred BKSW cavities were counted in Colony 4 with at least nine cavities confirmed to be active.

Table 4-4. Survey Results for the 2024 Bank Swallow Surveys at Colony 4

Observation Date / Time	Observer(s)	Observations
June 5, 2024 14:01 – 14:31	Elyse Hofs	▪ 100 BKSW cavities were located on a 50 m long, vertical, west-facing slope of a soil stockpile. ▪ BKSW were observed entering or exiting cavities twice during the survey. ▪ 26 BKSW individuals were observed flying above Colony 4. ▪ By the end of the survey two cavities were confirmed to be active.
June 9, 2024 13:24 – 13:54	Elyse Hofs	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ By the end of the survey seven cavities were confirmed to be active.
June 21, 2024 13:25 – 13:55	Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 27 BKSW individuals were observed flying above Colony 4 throughout the survey. ▪ By the end of the survey nine cavities were confirmed to be active.

4.5 Colony 5 (Batch Plant)

BKSW nesting activity was observed at Colony 5 (Batch Plant) during all three visits (Table 4-5; Photos 9 & 11). One hundred and thirty-three BKSW cavities were counted here with at least 13 cavities confirmed to be active.

Table 4-5. Survey Results for the 2024 Bank Swallow Surveys at Colony 5 (Batch Plant)

Observation Date / Time	Observer(s)	Observations
June 5, 2024 14:06 – 14:36	Natasha Gidluck	▪ BKSW cavities are located on a 190 m long, north/northeast-facing slope, with most cavities present on the west side of the slope. ▪ 4 BKSW individuals were observed flying above Colony 5. ▪ By the end of the survey two cavities were confirmed to be active.
June 9, 2024 13:23 – 13:52	Natasha Gidluck	▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ Up to 33 BKSW individuals were observed flying above Colony 5 throughout survey. ▪ By the end of the survey, 13 cavities were confirmed as active and were evenly spread out along the length of the slope.
June 21, 2024 13:25 – 13:55	Elyse Hofs	▪ 68 BKSW cavities were located on the western side of the slope with 65 cavities along the mid- and eastern sections of the slope for a total of 133 BKSW cavities. ▪ BKSW were observed entering and exiting cavities throughout the survey. ▪ By the end of the survey 10 cavities were confirmed to be active.

5.0 DISCUSSION

Evidence of BKSW breeding activity was documented at all five BKSW colonies surveyed in 2024. Colonies 1, 2, and 3 were located in sand stockpiles within an active aggregate storage area. In all three cases, near-vertical slope faces existed in the stockpile providing suitable BKSW nesting habitat. For future, BC Hydro should survey active work areas prior to the breeding season (i.e., generally before mid-April[4]) and recontour any near-vertical stockpile slopes to less than 70 degrees to discourage BKSW nesting[4]. During the breeding season, any vertical faces created in active work areas should be flattened at the end of each day to prevent BKSW from digging burrows overnight or on non-workdays[4]. Removing suitable BKSW nesting habitat from active work areas will encourage birds to use suitable nesting habitat outside of active work areas such as Colonies 4 and 5.

6.0 LIMITATIONS OF REPORT

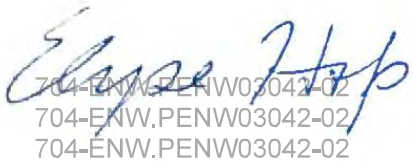
This report and its contents are intended for the sole use of BC Hydro and Power Authority and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Hydro and Power Authority, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in Appendix A or Contractual Terms and Conditions executed by both parties.

[4] Environment and Climate Change Canada. 2016. Bank Swallow (*Riparia riparia*) in Sandpits and Quarries. Government of Canada. Available at: https://publications.gc.ca/collections/collection_2017/eccc/CW66-522-2016-eng.pdf.

7.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.



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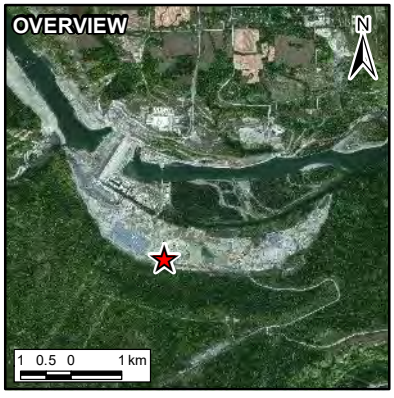
/sy

Enclosure: Figures (1)
Photos (11)
Appendix A: Tetra Tech's Limitations on the Use of this Document

FIGURES

LEGEND

Slope Face



NOTES
Base data source:
Imagery from BC Hydro (Main Map: August 2024 / Overview: Sept 2023).

STATUS
ISSUED FOR USE

SITE C
2024 BANK SWALLOW SURVEY MEMO

Area A Bank Swallow Survey Sites

PROJECTION UTM Zone 10			**DATUM** NAD83		**CLIENT** BC Hydro Power smart
Scale: 1:2,000 — 30 15 0 30 Metres					TETRA TECH
FILE NO. PENW03042-02_Fig01_AreaA.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** MRB	**APVD** EH	**REV** 0	**Figure 1**
DATE March 26, 2025	**PROJECT NO.** ENW.PENW03042-02				

G:\ENVIRONMENTAL\PENW\PENW03042-02\Maps\BankSwallow_2024\PENW03042-02_Fig01_AreaA.mxd modified 3/26/2025 by Stephanie.Leusink

PHOTOS

Photo 1. Colony 1 located on a north-facing slope of a sand stockpile. Photo on June 5, 2024.

Photo 2. Close-up view of Colony 1 on June 9, 2024.

Photo 3. Colony 2 located on a north- and east-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 4. Close-up view of Colony 2 on June 9, 2024.

Photo 5. Colony 3 located on a south-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 6. Close-up view of Colony 3 on June 9, 2024.

Photo 7. Colony 4 located on a west-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 8. Close-up view of a section of Colony 4 on June 9, 2024.

Photo 9. Colony 5 located on a north/northeast-facing slope. Photo shows the view of Colony 5 from the eastern end of the slope on June 5, 2024.

Photo 10. View of Colony 5 from the western end of the slope on June 5, 2024.

Photo 11. Close-up view of a section of Colony 5 through binoculars on June 5, 2024.

Photo 1: Colony 1 located on a north-facing slope of a sand stockpile. Photo on June 5, 2024.

Photo 2: Close-up view of Colony 1 on June 9, 2024.

Photo 3: Colony 2 located on a north- and east-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 4: Close-up view of Colony 2 on June 9, 2024.

Photo 5: Colony 3 located on a south-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 6: Close-up view of Colony 3 on June 9, 2024.

Photo 7: Colony 4 located on a west-facing slope of a sand stockpile. Photo on June 9, 2024.

Photo 8: Close-up view of a section of Colony 4 on June 9, 2024.

Photo 9: Colony 5 located on a north/northeast-facing slope.
Photo shows the view of Colony 5 from the eastern end of the slope on June 5, 2024.

Photo 10: View of Colony 5 from the western end of the slope on June 5, 2024.

Photo 11: Close-up view of a section of Colony 5 through binoculars on June 5, 2024.

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The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

1.8 NOTIFICATION OF AUTHORITIES

TETRA TECH professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by TETRA TECH of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

Appendix 3. 2024 Waterbird Monitoring Report

Site C Clean Energy Project
Waterbird Migration Monitoring Program
2024 Annual Report



PRESENTED TO

British Columbia Hydro and Power Authority

MARCH 28, 2025
ISSUED FOR USE
FILE: 704-ENV.VENV03095-01_WATERBIRDS24

Saulteau EBA Environmental Services Joint Venture
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Site C Clean Energy Project
Waterbird Migration Monitoring Program
2024 Annual Report

FILE: 704-ENW.PENW03042-02.WATERBIRDS24
March 28, 2025

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EXECUTIVE SUMMARY

In 2024, British Columbia Hydro and Power Authority (BC Hydro) contracted Saulteau EBA Environmental Services Joint Venture (SEES JV) to conduct the Waterbird Migration Monitoring Program to assess the effects of the Site C Clean Energy Project (the Project) on waterbirds. The objectives of the program are to document changes in waterbird habitat, abundance, and diversity within wetland and non-wetland habitats during Project construction and the first ten years of operations. Waterbird monitoring in 2024 varied from previous monitoring years, as on August 26, 2024, the Site C reservoir began filling. The last two river surveys were conducted within the reservoir-filling period.

The monitoring involves two study areas: a 146.5 kilometre (km) long stretch of the Peace River (between Hudson's Hope and the Alberta border); and wetlands within the Moberly Plateau that occur within 3 km of the transmission line right-of-way. Each study area was surveyed five times (known as "survey rounds") within the spring (April 1 to May 30) and fall (August 1 to October 15) waterbird migration periods. Qualified Environmental Professionals conducted boat surveys on the Peace River and standwatch and ground-transect surveys in the transmission line study area. Standwatch surveys were conducted in habitats with open water, and 100 metre transect surveys were conducted in sedge and willow-sedge habitats. Autonomous Recording Units (ARUs) were deployed in ten wetlands to capture vocalizations from four crepuscular and nocturnal species: American Bittern (*Botaurus lentiginosus*), Sora (*Porzana Carolina*), Yellow Rail (*Coturnicops noveboracensis*), and Virginia Rail (*Rallus limicola*).

Waterbird observations were analyzed and presented using the following metrics: species richness, species evenness, total abundance, and density. Mean densities of waterbirds on the Peace River were summarized by river habitat type and treatment area. For the transmission line, species richness and total abundance were also summarized by survey type and wetland station. ARU analysis used the bird sound recognition tool BirdNET Analyzer to analyze recording files for the presence of the four crepuscular/nocturnal species.

An overview of the results from the 2024 Waterbird Migration Monitoring Program are as follows:

- A total of 22 wetlands were surveyed, with a total of 160 wetland surveys (standwatches and transects) conducted in the transmission line.
- Peace River boat surveys detected 28 species across all survey periods (excluding unknown birds).
- Standwatch and transect surveys detected 37 species (excluding unknown birds). Standwatch surveys consistently detected more species (12 – 26 species) compared to transect surveys (1 – 14 species).
- The transmission line study area generally displayed higher species evenness than the Peace River study area.
- Boat surveys detected a greater total abundance of waterbirds compared to standwatch and transect surveys.
- The mainstem had the highest total abundance of waterbirds out of the Peace River habitat types, and the inundation impact area had the highest total abundance of waterbirds out of the Peace River treatment areas.
- For boat surveys, large dabblers attained the highest total abundance out of all the foraging guilds. Of these large dabblers, most consisted of Canada Goose (*Branta canadensis*).
- For standwatch surveys, dabbling ducks contributed to the highest mean densities in every survey round except for mid-spring, when large dabblers had slightly greater mean density. For transect surveys, generally, the mean density of dabbling ducks was greatest across all survey rounds.
- All ten wetlands where ARUs were deployed had positive detections of Sora, and two wetlands had positive detections of Virginia Rail. American Bittern and Yellow Rail were not detected in any of the wetlands.

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1.0 INTRODUCTION

British Columbia Hydro and Power Authority (BC Hydro) is assessing the effects of the Site C Clean Energy Project (the Project) on waterbirds as per the conditions outlined in the Environmental Assessment Certificate # E14-02 (Environmental Assessment Office 2014) and Federal Decision Statement (BC Hydro 2014). BC Hydro retained Saulteau EBA Environmental Services Joint Venture (SEES JV) to complete the 2024 Waterbird Migration Follow-up Monitoring Program (Waterbird Migration Monitoring Program) within areas of the Peace River (from Hudson's Hope to the Alberta border) and wetlands in Moberly Plateau near the transmission line right-of-way (ROW) (Figure 1), in the context of waterbird disturbance, displacement, mortality, and habitat alteration and fragmentation.

1.1 Waterbird Migration Monitoring Program

BC Hydro is assessing the effects of the Project on shorebirds, marsh birds, and waterfowl using methods in Version 6 of the *Site C Vegetation and Wildlife: Waterbird Migration Follow-up Monitoring Program* (hereafter known as the "Program Plan") (BC Hydro 2022). The primary objectives of the Waterbird Migration Monitoring Program are to document changes in waterbird habitat, abundance, and diversity within wetland and non-wetland habitats (i.e., on the Peace River and within the wetlands adjacent to the transmission line ROW), during Project construction and the first ten years of Project operations (BC Hydro 2022). On August 26, 2024, the Site C reservoir began filling, marking a change from the construction phase to the post-construction phase. Surveys after this date were therefore conducted within the reservoir-filling period.

1.2 Background

Ausenco Sustainability ULC (Ausenco) conducted the Waterbird Migration Monitoring Program from 2017 to 2023. In 2024, BC Hydro contracted SEES JV to conduct the Waterbird Migration Monitoring Program following the same methodology as in recent years.

The Program Plan defines a "waterbird" as a species of bird belonging to one of the following taxonomic orders:

- Anseriformes (ducks, geese, and swans)
- Gaviiformes (loons)
- Podicipediformes (grebes)
- Charadriiformes (avocets, gulls, phalaropes, plovers, sandpipers, snipes, and terns)
- Gruiformes (cranes, herons, and rails)
- Pelecaniformes (bitterns and pelicans)

The waterbird species observed correspond to eight different groups, which are based on habitat types, body characteristics, and dietary preferences, hereafter known as "foraging guilds" to remain consistent with the Program Plan:

- Benthic-feeding divers (species that forage by diving and feed on benthic aquatic vegetation or invertebrates)
- Piscivorous divers (species that dive and primarily consume fish)
- Dabbling ducks (species that dabble and dip their head and neck below the water to forage for either plants, insects, or invertebrates)

- Large dabblers (larger-bodied dabbling species, e.g., swans and geese)
- Cranes and herons
- Shorebirds
- Gulls and surface-feeding terns
- Marsh birds

2.0 METHODS

The Waterbird Migration Monitoring Program involves two key study areas: a 146.5 kilometre (km) long stretch of the Peace River (between Hudson's Hope and the Alberta border) and a select group of wetlands within the Moberly Plateau that occur within 3 km of the transmission line ROW (Figure 1).

Surveys were conducted according to conditions outlined in the Program Plan for the Waterbird Migration Monitoring Program (BC Hydro 2022). These methods are consistent with previous Waterbird Migration Monitoring conducted by Ausenco from 2017 – 2023 and included the same Peace River survey area and wetlands in the Moberly Plateau.

2.1 Waterbird Survey Frequency and Timing

The following terms are used to describe the timings of waterbird surveys throughout this report:

- Survey period: the season in which surveys are taking place, either spring or fall.
- Survey round: a group of days (e.g., August 1-2), consisting of a complete set of Peace River or transmission line surveys.
- Survey day: a single day of surveys (e.g., August 1, 2024) for either the Peace River or transmission line.

Each monitoring year, five rounds of Peace River surveys and transmission line wetland surveys are conducted. Two rounds are completed during the spring migration survey period (April 1 to May 30), and three rounds are completed in the fall migration survey period (August 1 to October 15). The required timing window for each survey round is provided in Table 1. Autonomous Recording Units (ARUs) are deployed at a subset of the transmission line wetlands in the spring and are retrieved in the fall (Table 1).

Table 1: Waterbird Survey Season, Timing, Frequency, and Location

Survey Period	Survey Period Date Ranges	Peace River (Boat Surveys)	Transmission Line (Ground Surveys)
Spring	Early (April 1 – April 14)	Two Rounds Required	-
	Middle (April 15 – May 6)	-	One Round Required
	Late (May 7 – May 30)	-	One Round Required + Deploy ARUs
Fall	Early (August 1 – 14)	One Round Required	One Round Required + Retrieve ARUs
	Middle (August 15 – September 14)	One Round Required	One Round Required
	Late (September 15 – October 15)	One Round Required	One Round Required

Modified from Table 6 within the Program Plan (BC Hydro 2022).

2.2 Peace River Boat Surveys

Surveys were carried out by two Qualified Environmental Professionals (QEPs) knowledgeable in waterbird identification and habitat classification. Each round of boat surveys was completed over a two-day period. The first survey day was conducted from Hudson's Hope to the Site C Dam (upstream of the dam, in the reservoir fill area). The second day involved surveying from the Site C Dam to the Alberta border (downstream of the dam).

The visual surveys were conducted between the hours of 7:00 a.m. and 8:00 p.m. (daylight hours), with breaks taken as required due to inclement weather or reduced visibility (e.g., thick fog, whitecaps). Suitable weather consisted of winds less than or equal to 3 on the Beaufort scale, no precipitation or very light drizzle, and clear visibility (absence of smoke or fog). Surveys began directly after leaving the boat launch to prevent flushing birds during mobilization to the survey start point. The same jet boat and the same boat operator (Stephen Kristoffy) were used for all five survey rounds. The boat maintained a speed of 30 to 40 kilometers per hour (km/hr), with higher speeds necessary (e.g., 45 to 50 km/hr) in shallow backchannels (to prevent getting stuck on gravel bars). The route for each survey was recorded using GPS tracking in ESRI's ArcGIS Field Maps application. If water levels were high enough, the boat circled around all accessible islands and backchannels in addition to travelling the mainstem of the river. The QEPs scanned using binoculars and the naked eye to detect and identify birds within the Peace River. The digital data collection application ESRI ArcGIS Survey123 was used to record the required data variables during the boat surveys (Appendix B). Basic details (e.g., date, time, surveyors) were recorded once per survey; weather details and flow measurements were recorded at the start and end of the survey. Each waterbird observation was recorded with associated habitat data.

Flow measurements were taken with a flow metre (Global Water FP111 model) from the side of the idling jet boat, with the measurement tool placed in line with the direction of flow of the river. Measurements were taken at the start and end of survey transects. This resulted in three measurements from the area upstream of the dam (Halfway River boat launch, Hudson's Hope, Site C Dam) and three measurements from the area downstream of the dam (Taylor boat launch, Site C Dam, Alberta border).

2.3 Moberly Plateau Transmission Line Wetland Surveys

Surveys were carried out by two QEPs with knowledge of waterbird identification and habitat classification. Surveys were conducted between the hours of 7:00 a.m. and 8:00 p.m. (daylight hours), with breaks taken as required due to inclement weather (e.g., thunder, lightning, heavy rain). Suitable weather consisted of winds less than or equal to 3 on the Beaufort scale, no precipitation or very light drizzle, and clear visibility (absence of smoke or fog).

Two types of visual surveys were conducted to record diurnally active waterbirds at three types of wetland habitats: standwatch surveys were conducted at open water areas, and fixed-length transects were conducted at sedge and willow-sedge wetland habitats. The wetland habitat composition (sedge or willow-sedge vegetation type and whether there was standing open water) determined which of the survey types was appropriate. If a given wetland site had a combination of habitats (e.g., open water pond surrounded by sedge wetland), then that site would have more than one type of survey completed.

Each survey was recorded using ESRI's ArcGIS Survey123 digital data collection application. Appendix C lists the data collection variables used for the wetland surveys. Basic details (e.g., date, time, surveyors) were recorded once per survey and weather details were recorded at the start and end of each wetland survey. Each waterbird observation was recorded, including the species, number of individuals, associated habitat, water depth, primary behaviour, detection type, and distance from the observer.

2.3.1 Standwatch Surveys

Standwatch surveys were conducted when the wetland site contained visible open water with average water depths greater than 0.5 metres (m). The presence of open water habitat can vary seasonally or annually depending on climatic conditions (e.g., amount of annual precipitation). The QEPs scanned the open water area using binoculars and the naked eye to detect and identify waterbird species. Each standwatch survey was 20 minutes (mins) in duration and observations were recorded within ESRI's ArcGIS Survey123 digital data collection application (Appendix C). The surveyors would use a 30-60x magnification spotting scope on a tripod to assist with the identification of waterbirds observed from further distances.

As per the Program Plan (BC Hydro 2022), two open water standwatch surveys were repeated for each transmission line survey round to provide estimates of detection rates (to be calculated in future analyses).

2.3.2 Transect Surveys

Transect surveys were conducted at wetland sites that contained at least 5 m of contiguous sedge or willow-sedge habitat with average water depths of less than 0.5 m. Each transect was approximately 100 m in length and took the surveyor 5-10 mins to walk. Each transect was recorded using GPS tracking in the Field Maps application. Surveyors walked in the appropriate habitat type and recorded waterbirds that were visually observed (including those flying overhead), heard nearby, or were flushed from vegetation or small areas of nearby open water. The surveyor recorded the width of the contiguous habitat type where the transect occurred, the proportion of the wetland site that was open water, sedge, or willow-sedge habitat, and the estimated water depth within each habitat type. Appendix C provides the full suite of variables collected while conducting a sedge transect or a willow-sedge transect. If multiple transects of the same habitat type (e.g., sedge) were conducted at the same wetland site on the same day, then the transect name was given a numerical suffix ending of 01 or 02 to differentiate the surveys.

2.3.3 ARU Deployment

ARUs were used to capture vocalizations from crepuscular and nocturnal waterbird species of interest. Four key marsh-dwelling species have been identified in the Program Plan: American Bittern (*Botaurus lentiginosus*), Sora (*Porzana Carolina*), Yellow Rail (*Coturnicops noveboracensis*), and Virginia Rail (*Rallus limicola*) (BC Hydro 2022).

Per monitoring year, a minimum of six wetland sites must have an ARU deployed from mid-May through July with the goal of detecting one or more of the marsh bird species of interest. The ARUs must be deployed within sedge or willow-sedge habitat with an area of at least 150-200 m of suitable habitat present. To reduce potential noise interference at the deployment site, trees or shrubs with few branches or obstacles were selected for ARU placement, or surveyors trimmed twigs and branches near the ARU. ARUs were secured to the trees with screws or zip ties at a height of 1 m or higher. External microphones were aimed toward marsh bird habitat. Each ARU was programmed to record an audio file 10 mins long every 60 mins (i.e., every hour) starting 30 mins before sunset and concluding 30 mins after sunrise.

3.0 DATA ANALYSIS

Waterbird observations were analyzed and presented using the following metrics:

- Species richness.
- Species evenness.
- Total abundance (i.e., the total number of waterbirds observed).
- Density, calculated as birds per kilometre-squared (km^2; open water and Peace River habitats), or birds per km (sedge and willow-sedge wetland habitats).

Observations of waterbirds that could not be identified to the species level (i.e., unknown waterbird observations) were excluded from richness and evenness calculations. However, counts of unknown waterbird observations were included in abundance and density calculations.

Each parameter was summarized by foraging guild and by survey round. In this 2024 annual report, we reassigned the foraging guild categories for five duck species that were previously classified as dabbling ducks (from 2017 to 2023). Canvasback (*Aythya valisineria*), Redhead (*Aythya americana*), Ring-necked Duck (*Aythya collaris*), Greater Scaup (*Aythya marila*), and Lesser Scaup (*Aythya affinis*) were reassigned to the benthic-feeding divers foraging guild because those five species are classified as diving ducks by the Cornell Lab of Ornithology (Cornell University 2025) and within the BC Resource Inventory Committee standards *Inventory Methods for Waterfowl and Allied Species: Loons, Grebes, Swans, Geese, Ducks, American Coot and Sandhill Crane* (Resources Inventory Committee 1999).

3.1 Peace River Boat Surveys

3.1.1 Species Richness and Evenness

Species richness (the number of species) and species evenness (the degree of similarity in abundance of each species) were selected as metrics to characterize waterbird diversity (BC Hydro 2022). Diversity metrics can be used to evaluate change in waterbird community structure across different survey locations and monitoring years.

Species richness and evenness were only assessed for birds identified in the mainstem and moderate flow habitat categories of the Peace River (i.e., areas of the river that were surveyed all five rounds) to account for differences in survey effort. Limited flow habitat and other backchannels could not be assessed for all survey dates due to low water levels. Species richness was summarized by foraging guild and survey round.

Species evenness was calculated for each survey round using Pielou's evenness index (MacDonald, Nielsen, and Acorn 2017):

$$Species\ evenness = \frac{(-\sum^{S}_{i=1}(p_i \times \ln p_i))}{(\ln S)}$$

Where S is the number of species (i.e., species richness), pi is the proportion of all sampled waterbirds represented by species i, and $\ln$ is the natural logarithm.

3.1.2 Waterbird Abundance

In the spring survey periods (April and May) the number of bird species observed on the Peace River were recorded using ranges instead of whole numbers. The following categories were used: 1; 2; 3; 4; 5; 6-10; 11-20; 21-30; 31-50; 51-100; >100. This was not consistent with surveys in previous years. For the fall surveys, this was corrected and only whole numbers were used. To generate whole numbers for the spring dataset for data analysis, values were imputed for each category using the fall data as a guide. The fall data were categorized into the ranges used in the spring surveys and the median of each range was identified. The median was then used to replace the range in the spring dataset. The median values for the Peace River are shown in Table 2.

Table 2: Median Values for the 2024 Spring Peace River Data

Range Category	6-10	11-20	21-30	31-50	51-100	>100
Median Value from Fall Data	8	15	25	38	57	200

Waterbird abundance on the Peace River was summarized in terms of total abundance by foraging guild and survey round, as well as by calculating the density of detected waterbirds per km^2. Density was calculated by dividing the total abundance of waterbirds by the total area of the river surveyed (in km^2) for each survey round. The area of the Peace River surveyed on each of the five survey rounds differed depending on the water level, as on certain dates the boat could access backchannels. Table 3 shows the total area of the Peace River surveyed during each survey round.

Table 3: Total Area of the Peace River Surveyed (km^2) for each Survey Round in 2024

	Spring		Fall		
Total Area Surveyed (km^2)	**Apr 11 – 12**	**Apr 14 – 15**	**Aug 1 – 2**	**Aug 28 – 29**	**Oct 2 – 3**
	43.11	43.06	50.83	44.94	95.13

The larger area surveyed during the August 1-2 survey period was a result of higher water levels both upstream and downstream of the dam, which allowed for more backchannels to be traversed. In October, the area surveyed was nearly double that of the other survey rounds due to the filling of the reservoir. The area calculated was based on the assumption that the reservoir was near normal level at this date.

Density was summarized by foraging guild, river habitat type, and treatment area. The river habitat categories are described below and displayed in Figures 2a-d. Descriptions are adapted from Table 10 of the Program Plan (BC Hydro 2022). The minimal connectivity habitat type has been excluded from this report as there were no observations for this category. The minimal connectivity habitat constitutes an area of minimal or no connectivity to the river (e.g., lentic [still freshwater] features) except during extreme high water or flooding events. It has minimal or no flow, and silty or otherwise fine-grained substrates. This habitat type is mostly shallow and includes ephemeral ponds; both emergent and submergent aquatic vegetation occur (BC Hydro 2022). An additional category (reservoir) has been added in 2024 as a result of the new habitat created following the reservoir filling. This category is only used to describe observations that were recorded on October 2, 2024. The habitat conditions observed on August 28-29, 2024, were classified as mainstem rather than reservoir, as filling was in the very early stages (filling began on August 26, 2024).

River Habitat Categories

- Limited Connectivity: limited connectivity to the river (i.e., backchannels primarily connected to the river at the downstream end) with relatively low flow rate and volumes, and fine substrates (e.g., silts and sands). Many shallow areas are only inundated when river levels are high. Submergent aquatic vegetation occurs along the shoreline.

- Moderate Flow: consistently connected to the river (e.g., side channels connected on upstream and downstream ends) with relatively moderate flows and moderately sized substrates (e.g., sand, gravel). Shallow waters typically inundate most of the riverbed. Aquatic vegetation is sparse.
- Mainstem: main channel of the river where water flow rates, depths, and substrate size (e.g., gravel, cobble) are greatest. Permanently inundated. Aquatic vegetation is sparse or absent.
- Reservoir: the widest area of the river where water flow rates are slow and depth is greatest, similar to lentic (i.e., lake) systems. Permanently inundated with variable sizes of substrate and amounts of debris (during 2024 conditions). Aquatic vegetation is sparse or absent.

The treatment areas for the Peace River are described below and displayed on Figure 3:

- Inundation impact area: the area of the Peace River that is flooded (inundated) with water (from Hudson's Hope to the Site C Dam).
- Flow regime impact area: the area where water flow is controlled by the dam (downstream of the Site C Dam to the confluence with the Pine River).
- Control area: the area where water level and flow will remain comparable to historical conditions (downstream of the confluence with the Pine River to the Alberta border).

3.2 Moberly Plateau Transmission Line Wetland Surveys

3.2.1 Species Richness and Evenness

Species richness (the number of species) and species evenness (the degree of similarity in abundance of each species) were selected as metrics to characterize waterbird diversity (BC Hydro 2022). Diversity metrics can be used to evaluate change in waterbird community structure across different survey locations and monitoring years.

Species richness for the transmission line was grouped by foraging guild, survey round, survey type (standwatch or transect survey), and wetland station ID.

Species evenness was calculated for each survey round using Pielou's evenness index (MacDonald, Nielsen, and Acorn 2017):

$$Species\ evenness = \frac{(-\sum^{S}_{i=1}(p_i \times \ln p_i))}{(\ln S)}$$

Where S is the number of species (i.e., species richness), pi is the proportion of all sampled waterbirds represented by species i, and $\ln$ is the natural logarithm.

3.2.2 Waterbird Abundance

In the spring survey periods (April and May) the number of bird species observed in the transmission line study area were recorded using ranges instead of whole numbers. The following categories were used: 1; 2; 3; 4; 5; 6-10; 11-20; 21-30; 31-50; 51-100; >100. This was not consistent with surveys in previous years. For the fall surveys, this was corrected and only whole numbers were used. To generate whole numbers for the spring dataset for data analysis, values were imputed for each category using the fall data as a guide. The fall data were categorized into the ranges used in the spring surveys and the median of each range was identified. The median was then used to replace the range in the spring dataset. The median values for the transmission line are shown in Table 4.

Table 4: Median Values for the 2024 Spring Transmission Line Data

Range Category	6-10	11-20	21-30	31-50	51-100	>100
Median Value from Fall Data	7	14	21	40	NA*	NA*

*No data collected in these ranges.

Total abundances for the transmission line were identified for both standwatch and transect surveys and were summarized by wetland station ID. Total abundances represent the sum of waterbirds from all survey rounds.

For standwatch surveys, waterbird abundance was summarized by density (waterbirds per km^2). Density was reported in terms of km^2 to maintain consistency with previous reports. The area used to calculate density was the amount of surveyed open water for each wetland for which a standwatch survey was conducted. The areas of open water wetlands that were surveyed in 2024 were estimated from Google Earth imagery (Google Earth Pro 2025). Table 5 lists the areas surveyed for each wetland where a standwatch survey was conducted. The presence of open water habitat can vary seasonally or annually depending on climatic conditions (e.g., amount of annual precipitation).

Table 5: Areas (km^2) of Open Water Wetlands Surveyed in 2024

Wetland Station ID	Area of Open Water Surveyed (km^2)
OW01	1.176
OW02	0.063
OW04	0.059
OW06	0.102
OW07	0.001
OW11	0.003
OW12	0.002
OW13	<0.001
SE03	0.010
SE05	0.002
SE09	0.001
SE10	0.001
SE12	0.001

Mean density was calculated as the total number of birds divided by the area of surveyed wetland habitat and averaged within survey rounds and foraging guilds.

3.3 ARU Data Analysis

In previous monitoring years, ARU analysis was completed using cluster analysis within the software program Kaleidoscope Pro. ARU recordings were compared to reference calls from the four species of interest by comparing amplitude and frequency characteristics. Recorded calls suspected to be from the target species were manually verified. An alternate approach to the ARU analysis was used in 2024 in an attempt to improve the potential detection of the four species using automated recognition. The analysis used the bird sound recognition tool BirdNET Analyzer (GUI version 1.3.1) to analyze the audio recording files for the presence of American Bittern, Sora, Yellow Rail, and Virginia Rail. BirdNET is a tool for acoustic analysis that uses the pre-trained models from

Cornell Lab of Ornithology and Chemnitz University of Technology to identify bird species from their vocalizations (Kahl et al. 2021; Symes et al. 2023).

Batch analysis in BirdNET was used to analyze multiple recordings at the same time. The settings used in BirdNET are listed in Table 6.

Table 6: BirdNET Settings for 2024 ARU Analysis

Setting Category	Setting Name	Setting Selection
Inference Settings	Minimum Confidence	0.5
	Sensitivity	1
	Overlap	1
	Minimum Bandpass Frequency (Hz)	0
	Maximum Bandpass Frequency (Hz)	15,000
Species Selection	Species List	Custom Species List*
Output Settings	Result Type	Kaleidoscope
	Combine Selection Tables?	Yes
	Skip Existing Results?	No
Other	Batch Size	1
	Threads	4
	Locale	EN

*American Bittern, Sora, Yellow Rail, and Virginia Rail.

Recordings where one of the target species was identified by BirdNET were manually verified by a QEP using Kaleidoscope Lite. Manual verification of recordings where the target species was identified only occurred until a positive verification at each survey location was attained (i.e., until presence/absence was verified). Data analysis was conducted using BirdNET for all ten survey locations. Two locations (OW11 and SE11) were cross-verified using the Kaleidoscope Pro (version 5.6.8) cluster analysis method (used in previous years) to allow for a comparison of the two methods. Default signal parameters were used for cluster analysis. For each cluster, five of the vocalizations closest to the centre of the cluster (i.e., most similar) were manually verified, and five vocalizations furthest from the centre of the cluster were verified. Wetlands OW11 and SE11 were selected for the cross-verification because they were surveyed by ARU in 2023, and both stations detected key species.

4.0 RESULTS

Appendix D provides a full list of the waterbird species observed in the 2024 monitoring year, including each species' foraging guild and total abundance.

4.1 2024 Survey Dates

Table 7 outlines the 2024 survey rounds when the Peace River boat surveys and transmission line wetland surveys were conducted.

Table 7: Survey Dates for Waterbird Monitoring in 2024

Survey Period	Peace River Survey Rounds	Transmission Line Survey Rounds
Spring	April 11 - 12	April 30 - May 2
	April 14 - 15	May 14 - 17 (ARUs deployed)
Fall	August 1 - 2	August 3 - 5 (ARUs retrieved)
	August 28 - 29*	August 27, 30, 31
	October 2 - 3*	September 29 - October 1

*Boat surveys were conducted after the Site C reservoir commenced filling.

The filling of the Site C reservoir began on August 25, 2024, and was completed in early November 2024 (BC Hydro 2025). The last two rounds of Peace River boat surveys (fall migration season) were conducted within the reservoir-filling period; one round occurred near the beginning of reservoir filling (August 28, 2024), and the second round occurred closer to the end of the reservoir-filling period (October 2, 2024). On August 28, the water levels and surveyable area remained similar to that of the previous pre-construction monitoring survey rounds, except for the area directly upstream of the dam, which could not be accessed due to floating debris. The survey of the Peace River on October 2 was considerably different from the pre-construction boat surveys as the water levels were much higher, and the area upstream of the dam functioned more like a lentic system (i.e., a lake) rather than a lotic system (i.e., flowing river). Waterbird data collected during both of these survey rounds has been included in the following Peace River results.

4.2 Peace River Boat Surveys

Flow measurements for the Peace River in 2024 (across all survey rounds) ranged from 0.1 to 1.9 metres per second.

4.2.1 Species Richness and Evenness

The total species richness in the Peace River study area in 2024 was 28 (excluding unknown birds) (Appendix D).

The species richness in 2024 during the spring migration was highest during April 11-12 (12 species), and in the fall migration was highest during October 2-3 (13 species) (Table 8). During the spring and fall survey periods, the highest species richness was observed in the benthic-feeding divers foraging guild (Table 8). There were zero detections of marsh birds during the Peace River boat surveys.

Pielou's evenness index ranged from 0.5 to 0.8 across the survey rounds.

Table 8: Peace River Species Richness in 2024

Foraging Guild	Spring		Fall		
	Apr 11 – 12	Apr 14 – 15	Aug 1 – 2	Aug 28 – 29	Oct 2 – 3
Benthic-feeding Divers	6	1	0	1	5
Piscivorous Divers	1	1	2	2	3
Dabbling Ducks	3	3	2	1	1
Large Dabblers	2	3	2	2	2
Cranes and Herons	0	0	1	0	0
Shorebirds	0	0	2	1	1
Gulls and Surface-feeding Terns	0	0	3	2	1
Marsh Birds	0	0	0	0	0
Total Richness	**12**	**8**	**12**	**9**	**13**
Pielou's Evenness	**0.7**	**0.7**	**0.5**	**0.8**	**0.5**

Note: Observations of unknown species were excluded from the richness and evenness calculations.

4.2.2 Waterbird Abundance

In terms of total abundance, boat surveys detected 4700 waterbirds across spring and fall, 2024 (Table 9). In the spring, the highest total abundance was observed for the April 14-15 survey round (Table 9). In the fall, the highest total abundance was observed for the August 1-2 survey round (Table 9). Large dabblers attained the highest total abundance out of all the foraging guilds with a total of 1964 birds, comprising 42% of all waterbirds (Table 9). Of these large dabblers, 96% consisted of Canada Goose (*Branta canadensis*) with the remaining 4% consisting of Trumpeter Swan and Cackling Goose.

Table 9: Peace River Absolute Waterbird Abundances in 2024

Foraging Guild	Spring		Fall		
	Apr 11 – 12	Apr 14 – 15	Aug 1 – 2	Aug 28 – 29	Oct 2 – 3
Benthic-feeding Divers	310	291	0	2	76
Piscivorous Divers	51	22	37	41	39
Dabbling Ducks	228	365	119	80	117
Large Dabblers	373	395	435	234	527
Cranes and Herons	0	0	3	0	0
Shorebirds	0	0	88	31	1
Gulls and Surface-feeding Terns	0	0	392	204	43
Marsh Birds	0	0	0	0	0
Unknown Waterbirds	7	0	62	102	25
Total Abundance	**969**	**1073**	**1136**	**694**	**828**

The total mean densities of waterbirds detected in each habitat type of the Peace River in 2024 were similar, ranging from 0.12-0.19 birds per km^2 (Table 10). The mainstem detected the highest total abundance of waterbirds, comprising 65% of all detections, however the moderate flow habitat had the highest total mean density (0.19 birds/km^2) out of all the habitat types (Table 10). Dabbling ducks had the highest mean density in limited connectivity (0.40 birds/km^2) and moderate flow habitats (0.48 birds/km^2). Unknown waterbirds (60% of which were classified

as “unknown gull”) and gulls and surface-feeding terns had the highest mean densities in mainstem habitats (0.33 and 0.22 birds/km^2, respectively) and large dabblers had the highest mean density in the reservoir (0.50 birds/km^2) (Table 10).

Table 10: Mean Density (Birds/Km^2/Survey Round) in the Peace River Habitat Types in 2024

Foraging Guild	River Habitat Type			
	Limited Connectivity	Moderate Flow	Mainstem	Reservoir*
Benthic-feeding Divers	0	0.21	0.16	0.07
Piscivorous Divers	0.05	0.09	0.09	0.03
Dabbling Ducks	0.40	0.48	0.12	0.11
Large Dabblers	0.19	0.20	0.10	0.50
Cranes and Herons	0	0.04	0.02	0
Shorebirds	0.03	0.05	0.03	0.01
Gulls and Surface-feeding Terns	0	0.14	0.22	0.03
Marsh Birds	0	0	0	0
Unknown Waterbirds	0	0	0.33	0.07
Total Mean Density	**0.17**	**0.19**	**0.12**	**0.14**
Total Abundance	**275**	**748**	**3071**	**606**

*Calculations for the reservoir habitat category only used data from the October 1-2 survey period.

The mean densities of waterbirds detected in each treatment area of the Peace River in 2024 ranged from 0.07-0.17 birds per km^2 (Table 11). The inundation impact area had the highest total mean density (0.17 birds/km^2) and highest total abundance of waterbirds (3532, or 75% of the total) (Table 11). In the inundation impact area, unknowns had the highest mean density (0.41 birds/km^2). Of these unknown observations in the inundation impact area, 57% were categorized as “unknown gull”, and the remaining 43% as “unknown waterbird”. In the flow regime impact area, benthic-feeding divers had the highest density (0.17 birds/km^2) and in the control area, dabbling ducks had the highest density (0.12 birds/km^2) (Table 11). Figures 4a-e show the mean densities of waterbirds in the Peace River treatment areas, grouped by habitat polygons.

Table 11: Mean Density (Birds/Km^2/Survey Round) in the Peace River Treatment Areas in 2024

Foraging Guild	Treatment Areas		
	Inundation Impact Area	Flow Regime Impact Area	Control Area
Benthic-feeding Divers	0.19	0.17	0.08
Piscivorous Divers	0.08	0.04	0.04
Dabbling Ducks	0.22	0.08	0.12
Large Dabblers	0.15	0.10	0.08
Cranes and Herons	0	0	0.03
Shorebirds	0.04	0.05	0.04
Gulls and Surface-feeding Terns	0.33	0.11	0.03
Marsh Birds	0	0	0
Unknown Waterbirds	0.41	0	0.04
Total Mean Density	**0.17**	**0.10**	**0.07**
Total Abundance	**3532**	**441**	**727**

4.3 Moberly Plateau Transmission Line Surveys

4.3.1 Wetlands Surveyed in 2024

Table 12 and Figures 5a-c outline the transmission line wetlands that were surveyed in 2024 and the types of surveys that were conducted at each wetland. All wetlands were surveyed for all survey rounds, with the following exceptions:

- OW12 was only surveyed during the fall survey rounds due to a human error with the spring 2024 Field Maps and Survey123 applications, which omitted OW12 as a survey location.
- OW14 was excluded from the 2024 monitoring program following the spring survey period due to difficulties with access, lack of a suitable vantage for standwatch surveys, and lack of suitable habitat for transect surveys. Data collected from OW14 in the May 14-17 survey round was not included in the 2024 data analysis or results.

If multiple transect surveys of the same type were completed at the same wetland site, on the same day (e.g., SE-TRANS01, SE-TRANS02), they were combined in Table 12 and considered to be a single unique survey.

Table 12: Locations of Open Water (OW), Sedge (SE), and Willow-sedge (WS) Surveys in 2024

Wetland ID	Apr 30 - May 2			May 14 - 17			Aug 3 - 5			Aug 27, 30, 31			Sep 29 - Oct 1		
	OW	SE	WS	OW	SE	WS	OW	SE	WS	OW	SE	WS	OW	SE	WS
OW01	✓	✓	✓	✓			✓	✓		✓	✓	✓	✓	✓	
OW02	✓			✓			✓			✓			✓		
OW04	✓			✓			✓			✓			✓		
OW06	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
OW07	✓			✓			✓			✓			✓		
OW11	✓			✓			✓			✓			✓		
OW12							✓			✓	✓		✓	✓	
OW13	✓				✓			✓			✓			✓	
OW14*				✓											
SE02		✓			✓			✓			✓			✓	✓
SE03	✓			✓			✓	✓		✓	✓		✓	✓	
SE04		✓	✓		✓			✓	✓		✓	✓		✓	✓
SE05			✓	✓	✓		✓			✓			✓		
SE06		✓			✓			✓	✓		✓	✓		✓	✓
SE07		✓	✓		✓	✓		✓	✓		✓	✓		✓	✓
SE09	✓	✓		✓	✓		✓	✓		✓	✓		✓	✓	
SE10	✓			✓			✓			✓			✓		
SE11		✓	✓		✓	✓		✓	✓		✓	✓		✓	✓
SE12	✓			✓	✓		✓			✓			✓		
SE14		✓	✓		✓			✓	✓		✓	✓		✓	✓
WS01		✓	✓		✓	✓			✓		✓	✓		✓	✓
WS02			✓			✓			✓			✓			✓
WS03			✓			✓			✓			✓			✓
Total	**11**	**10**	**9**	**11**	**12**	**5**	**12**	**11**	**9**	**12**	**13**	**10**	**12**	**13**	**10**

*OW14 was excluded from the 2024 monitoring program due to difficulties with access, lack of a suitable vantage point, and lack of suitable habitat for transect surveys.

As per the Programlo Plan (BC Hydro 2022), in each survey round, at least 10 surveys should be conducted in each wetland habitat type (e.g., open water, sedge, willow-sedge). This target was not always met in 2024, due to the lack of suitable willow-sedge habitat available in certain seasons (Table 12).

A total of 22 wetlands were surveyed in 2024, not including OW14 (Table 12). SEES JV completed 58 open water standwatch surveys, 59 sedge transect surveys, and 43 willow-sedge transect surveys, for a total of 160 transmission line wetland surveys (Table 12).

4.3.2 Species Richness and Evenness

The total species richness for 2024 in the transmission line survey area was 37 (excluding unknown birds) (Appendix D). The wetland with the highest species richness was OW06 (24 species), and the wetland with the lowest species richness was WS03 (0 species). A full list of species observed in each of the transmission line wetlands is provided in Appendix E.

The highest species richness for standwatch surveys was observed during the spring period from April 30-May 2 (26 species), and during the fall period on August 27, 30, and 31 (16 species) (Table 13). For transect surveys, the highest species richness in the spring was observed from May 14-17 (14 species), and in the fall was observed from September 29-October 1 (3 species) (Table 13). The open water standwatch surveys consistently resulted in higher species richness compared to the transect surveys, regardless of the survey round (Table 13). Including spring and fall survey periods, standwatch surveys detected 37 species total and transect surveys detected 15 species total (excluding unknown birds).

The dabbling ducks and benthic-feeding divers had greater species richness for the standwatch surveys, and dabbling ducks and shorebirds had greater richness for the transect surveys (Table 13). The gulls and surface-feeding terns guild had the lowest species richness for the standwatch and transect surveys.

Evenness ranged from 0.5 to 0.9 on Pielou's evenness index for standwatch surveys and from 0 to 0.9 for transect surveys (where values of zero resulted from a single species detection) (Table 13). For the standwatch surveys, species evenness was greater in the spring than in the fall.

Table 13: Transmission Line Species Richness in 2024

Foraging Guild	Spring		Fall		
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1
Standwatch Surveys					
Benthic-feeding Divers	6	2	4	5	5
Piscivorous Divers	3	1	3	4	4
Dabbling Ducks	7	5	3	5	3
Large Dabblers	3	2	1	2	2
Cranes and Herons	0	0	0	0	0
Shorebirds	4	3	1	0	0
Gulls and Surface-feeding Terns	2	0	0	0	0
Marsh Birds	1	2	0	0	0
Total Richness	**26**	**15**	**12**	**16**	**14**
Pielou's Evenness	**0.8**	**0.9**	**0.7**	**0.7**	**0.5**

Foraging Guild	Spring		Fall		
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1
Transect Surveys					
Benthic-feeding Divers	0	3	0	0	0
Piscivorous Divers	0	0	1	0	0
Dabbling Ducks	3	4	0	1	3
Large Dabblers	1	2	0	0	0
Cranes and Herons	0	0	0	0	0
Shorebirds	3	4	0	0	0
Gulls and Surface-feeding Terns	0	0	0	0	0
Marsh Birds	1	1	0	0	0
Total Richness	**8**	**14**	**1**	**1**	**3**
Pielou's Evenness	**0.8**	**0.9**	**0**	**0**	**0.9**

Note: Observations of unknown species were excluded from the richness and evenness calculations.

4.3.3 Waterbird Abundance for Standwatch Surveys

In terms of total abundance, standwatch surveys detected 1591 waterbirds across spring and fall survey periods in 2024 (Table 14). The wetland with the highest total abundance of waterbirds for standwatch surveys (combining spring and fall survey periods), was OW06 (581 birds), followed by OW01 (389 birds) (Table 14). The wetland with the lowest total abundance of waterbirds for transect surveys was SE09 (7 birds), followed by OW13 (8 birds) (Table 14). The highest total abundance value in the spring survey period occurred during the April 30-May 2 survey round (227 birds, OW01), and in the fall survey period occurred during the September 29-October 1 survey round (277 birds, OW06) (Table 14).

Table 14: Total Abundance in Surveyed Open Water Wetlands in 2024

Wetland ID	Spring		Fall			Total
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1	
OW01	227	17	11	70	64	**389**
OW02	19	14	10	36	12	**91**
OW04	27	14	12	6	19	**78**
OW06	129	38	72	65	277	**581**
OW07	21	23	35	74	7	**160**
OW11	10	8	3	6	7	**34**
OW12	0	10	1	0	0	**11**
OW13	8	0	0	0	0	**8**
SE03	50	29	33	27	1	**140**
SE05	0	3	3	8	0	**14**
SE09	0	5	0	0	2	**7**
SE10	19	14	13	18	0	**64**
SE12	4	10	0	0	0	**14**
					Grand Total	**1591**

The total abundance for each wetland station (combining abundances from standwatch and transect surveys) is displayed in Figures 6a-c.

The total mean density of waterbirds in surveyed open water wetlands was highest during August 27, 30, and 31 (2418.9 birds/km^2) and the lowest from September 29-October 1 (855.8 birds/km^2) (Table 15). Species within the dabbling ducks foraging guild contributed to the highest mean densities in every survey round except for mid-spring, when the large dabblers had slightly greater mean density (Table 15).

Table 15: Mean Density (Waterbirds/Km^2) in Surveyed Open Water Wetlands in 2024

Foraging Guild	Spring		Fall		
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1
Benthic-feeding Divers	194.2	348.9	182.9	236.4	290.5
Piscivorous Divers	21.4	12.9	28.3	158.2	422.4
Dabbling Ducks	1168.2	1120.6	2085.7	4755.4	645.5
Large Dabblers	342.7	1217.2	298.0	166.9	12.8
Cranes and Herons	0	0	0	0	0
Shorebirds	857.5	678.7	15.8	0	0
Gulls and Surface-feeding Terns	6.0	0	0	0	0
Marsh Birds	411.3	982.5	0	0	0
Unknown Waterbirds	0	0	381.9	0	0
Total Mean Density	**676.5**	**855.8**	**1139.0**	**2418.9**	**433.1**

4.3.4 Waterbird Abundance for Transect Surveys

In terms of total abundance, transect surveys detected a total of 118 waterbirds across spring and fall, 2024 (Table 16). The wetland with the highest total abundance of waterbirds for transect surveys (combining spring and fall survey periods), was SE05 (23 birds), followed by OW06 and SE09 (16 birds) (Table 16). The wetlands with the lowest total abundance of waterbirds for transect surveys were SE12, OW01, OW12, and WS03 (0 birds) (Table 16). Spring transect surveys detected more birds than fall transect surveys (Table 16). The highest total abundance value for transect surveys occurred during the April 30-May 2 survey round at SE05 (17 birds) (Table 16).

Table 16: Total Abundance in Surveyed Sedge and Willow-sedge Habitats in 2024

Wetland ID	Spring		Fall			Total
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1	
OW01	0	0	0	0	0	**0**
OW06	0	5	0	0	11	**16**
OW12	0	0	0	0	0	**0**
OW13	0	4	0	0	0	**4**
SE02	8	3	0	0	0	**11**
SE03	0	0	2	0	0	**2**
SE04	12	1	0	0	0	**13**
SE05	17	6	0	0	0	**23**
SE06	1	0	0	0	0	**1**
SE07	0	6	0	0	0	**6**
SE09	2	4	0	10	0	**16**
SE11	2	3	0	0	0	**5**
SE12	0	0	0	0	0	**0**
SE14	1	1	0	0	0	**2**
WS01	0	7	1	0	0	**8**
WS02	1	10	0	0	0	**11**
WS03	0	0	0	0	0	**0**
					Grand Total	**118**

The total abundance for each wetland station (combining abundances from standwatch and transect surveys) is displayed in Figures 6a-c.

The mean density of waterbirds along transects was highest on August 27, 30, and 31 (100.0 birds/km2) and was the lowest from August 3-5 (15.0 birds/km^2) (Table 17). Generally, the mean density of dabbling ducks was the greatest across all survey rounds. However, from August 3-5 piscivorous divers had the highest mean density, and from May 14-17, benthic-feeding divers had the same mean density as dabbling ducks (Table 17).

Table 17: Mean Density (Waterbirds/Km) in Surveyed Sedge and Willow-sedge Habitats in 2024

Foraging Guild	Spring		Fall		
	Apr 30 – May 2	May 14 – 17	Aug 3 – 5	Aug 27, 30, 31	Sep 29 – Oct 1
Benthic-feeding Divers	0	25.0	0	0	0
Piscivorous Divers	0	0	20.0	0	0
Dabbling Ducks	27.1	25.0	0	100.0	36.7
Large Dabblers	30.0	20.0	0	0	0
Cranes and Herons	0	0	0	0	0
Shorebirds	10.0	13.3	0	0	0
Gulls and Surface-feeding Terns	0	0	0	0	0
Marsh Birds	20.0	13.8	0	0	0
Unknown Waterbirds	0	0	10.0	0	0
Total Mean Density	**21.0**	**18.5**	**15.0**	**100.0**	**36.7**

4.3.5 ARUs at Transmission Line Wetlands

Ten ARUs were deployed from May 14-17 to August 3-5, 2024 (Table 18). All ARUs were in good condition upon retrieval except for the ARU at SE11, which had fallen onto the ground with the tree it had been affixed to. In 2024, two out of the four key species were detected with ARUs (Sora and Virginia Rail). Table 18 illustrates which wetlands had positive detections of key species. The BirdNET automated detection analysis and Kaleidoscope cluster analysis did not detect the same species for the two cross-verification wetlands. At OW11, BirdNET detected Sora and Virginia Rail whereas Kaleidoscope only detected Sora, and at SE11, BirdNET detected Sora and Kaleidoscope did not (Table 18).

Table 18: Detections of Key Species by ARU

Wetland ID	ARU ID	Number of Recording Nights	Analysis Program	Key Species			
				American Bittern	Sora	Virginia Rail	Yellow Rail
OW06	ARU04	81	BirdNET	X	✓	✓	X
OW07	ARU05	82	BirdNET	X	✓	X	X
OW11	ARU08	80	BirdNET	X	✓	✓	X
			Kaleidoscope	X	✓	X	X
OW12	ARU01	78	BirdNET	X	✓	X	X
SE02	ARU10	81	BirdNET	X	✓	X	X
SE03	ARU07	81	BirdNET	X	✓	X	X
SE09	ARU09	81	BirdNET	X	✓	X	X
SE11	ARU02	81	BirdNET	X	✓	X	X
			Kaleidoscope	X	X	X	X
WS02	ARU03	81	BirdNET	X	✓	X	X
WS03	ARU06	81	BirdNET	X	✓	X	X
Number of Wetlands with Species Detections				**0**	**10**	**2**	**0**

Figures 7a-c show the spatial locations where ARUs were deployed in 2024 and which key species were identified.

5.0 DISCUSSION

5.1 Peace River Boat Surveys

5.1.1 Species Richness and Evenness

The greater amount of benthic-feeding divers, piscivorous divers, dabbling ducks and large dabblers on the Peace River compared to other foraging guilds could be due to the large amount of open water habitat available (43.06 to 95.13 ha) to support these foraging guilds, as these guilds prefer moderate to deep waters with vegetation, invertebrates, and fish for foraging. Species richness of benthic-feeding divers and piscivorous divers was high in the October survey round, which could be partially due to the development of the reservoir habitat. The flooding of the inundation impact area provided deeper waters, a larger open water area, and increased submerged vegetation and debris, which may have increased foraging opportunities for diving species (Winkler, Billerman, and Lovette 2020a) The remaining guilds (i.e., cranes and herons, shorebirds, and marsh birds), with the exception of gulls and surface-feeding terns, are more likely to inhabit shallow waters, backchannels, and wetlands. The lack of marsh birds detected during the boat surveys is consistent with results for the Peace River in 2022 and 2023 (Ausenco Sustainability ULC 2023; 2024). This could be due to the inconspicuous nature of these birds and their preference for vegetated wetland habitats, which are generally inaccessible by jet boat (Melvin and Gibbs 2020; Leston and Bookhout 2020).

The lower species evenness observed in the early and late fall survey rounds compared to the mid-fall could be due to varying water levels. During August 1-2, higher water levels contributed to a greater number of surveyed backchannels, and during October 2-3, there were higher water levels due to reservoir filling. When a few species were observed in low abundances in these new habitat types, and higher abundances were observed on the mainstem, lower Pielou evenness scores were obtained. For example, during August 1-2, more shorebird and heron species were observed in low abundances in the backchannel areas, however, high abundances of Ring-billed Gulls (*Larus delawarensis*) and Canada Goose were observed on the mainstem, leading to a lower evenness score.

5.1.2 Waterbird Abundance

The marked decrease of total waterbirds in 2024 (4700 birds) compared to the last two monitoring years (17741birds in 2022 and 15408 birds in 2023) appears to be largely due to the lack of observations of Canada Goose. In 2024, the total abundance of Canada geese was 1881, but in 2022 and 2023 the total abundances were 10515 and 11953, respectively (Ausenco Sustainability ULC 2023; 2024). This may be due to the difference in spring survey dates among years. In 2023 and 2022, Ausenco surveyed in early April (April 2-6) and observed a mean density of 4251 large dabblers/survey round and 3635 large dabblers/survey round, respectively. It is possible that the majority of migrating Canada geese had already passed through the Peace River study area by the time of the first survey round in 2024 (April 11-12), thus accounting for the reduced number of observations. The April surveys in future years should be spaced out within the survey period as much as feasible to avoid missing spring migrants.

The variation in waterbird abundances during the fall survey rounds compared to the spring could be due to the close temporal proximity of the two spring survey rounds, which occurred within days of one another, compared to the fall surveys, which occurred over two months. As well, the lack of detections of cranes and herons, shorebirds, and gulls and surface-feeding terns in the spring could be due to the lateness of the survey rounds (i.e., April 11-15) compared to previous years, as mentioned above (i.e., the peak migration window for those foraging guilds may have occurred earlier in April). The high waterbird abundances observed during the August 1-2 survey round may be attributed to the increased water levels, which allowed for more backchannels to be accessed.

The mainstem contributed the most out of all the river habitat types to total abundance, likely because birds prefer the protection that vegetated islands provide (from weather, predators, boats, etc.). Dabbling ducks contributed the highest density in limited connectivity and moderate flow habitats, which may be due to their flighty nature; flighty birds tend to select for more secluded areas of the Peace River where they will not be flushed as often. Conversely, gulls and surface-feeding terns had the highest density in mainstem habitats and tend to be less flighty, congregating in large groups on the water or in the sky. Density estimates for limited connectivity and moderate flow river habitat types are based on a smaller number of observations (primarily from the August 1-2 survey round) compared to the mainstem, as these habitats could not be surveyed during all rounds due to varying water levels of the Peace River. Similarly, density estimates for the reservoir habitat type are based solely on data collected from October 2, 2024, when the reservoir was filled.

The flow regime impact area comprises a smaller area than the other two treatments, which could explain why it has the lowest total abundance. Gulls and surface-feeding terns and unknown birds (more than half of which were classified as “unknown gulls”) contributed the most to the mean waterbird density in the inundation impact area, whereas in the control area, this guild was one of the lowest mean densities, tied only with cranes and herons. Increased disturbance in the inundation impact area (e.g., Site C dam, roads, various settlements, landfills) may be preferred by gull species, which take advantage of human-inhabited areas for foraging opportunities (Pollet et al. 2020).

The mean waterbird densities in the control area were all lower compared to mean densities in the inundation impact area, with the exception of cranes and herons (as one great blue heron was observed flying overhead during a survey in the control area, and no cranes or herons were observed in the other treatments).

5.2 Moberly Plateau Transmission Line Surveys

In 2024, SEES JV completed a total of 161 transmission line wetland surveys. This amount is comparable to previous survey efforts performed by Ausenco; in 2019, 2022, and 2023, the survey totals were 189, 157, and 139, respectively (Ausenco Sustainability ULC 2024).

5.2.1 Species Richness and Evenness

Higher species richness was observed in sedge and willow-sedge habitats in the spring compared to the fall, which could be due to higher water levels in the spring from recent snowmelt. When the fall survey rounds were conducted, many of the sedge and willow-sedge habitats were drier, potentially contributing to lower species richness.

Open water wetland habitats had low species richness for gulls and surface-feeding terns, which is likely because all but one of the surveyed open water areas were small in size (<0.001 to 0.063 km^2) and gulls and terns prefer larger open water bodies such as lakes and rivers where there are ample foraging opportunities (Winkler, Billerman, and Lovette 2020b). The only monitored wetland site in the Moberly Plateau that had detections of gulls was OW01 (Boucher Lake), which is the largest open water wetland (1.18 km^2). Marsh birds (with the exception of Wilson’s snipe) were rarely detected in the standwatch surveys or transect surveys, again likely due to their inconspicuous natures and nocturnal activity patterns (Melvin and Gibbs 2020; Leston and Bookhout 2020). ARUs had greater success detecting marsh birds; see section 5.2.3.

Species evenness for the transect surveys was consistently high, likely because there were few species detected from the surveys, each with a low abundance (ranging from 1-18). For open water standwatch surveys, evenness was consistently high for all survey rounds, with the exception of the late fall survey round from September 29-October 1. This is due to the high abundances of migrating scaup (total abundance of 293) observed during this survey round, compared to the relatively low abundances of other waterbirds (with total abundance ranging from 1-33 birds).

5.2.2 Waterbird Abundance

Abundance counts for open water standwatch surveys have been presented using the density-by-area method for each foraging guild during each survey round, which has the potential drawback of extrapolation. There were several occasions where smaller-sized open water areas (e.g., SE10 with an open water area of 0.0005 km^2) had many waterbirds detected (e.g., between 13 and 19 individuals observed). When higher abundances and small areas are used to calculate density, the density value becomes inflated. The extrapolation of the data does not account for the realistic changes in open water habitat quality and microhabitat features, which affect waterbird density at larger scales.

The greatest density per foraging guild for transmission line surveys corresponded to the dabbling ducks, followed by benthic-feeding divers. Dabbling ducks such as mallards, northern shovelers, American wigeon, etc., tend to be opportunistic omnivores that can feed on vegetation, insects, and aquatic invertebrates (Winkler, Billerman, and Lovette 2020a), which sedge and willow-sedge habitats can provide, particularly during wetter conditions when some shallow surface water remains. During transect surveys, birds observed loafing and foraging on adjacent small ponds or waterbodies were included in the observations. This could explain why the benthic-feeding divers comprised the second highest density per foraging guild during transect surveys, despite the fact that sedge and willow-sedge habitats typically do not contain an abundance of invertebrates or fish, which the diving ducks prefer to feed on.

5.2.3 ARUs at Transmission Line Wetlands

BirdNET identified Sora at SE11 and Virginia Rail at OW11 while the Kaleidoscope cross-verification did not, which suggests that BirdNET may provide more accuracy during analysis. Although the methods used are considered comparable for analysis, BirdNET was also found to be a more efficient method of manual verification compared to the Kaleidoscope cluster analysis.

All ten of the ARUs detected Soras, which could be due to the flexibility of their habitat requirements when it comes to selecting wetlands during the breeding season (Melvin and Gibbs 2020).

Virginia Rails were detected at two of the wetlands. Wetland OW06 has a very large open water area with an ample expanse of sedge and willow-sedge habitat, whereas OW11 is adjacent to a gravel road, has large swathes of invasive thistle, and only small sections of open water which are present seasonally. Ausenco detected Virginia Rails at SE11, SE07 and SE09 in 2022 (Ausenco Sustainability ULC 2023) indicating that Virginia Rails may be present in a variety of wetland habitat types as long as there is adequate vegetative cover (Conway and Pyle 2024).

American Bittern was not detected at any of the wetlands, which is consistent with previous monitoring years. This species is inconspicuous and regionally very rare (blue-listed species in BC). According to the BC Species and Ecosystems Explorer, there are no historical observations of American Bittern for Fort St. John and the surrounding area (B.C. Ministry of Environment. Victoria, B.C. 2024).

Yellow Rail was also not detected by ARU in the ten wetlands in 2024. In 2023, Yellow Rail was detected at OW11 and near OW01, and in 2022, it was detected at SE11 (Ausenco Sustainability ULC 2023; 2024). A different method for analysis was used in 2024 (BirdNET), however a cross-validation was performed for OW11 and SE11 with the Kaleidoscope cluster analysis and yielded the same results (zero detections). Yellow Rail may not have been present at the study wetlands in 2024. Alternatively, the noise interference at the study wetlands (e.g., boreal chorus frog calls), may have masked the more discreet call of the Yellow Rail in the ARU recordings.

6.0 CONCLUSION

This 2024 monitoring year marks the end of the pre-construction phase of the Waterbird Migration Monitoring, as the reservoir finished filling in early November, 2024. The methods outlined in the Program Plan that were used from 2017 to 2024 for Waterbird Migration Monitoring have successfully recorded the baseline data required to infer changes to waterbird abundance and diversity in the context of waterbird disturbance, displacement, mortality, and habitat alteration and fragmentation. Future post-construction monitoring surveys should follow the same Program Plan, however, SEES JV has a few additional recommendations for consideration:

- Using the same timing windows for survey rounds as stated in the Program Plan, QEPs should space out the April surveys as much as feasible to increase the likelihood of capturing the majority of the spring migrators, particularly the early migrators such as Canada Goose.
- As the reservoir habitat category now exists (from Hudson's Hope to the Site C Dam), future boat surveys on the reservoir should include multiple passes in areas where the reservoir is too wide to maintain sightlines of both shorelines.
- The wetland OW14 should not be included in future monitoring years due to difficulties with access, lack of a suitable vantage for standwatch surveys, and lack of suitable habitat for transect surveys.
- BirdNET Analyzer should be used in future data analysis for more efficient and accurate automated detection of marsh birds.

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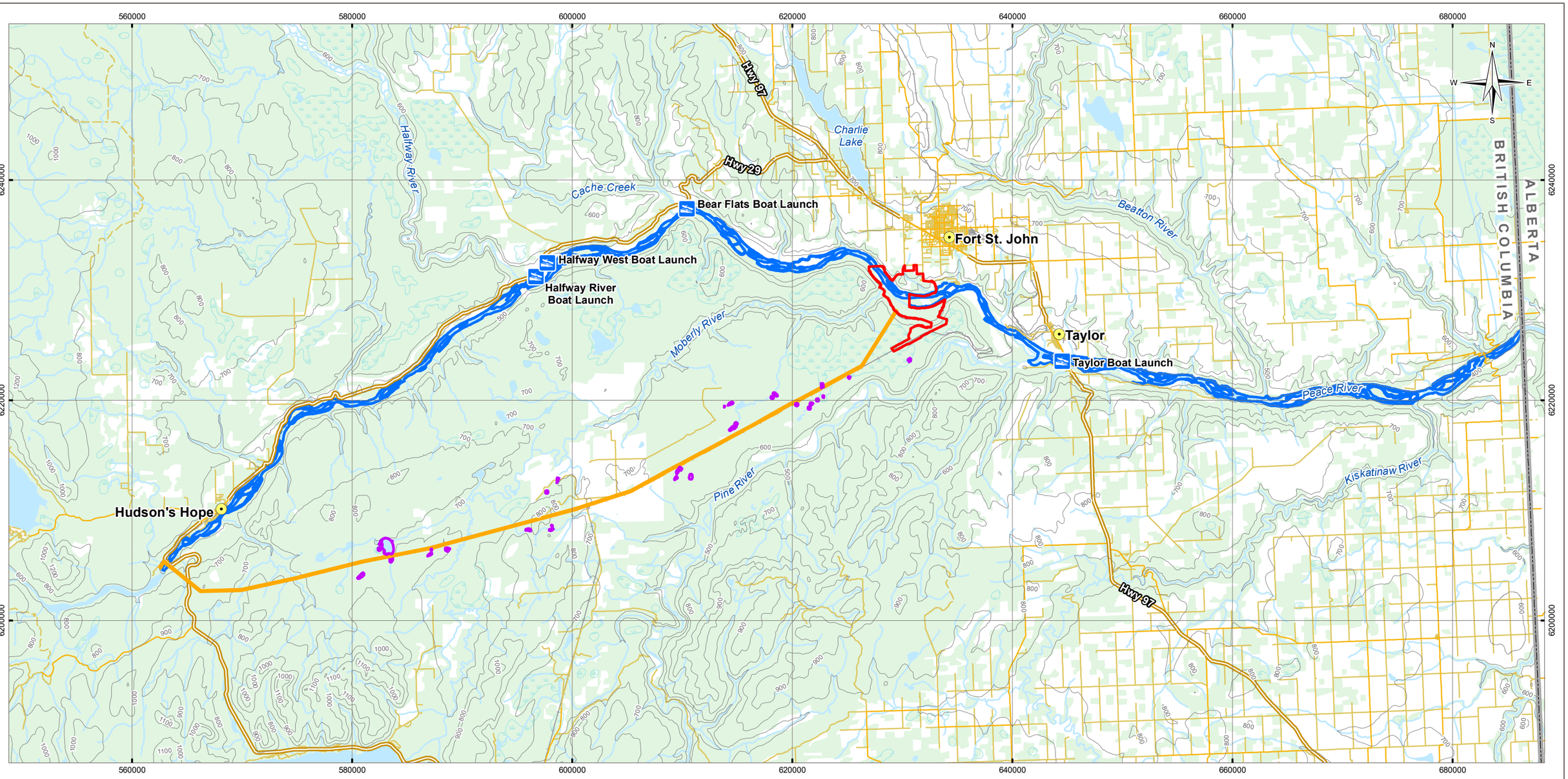
FIGURES



LEGEND

- Boat Launch Location
- Site C Project Boundary
- Peace River Study Area
- Transmission Line Corridor
- Wetland Survey Station
- Populated Place
- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Residential Area
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Wooded Area
- Provincial Boundary

NOTES
Base data source: CanVec 1:250,000.

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Waterbird Survey Project Overview

PROJECTION UTM Zone 10			**DATUM** NAD83		**CLIENT** BC Hydro Power smart
Scale: 1:350,000 (5 2.5 0 5 Kilometres)					TETRA TECH
FILE NO. PENW03042-02_Fig01_ProjectOverview.mxd					
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0	**Figure 1**
DATE March 2025	**PROJECT NO.** ENW.PENW03042-02				

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565000 570000 575000 580000 585000 590000 595000

6220000

6215000

6210000

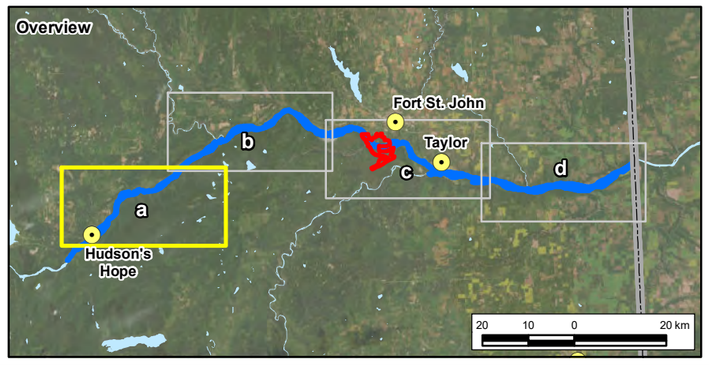
Farrell Creek

Lynx Creek

Hudson's Hope

Moberly River

N W E S



LEGEND

- Populated Place
- Watercourse

Habitat Types

- Mainstem
- Moderate Flow
- Limited Connectivity
- Reservoir Level (461.8 metres above sea level)

NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Peace River Habitat Types Hudson's Hope to Farrell Creek

PROJECTION	DATUM	CLIENT
UTM Zone 10	NAD83	BC Hydro Power smart

Scale: 1:90,000
1.5 0.75 0 1.5
Kilometres

FILE NO. PENW03042-02_Fig02_PRHabitatTypes.mxd

TETRA TECH

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	DS	SL	NG	0

DATE March 28, 2025
PROJECT NO. ENV.PENW03042-02

Figure 2a

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585000 590000 595000 600000 605000 610000 615000 620000

6240000 6235000 6230000 6225000

Cache Creek

Halfway River

Moberly River

N W E S

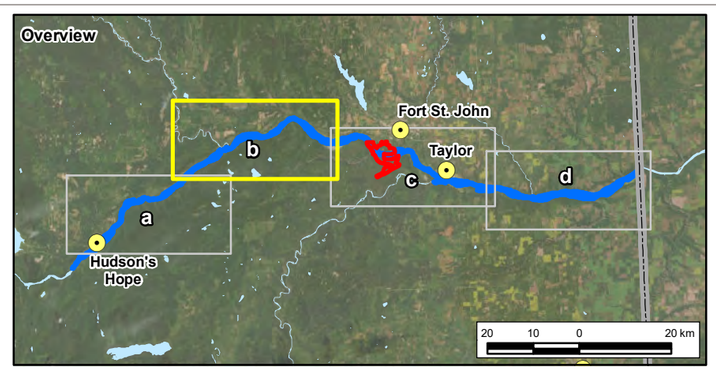
585000 590000 595000 600000 605000 610000 615000 620000

LEGEND

Watercourse

Habitat Types

- Mainstem
- Moderate Flow
- Limited Connectivity
- Reservoir Level (461.8 metres above sea level)



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Peace River Habitat Types Halfway River to Cache Creek

PROJECTION: UTM Zone 10				DATUM: NAD83	CLIENT: BC Hydro Power smart
Scale: 1:90,000 (1.5 0.75 0 1.5 Kilometres)					TETRA TECH
FILE NO.: PENW03042-02_Fig02_PRHabitatTypes.mxd					
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	Figure 2b
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

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620000 625000 630000 635000 640000 645000 650000

6235000 6230000 6225000 6220000

Fort St John

Taylor

Moberly River

Pine River

N W E S

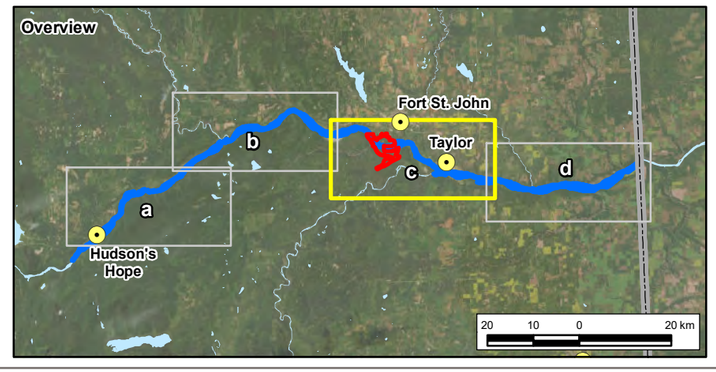
620000 625000 630000 635000 640000 645000 650000

LEGEND

- Populated Place
- Watercourse

Habitat Types

- Mainstem
- Moderate Flow
- Limited Connectivity
- Reservoir Level (461.8 metres above sea level)



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Peace River Habitat Types
Moberly River to Taylor

PROJECTION UTM Zone 10	**DATUM** NAD83	**CLIENT** BC Hydro Power smart
Scale: 1:90,000 — 1.5 0.75 0 1.5 — Kilometres		TETRA TECH
FILE NO. PENW03042-02_Fig02_PRHabitatTypes.mxd		
OFFICE Tt-VANC	**DWN** DS / **CKD** SL / **APVD** NG / **REV** 0	**Figure 2c**
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02	

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655000 660000 665000 670000 675000 680000 685000

6230000 6225000 6220000 6215000

Beatton River

Colata Creek

Alces River

Kiskatinaw River

N W E S

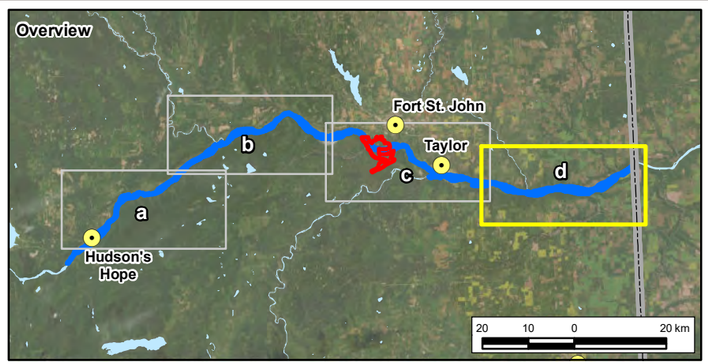
BRITISH COLUMBIA
ALBERTA

LEGEND

Watercourse

Habitat Types

- Mainstem
- Moderate Flow
- Limited Connectivity



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Peace River Habitat Types
Beatton River to Alberta Border

PROJECTION UTM Zone 10	**DATUM** NAD83	**CLIENT** BC Hydro Power smart
Scale: 1:90,000 (1.5 0.75 0 1.5 Kilometres)		TETRA TECH
FILE NO. PENW03042-02_Fig02_PRHabitatTypes.mxd		
OFFICE Tt-VANC	**DWN** DS / **CKD** SL / **APVD** NG / **REV** 0	**Figure 2d**
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02	

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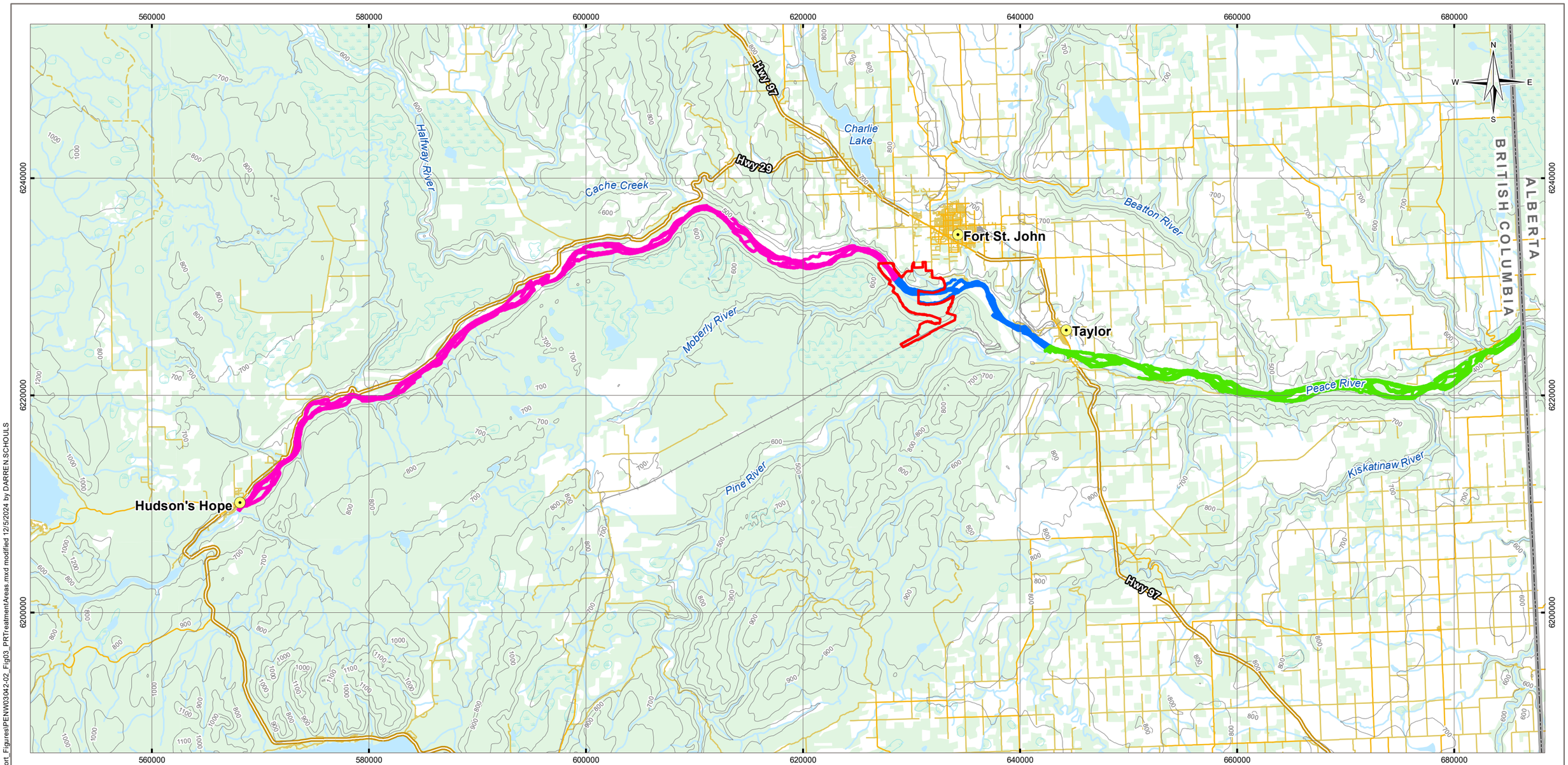

LEGEND

- Site C Project Boundary
- **Treatment Areas**
  - Control Area
  - Flow Regime Impact Area
  - Inundation Impact Area
- Populated Place
- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Residential Area
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Wooded Area
- Provincial Boundary

NOTES
Base data source: CanVec 1:250,000.

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Peace River Treatment Areas

PROJECTION UTM Zone 10			**DATUM** NAD83	**CLIENT** BC Hydro Power smart
Scale: 1:350,000 (5 2.5 0 5 Kilometres)				TETRA TECH
FILE NO. PENW03042-02_Fig03_PRTreatmentAreas.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02			**Figure 3**

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565000 570000 575000 580000 585000 590000 595000

Before Reservoir Filling

N W E S

Farrell Creek

Lynx Creek

Hudson's Hope

Moberly River

6220000

6215000

6210000

565000 570000 575000 580000 585000 590000 595000

LEGEND

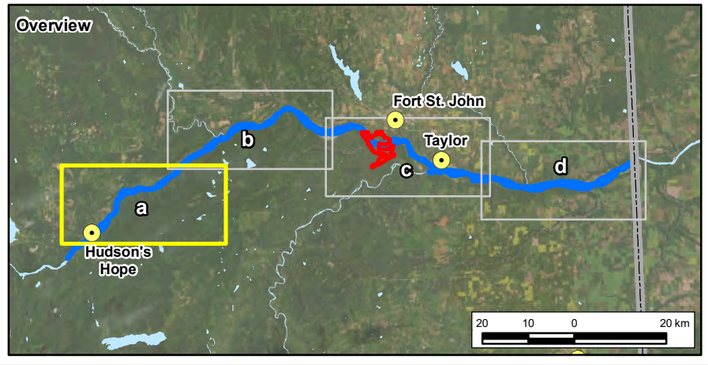
- Populated Place
- Watercourse

Treatment Areas

- Inundation Impact Area

Mean Density (Birds/km²/Survey Round)

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- > 0.50
- Not Surveyed



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Mean Density by Peace River Treatment Areas Hudson's Hope to Farrell Creek

PROJECTION UTM Zone 10	**DATUM** NAD83			
Scale: 1:90,000 (1.5 0.75 0 1.5 Kilometres)				
FILE NO. PENW03042-02_Fig04_Density.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02			

CLIENT BC Hydro Power smart

TETRA TECH

Figure 4a

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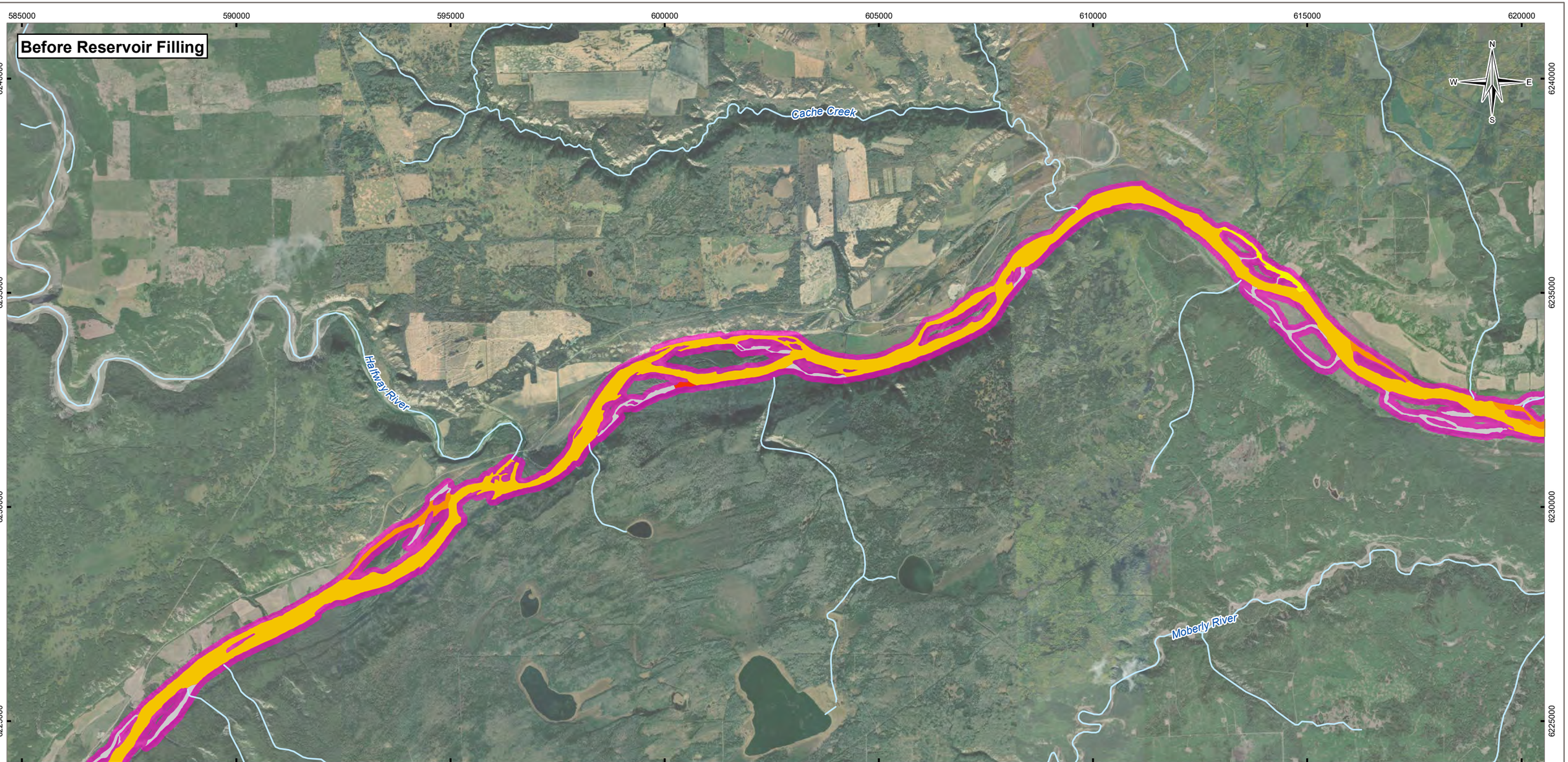


LEGEND

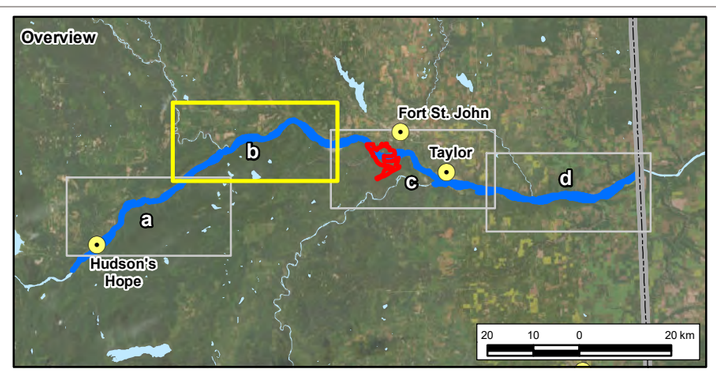
Watercourse

Treatment Areas

Inundation Impact Area

Mean Density (Birds/km²/Survey Round)

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- > 0.50
- Not Surveyed



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Mean Density by Peace River Treatment Areas Halfway River to Cache Creek

PROJECTION UTM Zone 10				**DATUM** NAD83
Scale: 1:90,000				
1.5 0.75 0 1.5 Kilometres				
FILE NO. PENW03042-02_Fig04_Density.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02			

CLIENT BC Hydro Power smart

TETRA TECH

Figure 4b

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620000 625000 630000 635000 640000 645000 650000

6235000 6230000 6225000 6220000

Before Reservoir Filling

Fort St John

Taylor

Moberly River

Pine River

N W E S

620000 625000 630000 635000 640000 645000 650000

LEGEND

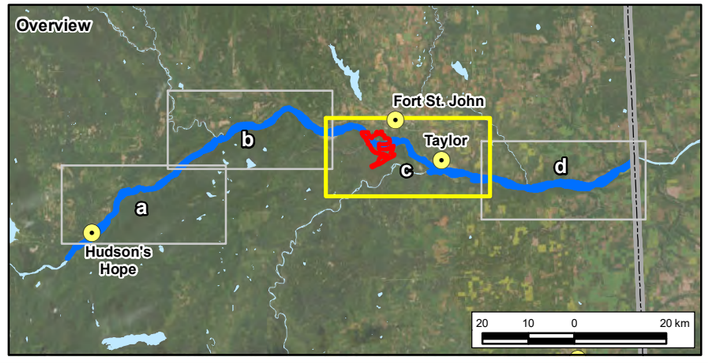
- Populated Place
- Site C Project Boundary
- Watercourse

Treatment Areas

- Control Area
- Flow Regime Impact Area
- Inundation Impact Area

Mean Density (Birds/km²/Survey Round)

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- > 0.50
- Not Surveyed



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Mean Density by Peace River Treatment Areas Moberly River to Taylor

PROJECTION UTM Zone 10		**DATUM** NAD83		**CLIENT** BC Hydro Power smart
Scale: 1:90,000 — 1.5 0.75 0 1.5 — Kilometres				TETRA TECH
FILE NO. PENW03042-02_Fig04_Density.mxd				
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02			**Figure 4c**

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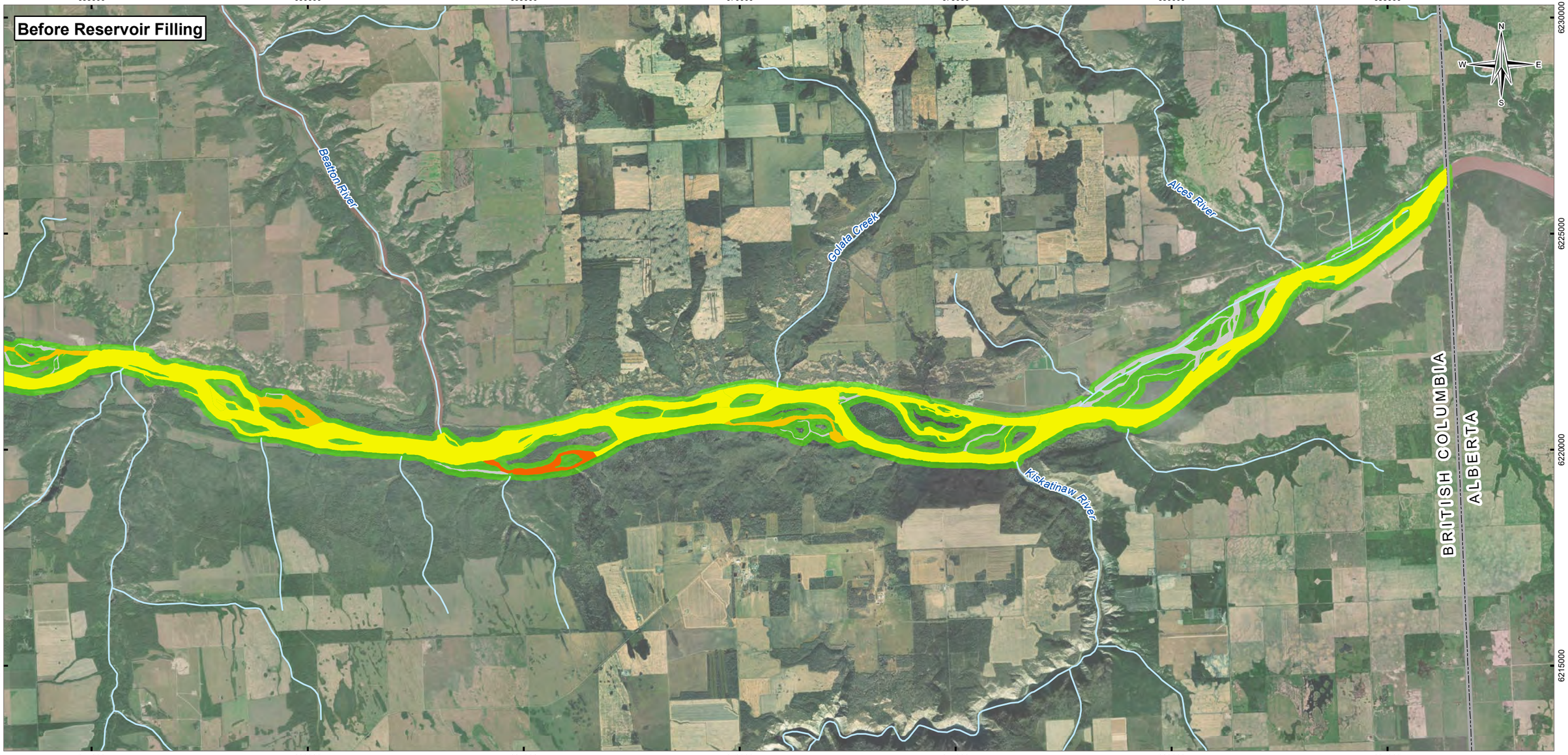


LEGEND

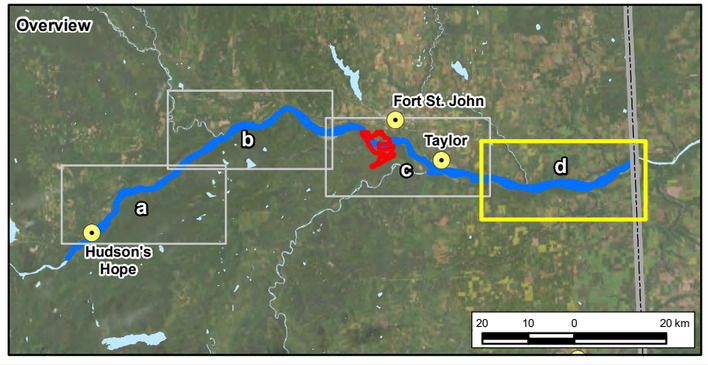
- Provincial Boundary
- Watercourse

Treatment Areas

- Control Area

Mean Density (Birds/km²/Survey Round)

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- > 0.50
- Not Surveyed



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Mean Density by Peace River Treatment Areas Beatton River to Alberta Border

PROJECTION UTM Zone 10				**DATUM** NAD83	**CLIENT** BC Hydro Power smart
Scale: 1:90,000 1.5 0.75 0 1.5 Kilometres					TETRA TECH
FILE NO. PENW03042-02_Fig04_Density.mxd					
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0	**Figure 4d**
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02				

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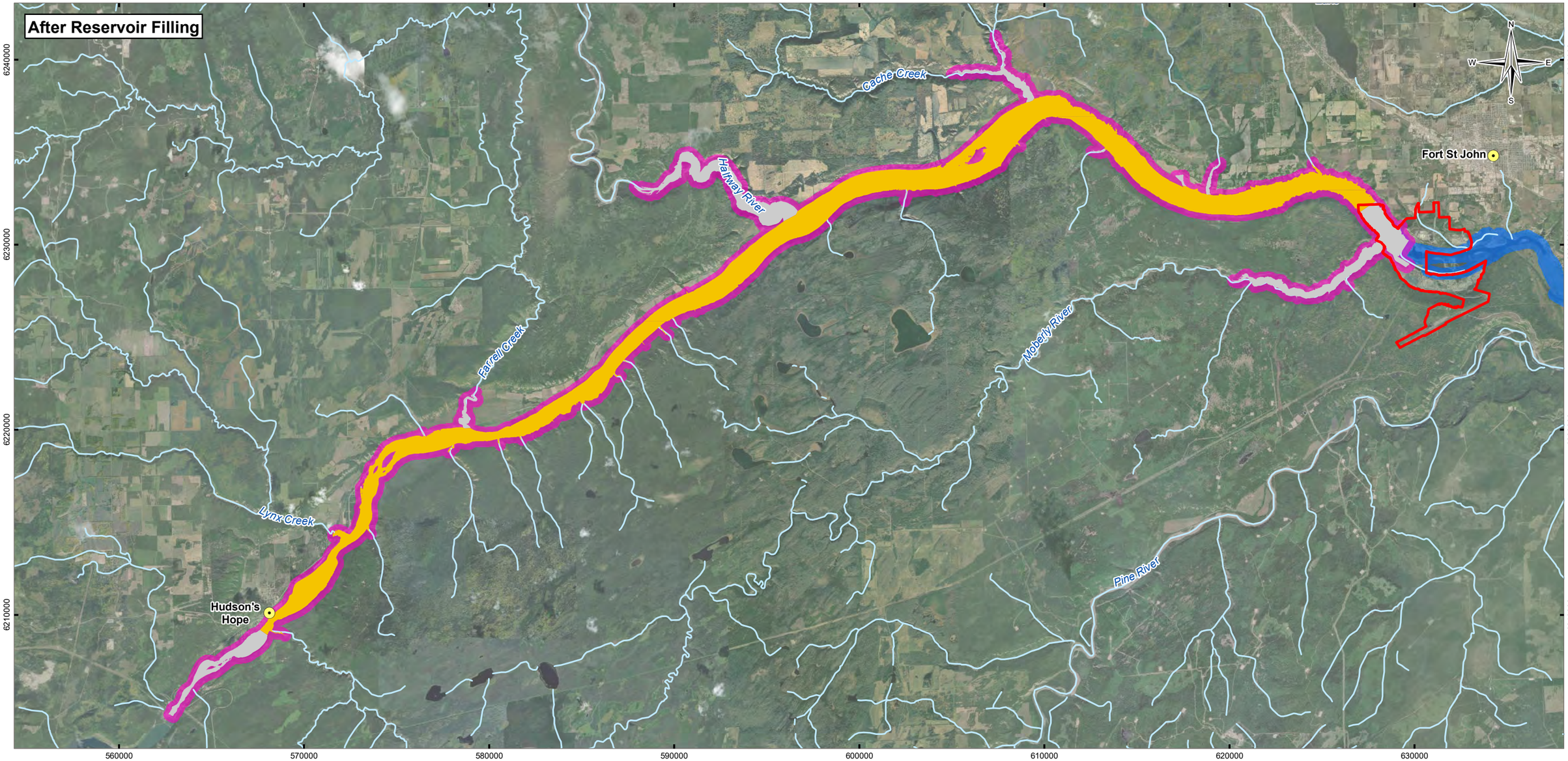


LEGEND

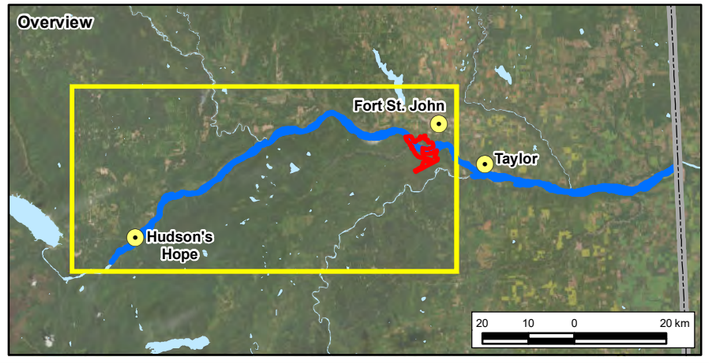
- Populated Place
- Site C Project Boundary
- Watercourse

Treatment Areas

- Flow Regime Impact Area
- Inundation Impact Area

Mean Density (Birds/km²/Survey Round)

- 0 - 0.10
- 0.11 - 0.20
- 0.21 - 0.30
- 0.31 - 0.40
- 0.41 - 0.50
- > 0.50
- Not Surveyed



NOTES
Base data source:
CanVec 1:250,000 (2019)
Imagery from ESRI; Maxar

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Mean Density by Peace River Treatment Areas Within Proposed Reservoir Hudson's Hope to Site C Dam

PROJECTION: UTM Zone 10	DATUM: NAD83				CLIENT: BC Hydro Power smart
Scale: 1:210,000 (4 2 0 4 Kilometres)					TETRA TECH
FILE NO.: PENW03042-02_Fig04e_ReservoirDensity.mxd					
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	Figure 4e
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

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610000 612000 614000 616000 618000 620000 622000 624000 626000 628000 630000 632000

6226000 6224000 6222000 6220000 6218000

Moberly River

Pine River

SE10

SE06

SE12

SE04

SE11

OW10

SE14

OW07

OW09

WS01

SE07

SE05

WS02

OW06

N W E S

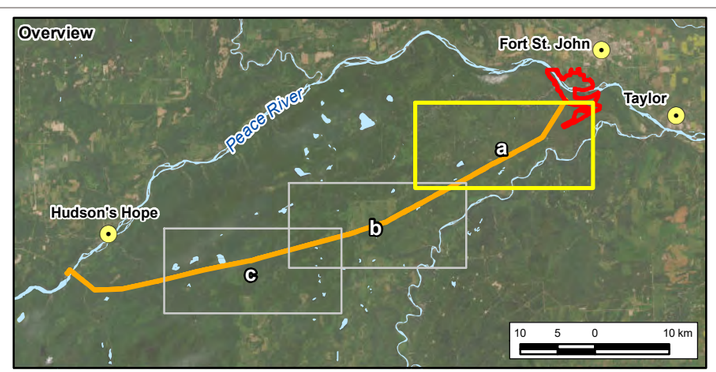
610000 612000 614000 616000 618000 620000 622000 624000 626000 628000 630000 632000

LEGEND

- Transmission Line Corridor
- Site C Project Boundary
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed
- Not Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Surveyed in 2024 - Eastern Portion

PROJECTION: UTM Zone 10	DATUM: NAD83				
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					
FILE NO.: PENW03042-02_Fig05_TransLineSurveys.mxd					
OFFICE: TI-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

CLIENT: BC Hydro Power smart

TETRA TECH

Figure 5a

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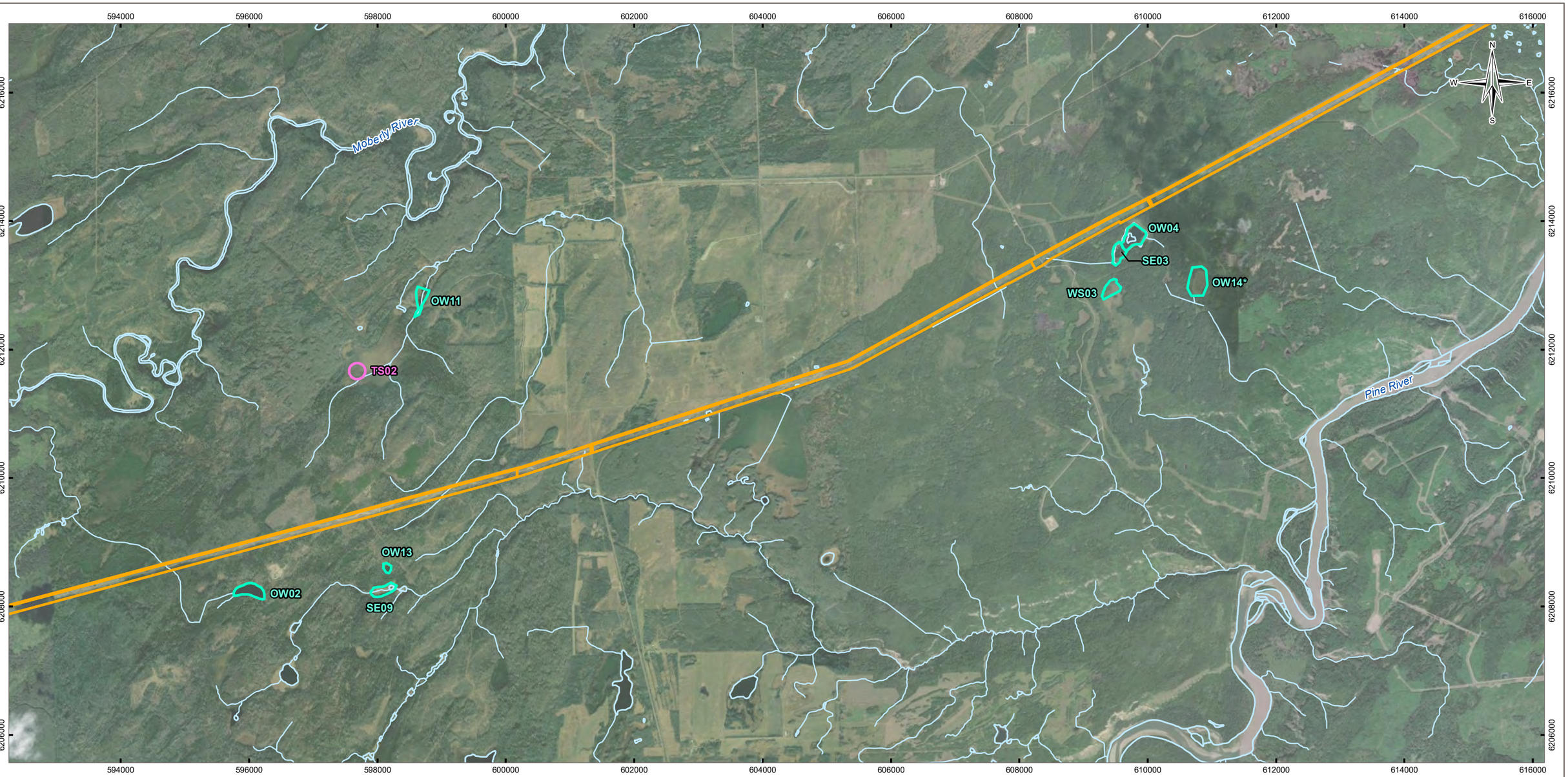
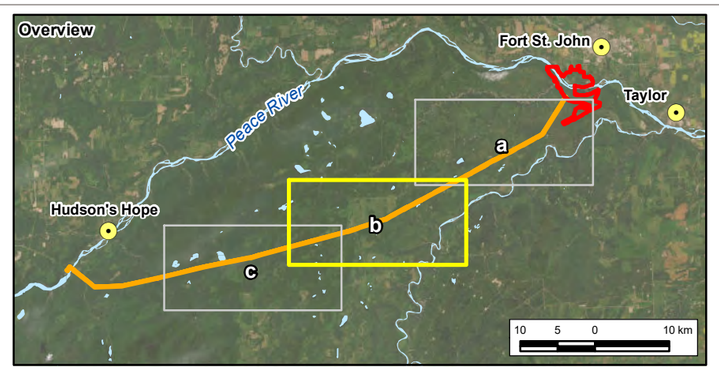


LEGEND

- Transmission Line Corridor
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed
- Not Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Surveyed in 2024 - Central Portion

PROJECTION: UTM Zone 10				DATUM: NAD83	
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					
FILE NO.: PENW03042-02_Fig05_TransLineSurveys.mxd					
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

CLIENT: BC Hydro Power smart

TETRA TECH

Figure 5b

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576000 578000 580000 582000 584000 586000 588000 590000 592000 594000 596000 598000

6210000 6208000 6206000 6204000 6202000 6200000

N W E S

SE01 OW01 TS01 SE02 BT04 BT01 BT03 OW12* BT02 OW13 OW02 SE09

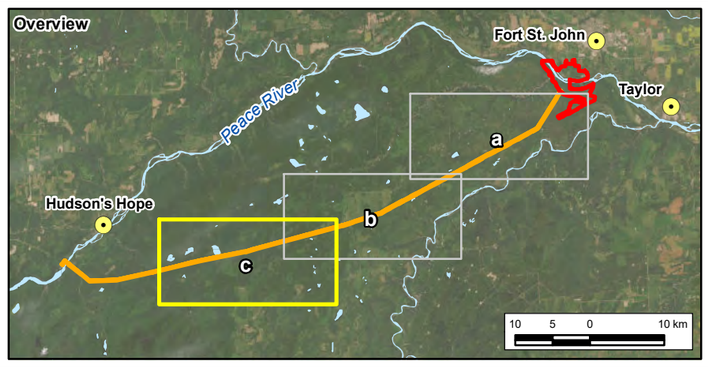
Moberly River

LEGEND

- Transmission Line Corridor
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed
- Not Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Surveyed in 2024 - Western Portion

PROJECTION: UTM Zone 10	DATUM: NAD83				CLIENT: BC Hydro Power smart
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					TETRA TECH
FILE NO.: PENW03042-02_Fig05_TransLineSurveys.mxd					
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	Figure 5c
DATE: March 28, 2025	PROJECT NO.: ENV.PENW03042-02				

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610000 612000 614000 616000 618000 620000 622000 624000 626000 628000 630000 632000

6226000 6224000 6222000 6220000 6218000

Moberly River

Pine River

SE10

SE06

SE12

SE04

SE11

SE14

WS01

SE07

SE05

OW07

WS02

OW06

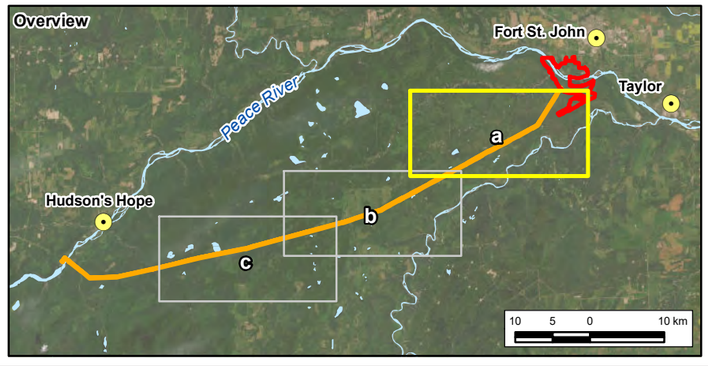
N W E S

LEGEND

- Transmission Line Corridor
- Site C Project Boundary
- Watercourse/Waterbody

Abundance

- 0
- 1 - 10
- 11 - 30
- 31 - 50
- 51 - 100
- > 100



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Total Abundance - Eastern Portion

PROJECTION: UTM Zone 10	DATUM: NAD83				CLIENT: BC Hydro Power smart
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					
FILE NO.: PENW03042-02_Fig06_TransLineAbundance.mxd					TETRA TECH
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	Figure 6a
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

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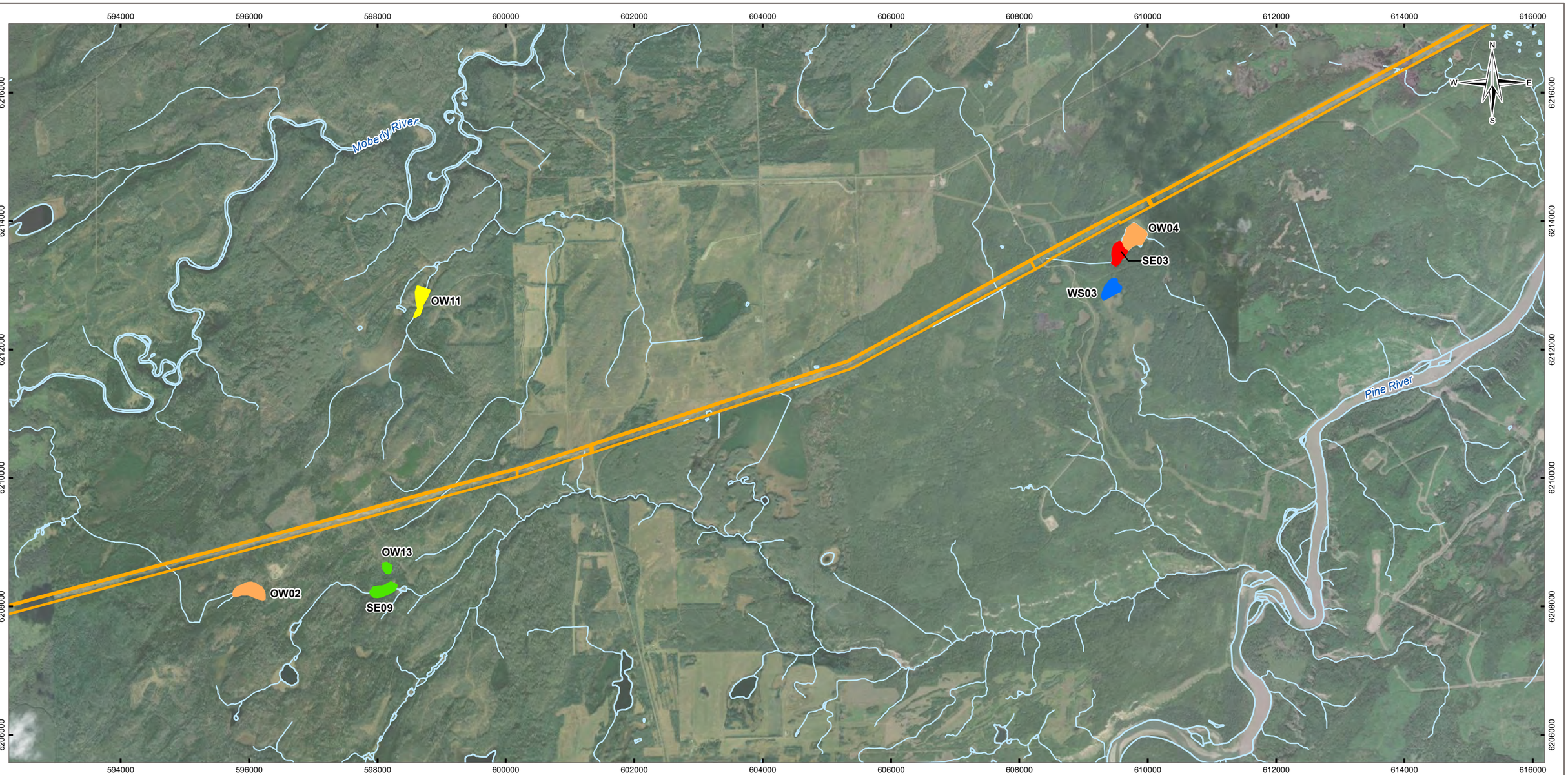
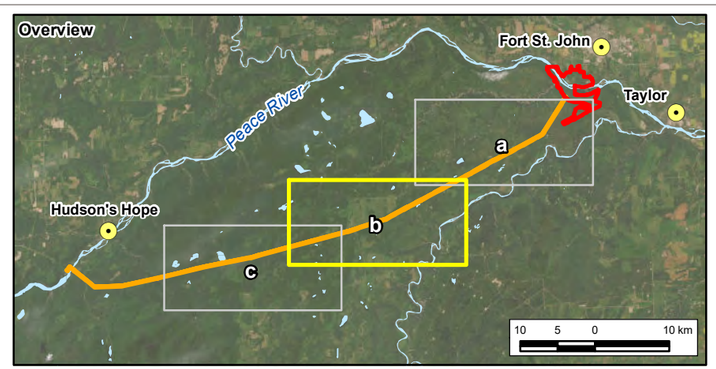


LEGEND

- Transmission Line Corridor
- Watercourse/Waterbody

Abundance

- 0
- 1 - 10
- 11 - 30
- 31 - 50
- 51 - 100
- > 100



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Total Abundance - Central Portion

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT** BC Hydro Power smart
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					TETRA TECH
FILE NO. PENW03042-02_Fig06_TransLineAbundance.mxd					
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0	**Figure 6b**
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02				

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576000 578000 580000 582000 584000 586000 588000 590000 592000 594000 596000 598000

6210000 6208000 6206000 6204000 6202000 6200000

N W E S

OW01

OW12*

SE02

OW13

OW02

SE09

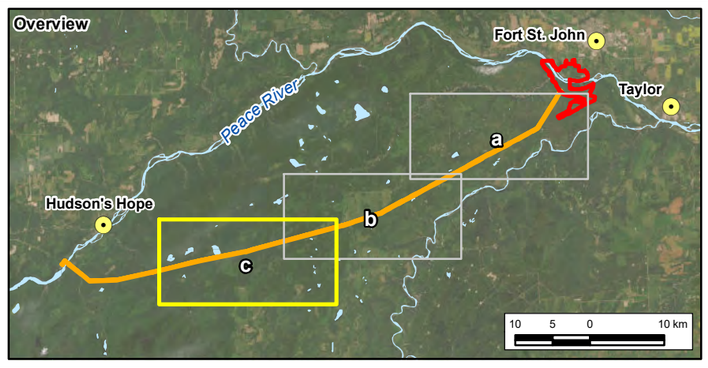
Moberly River

LEGEND

- Transmission Line Corridor
- Watercourse/Waterbody

Abundance

- 0
- 1 - 10
- 11 - 30
- 31 - 50
- 51 - 100
- > 100



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

Transmission Line Wetlands Total Abundance - Western Portion

PROJECTION: UTM Zone 10	DATUM: NAD83				CLIENT: BC Hydro Power smart
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					TETRA TECH
FILE NO.: PENW03042-02_Fig06_TransLineAbundance.mxd					
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0	Figure 6c
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02				

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610000 612000 614000 616000 618000 620000 622000 624000 626000 628000 630000 632000

6226000 6224000 6222000 6220000 6218000

N W E S

Moberly River

SE10

SE06

SE12

SE04

SE11-ARU02
(Sora)

SE11

OW07

OW07-ARU05
(Sora)

SE14

WS01

SE07

SE05

Pine River

WS02–ARU03
(Sora)

WS02

OW06-ARU04
(Sora, Virginia Rail)

OW06

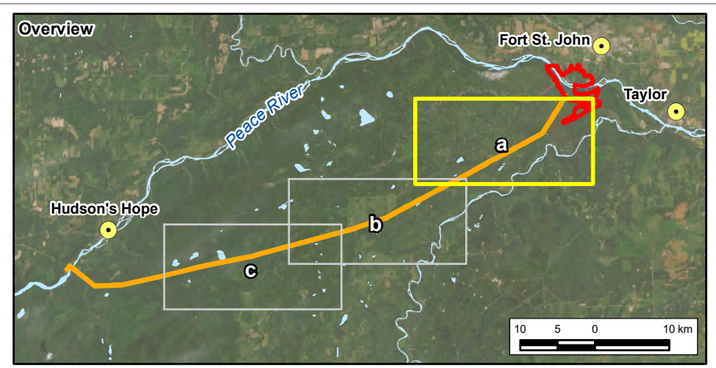
610000 612000 614000 616000 618000 620000 622000 624000 626000 628000 630000 632000

LEGEND

- 2024 ARU Location (Key Species Detected)
- Transmission Line Corridor
- Site C Project Boundary
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

ARU Locations and Key Species Detections - Eastern Portion

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT** BC Hydro Power smart
Scale: 1:60,000 — 1 0.5 0 1 — Kilometres					TETRA TECH
FILE NO. PENW03042-02_Fig07_TransLineARUs.mxd					
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0	**Figure 7a**
DATE March 28, 2025	**PROJECT NO.** ENW.PENW03042-02				

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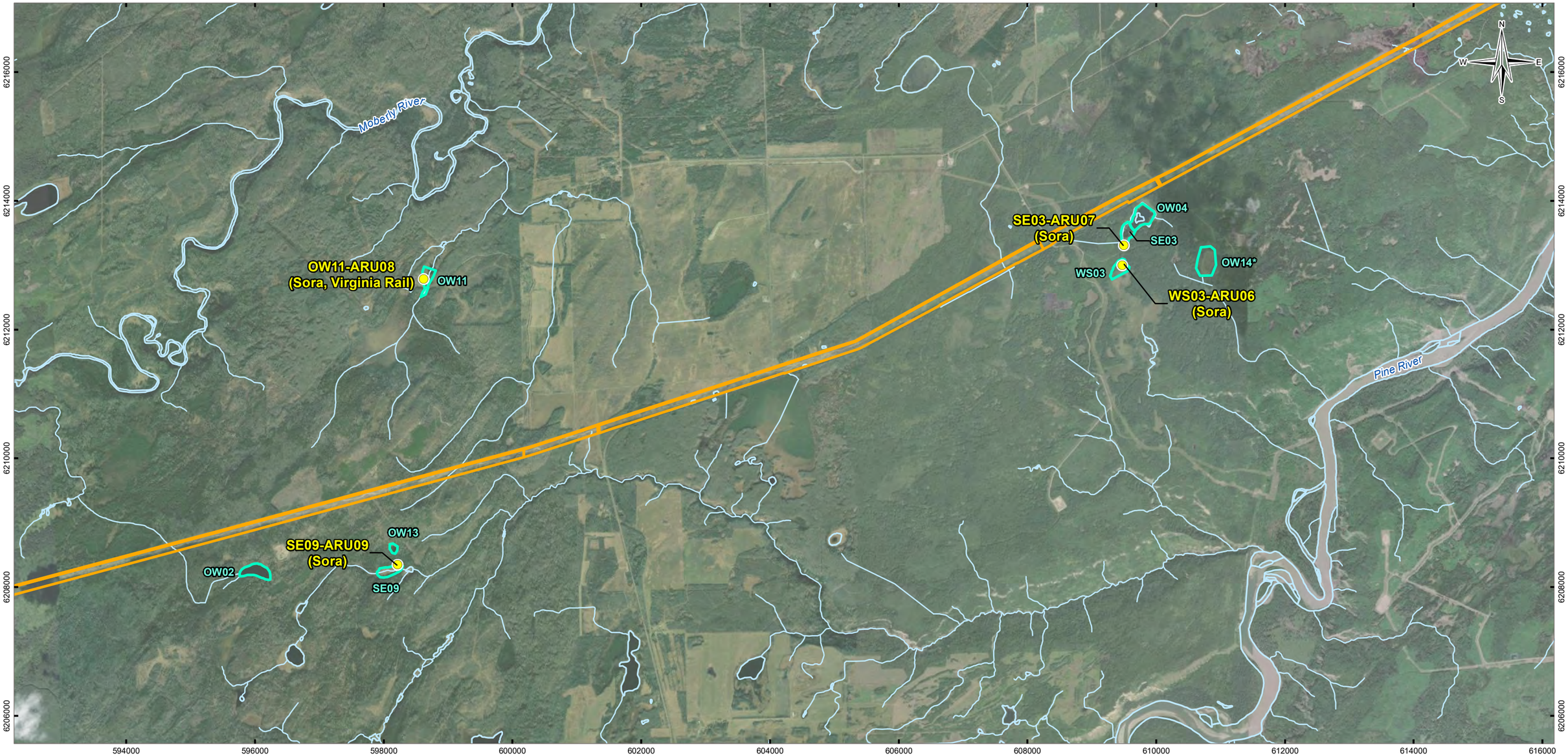
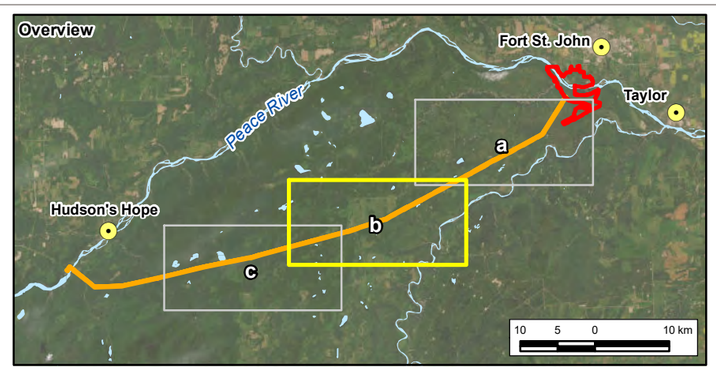


LEGEND

- 2024 ARU Location (Key Species Detected)
- Transmission Line Corridor
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

ARU Locations and Key Species Detections - Central Portion

PROJECTION: UTM Zone 10	DATUM: NAD83			
Scale: 1:60,000 (1 0.5 0 1 Kilometres)				
FILE NO.: PENW03042-02_Fig07_TransLineARUs.mxd				
OFFICE: Tt-VANC	DWN: DS	CKD: SL	APVD: NG	REV: 0
DATE: March 28, 2025	PROJECT NO.: ENW.PENW03042-02			

CLIENT: BC Hydro Power smart

TETRA TECH

Figure 7b

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576000 578000 580000 582000 584000 586000 588000 590000 592000 594000 596000 598000

6210000 6208000 6206000 6204000 6202000 6200000

N W E S

OW01

OW12-ARU01 (Sora)

OW12*

SE02-ARU10 (Sora)

SE02

Moberly River

OW02

SE09-ARU09 (Sora)

OW13

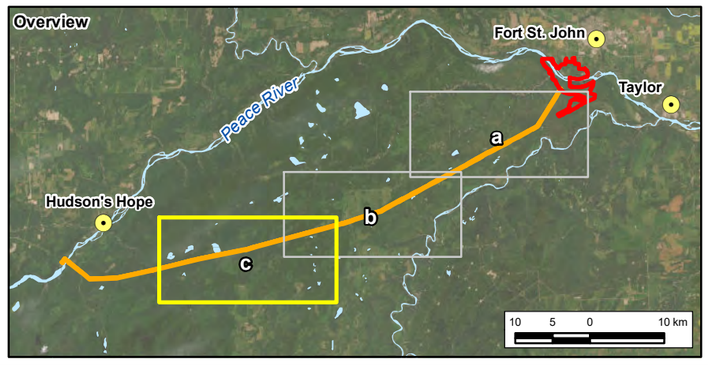
SE09

LEGEND

- 2024 ARU Location (Key Species Detected)
- Transmission Line Corridor
- Watercourse/Waterbody

2024 Surveyed Wetlands

- Surveyed



NOTES
Base data source:
Freshwater Atlas (2023)
Imagery from ESRI; Maxar

* Partially surveyed wetland

STATUS
ISSUED FOR USE

SITE C WATERBIRD 2024 ANNUAL REPORT

ARU Locations and Key Species Detections - Western Portion

PROJECTION UTM Zone 10		**DATUM** NAD83			**CLIENT** BC Hydro Power smart
Scale: 1:60,000 (1 0.5 0 1 Kilometres)					TETRA TECH
FILE NO. PENW03042-02_Fig07_TransLineARUs.mxd					
OFFICE Tt-VANC	**DWN** DS	**CKD** SL	**APVD** NG	**REV** 0	**Figure 7c**
DATE March 28, 2025	**PROJECT NO.** ENV.PENW03042-02				

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APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

NATURAL SCIENCES

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the sole use of TETRA TECH's Client (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH.

Any unauthorized use of the Professional Document is at the sole risk of the user. TETRA TECH accepts no responsibility whatsoever for any loss or damage where such loss or damage is alleged to be or, is in fact, caused by the unauthorized use of the Professional Document.

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The Professional Document is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the Document, if required, may be obtained upon request.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be immediately brought to the attention of TETRA TECH.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary investigation and assessment.

TETRA TECH is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 ENVIRONMENTAL ISSUES

The ability to rely upon and generalize from environmental baseline data is dependent on data collection activities occurring within biologically relevant survey windows.

It is incumbent upon the Client and any Authorized Party, to be knowledgeable of the level of risk that has been incorporated into the project design or scope, in consideration of the level of the environmental baseline information that was reasonably acquired to facilitate completion of the scope.

1.8 NOTIFICATION OF AUTHORITIES

TETRA TECH professionals are bound by their ethical commitments to act within the bounds of all pertinent regulations. In certain instances, observations by TETRA TECH of regulatory contravention may require that regulatory agencies and other persons be informed. The client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

PEACE RIVER DIGITAL DATA COLLECTION FIELD FORM (SURVEY123)

Appendix B. Peace River Digital Data Collection Field Form (Survey123)

Survey Variable	Response Options within Survey123
Basic Survey Details (data collected once per survey)	
Surveyor Names	Full names of the QEPs conducting the survey
Date	Date of the survey
Survey Start Time	Start time of the survey
Start Location	Name of the boat launch where the boat survey started, e.g., Bear Flats boat launch, Halfway River boat launch, Taylor boat launch.
Survey End Time	End time of the survey
End Location	Name of the location where the boat survey ended, e.g., Hudson's Hope, Site C Dam (upstream side), Site C Dam (downstream side), Alberta border.
Survey Weather Conditions (recorded at the start and end of survey)	
Wind (Beaufort Scale)	0 (<1 km/hr, calm, water surface is like a mirror)
	1 (1-5 km/hr, light air, ripples with the appearance of scales are formed on the water, without crests)
	2 (6-11 km/hr, light breeze, small wavelets, still short but more pronounced, crests do not break)
	3 (12-19 km/hr, gentle breeze, large wavelets, crests begin to break, foam of glassy appearance, perhaps scattered whitecaps)
	4 (20-28 km/hr, moderate breeze, small waves that are becoming longer, fairly frequent whitecaps)
	5 (29-38 km/hr, fresh breeze, moderate waves that are taking a more pronounced long form, many whitecaps are formed, chance of some spray)
Air Temperature (°C)	Temperature recorded at the start or end of the survey
Percent Cloud Cover (%)	<1%
	5%
	10%
	25%
	40%
	50%
	60%
	75%
	80%
	90%
	100%
Precipitation	None
	Fog
	Light rain (<2.5 mm/hr)
	Moderate rain (2.6-7 mm/hr)
	Light snow fall
	Moderate snowfall
Visibility	Excellent
	Good
	Moderate
	Slightly poor
	Poor

Waterbird Observations (repeatable section within the digital survey)	
Observation Location	GPS coordinate
Species	Waterbird species
Number	Number of birds observed
Observation Data and Time	Date and time when the bird was observed
Water Depth (metres)	Very shallow (<0.5 m)
	Shallow (0.5-1 m)
	Moderate (2-5 m)
	Moderately deep (5-10 m)
	Deep (>10 m)
	Non-applicable (if observed out of the water)
Sediment or Substrate Type	Silt
	Sand
	Small gravels
	Large gravels
	Cobbles
	Boulder
	Bedrock or cliff
	Terrestrial vegetation
	Aquatic vegetation
	Non-applicable (if observed on the water)
Bird Behaviour at Detection	Flushed
	Flying
	Perched on land or vegetation
	Floating on the water
Peace River Habitat Type	River mainstem
	Backchannel
	Riverbank edge
	Vegetated island
	Sky (flying)
Peace River Flow Measurement (repeatable section within the digital survey)	
Flow Measurement Location	GPS coordinate
Flow Rate (metres/second)	Flow rate for the start or end survey location

APPENDIX C

TRANSMISSION LINE WETLANDS DIGITAL DATA COLLECTION FIELD FORM (SURVEY123)

Appendix C. Transmission Line Wetlands Digital Data Collection Field Form (Survey123)

Survey Variable	Response Options within Survey123
Basic Survey Details (data collected once per survey)	
Surveyor Names	Full names of the QEPs conducting the survey
Date	Date of the survey
Survey Start Time	Start time of the survey
Survey End Time	End time of the survey
Wetland Station ID	Wetland station ID for the survey location
Proportion of Sedge (SE) Wetland Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Proportion of Willow-Sedge (WS) Wetland Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Proportion of Open Water (OW) Wetland Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Average Water Depth (for SE and WS transects only)	Very shallow (<0.1 m)
	Shallow (0.1-0.5 m)
	Moderate depth (0.5-1 m)
	Moderate to deep (1-2 m)
	Deep (>2 m)
	Not applicable (an open water wetland)
Survey Weather Conditions (recorded at the start and end of survey)	
Wind (Beaufort Scale)	0 (<1 km/hr, calm, smoke rises vertically)
	1 (1-5 km/hr, light air, direction of wind shown by smoke drift, but not wind vanes)
	2 (6-11 km/hr, light breeze, wind felt on face, leaves rustle, ordinary vane moved by wind)
	3 (12-19 km/hr, gentle breeze, leaves and small twigs in constant motion, wind extends light flag)
	4 (20-28 km/hr, moderate breeze, raises dust and loose paper, small branches are moved)
	5 (29-38 km/hr, fresh breeze, small trees with leaves begin to sway, crested wavelets form on inland waters)
Air Temperature (°C)	Temperature recorded at the start or end of the survey
Percent Cloud Cover (%)	<1%
	5%
	10%
	25%
	40%
	50%
	60%
	75%
	80%
	90%
	100%
Precipitation	None
	Fog
	Light rain (<2.5 mm/hr)
	Moderate rain (2.6-7 mm/hr)
	Light snow fall
	Moderate snowfall
Visibility	Excellent
	Good
	Moderate
	Slightly poor
	Poor

Habitat Observations (recorded once per wetland survey)	
Survey Type	Open Water Standwatch (OW)
	Sedge Transect (SE)
	Willow-Sedge Transect (WS)
Survey start time	This field auto-populates when clicked.
Proportion of Sedge (SE) Habitat within Survey Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Proportion of Willow-Sedge (WS) Habitat within Survey Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Proportion of Open Water (OW) Habitat within Survey Area (%)	0
	1-10
	11-30
	31-50
	51-75
	76-100
Width of Contiguous Habitat for Transects (metres)	Width entered as numerical value
Waterbird Observations (repeatable section within the digital survey)	
Species	Waterbird species
Number	Number of birds observed
Water Depth (metres)	Very shallow (<0.5 m)
	Shallow (0.5-1 m)
	Moderate (2-5 m)
	Moderately deep (5-10 m)
	Deep (>10 m)
	Non-applicable (if observed out of the water)
Habitat Type	Aquatic vegetation
	Upland vegetation
	Tree
	Nest
Distance from Observer (metres)	<5 m
	5-10 m
	10-20 m
	20-50 m
	50-75 m
	75-100
	>100 m
Bird Behaviour at Detection	Flushed
	Flying
	Perched on land or vegetation
	Floating on the water

APPENDIX D

WATERBIRD SPECIES LIST, FORAGING GUILD, AND TOTAL ABUNDANCE IN 2024

Appendix D. Waterbird Species List, Foraging Guild, and Total Abundance in 2024

Foraging Guild	Species Common Name	Species Scientific Name	Peace River Abundance	Standwatch Abundance	Transect Abundance
Benthic-Feeding Divers	Barrow's Goldeneye	*Bucephala islandica*	13	7	
	Bufflehead	*Bucephala albeola*	9	106	2
	Canvasback	*Aythya valisineria*		4	
	Common Goldeneye	*Bucephala clangula*	523	59	1
	Greater Scaup	*Aythya marila*	8	192	
	Lesser Scaup	*Aythya affinis*	58	291	
	Redhead	*Aythya americana*		2	
	Ring-necked Duck	*Aythya collaris*	4	53	7
	Ruddy Duck	*Oxyura jamaicensis*		1	
	Surf Scoter	*Melanitta perspicillata*	48	7	
	White-winged Scoter	*Melanitta deglandi*	16		
Cranes and Herons	Great Blue Heron	*Ardea herodias*	3		
Dabbling Ducks	American Coot	*Fulica americana*		3	
	American Wigeon	*Mareca americana*	8	114	4
	Blue-winged Teal	*Spatula discors*		18	4
	Gadwall	*Mareca strepera*	8		
	Green-winged Teal	*Anas carolinensis*	10	56	14
	Mallard	*Anas platyrhynchos*	874	343	33
	Northern Pintail	*Anas acuta*	8	35	
	Northern Shoveler	*Spatula clypeata*	1	28	
Gulls and Surface-feeding Terns	Bonaparte's Gull	*Chroicocephalus philadelphia*	154	7	
	Mew Gull	*Larus canus*	1	7	
	Ring-billed Gull	*Larus delawarensis*	484		
Large Dabblers	Cackling Goose	*Branta hutchinsii*	11	7	
	Canada Goose	*Branta canadensis*	1881	35	7
	Trumpeter Swan	*Cygnus buccinator*	72	33	2
Marsh Birds	Sora	*Porzana carolina*		2	
	Wilson's Snipe	*Gallinago delicata*		26	29
Piscivorous Divers	Belted Kingfisher	*Megaceryle alcyon*	15		
	Common Loon	*Gavia immer*	8	23	2
	Common Merganser	*Mergus merganser*	136	1	
	Eared Grebe	*Podiceps nigricollis*		9	
	Hooded Merganser	*Lophodytes cucullatus*		5	
	Horned Grebe	*Podiceps auritus*		3	
	Pied-billed Grebe	*Podilymbus podiceps*	3	6	
	Red-necked Grebe	*Podiceps grisegena*	28	47	
Shorebirds	Greater Yellowlegs	*Tringa melanoleuca*		7	1
	Killdeer	*Charadrius vociferus*		3	3
	Least Sandpiper	*Calidris minutilla*		1	
	Lesser Yellowlegs	*Tringa flavipes*		35	4
	Solitary Sandpiper	*Tringa solitaria*	2	11	4
	Spotted Sandpiper	*Actitis macularius*	118	1	
Unknown Waterbirds	Unknown Grebe		2	2	
	Unknown Gull		107		
	Unknown Shorebird			1	
	Unknown Waterbird		87		1
Totals			**4700**	**1591**	**118**

APPENDIX E

TRANSMISSION LINE WETLANDS TOTAL SPECIES RICHNESS AND TOTAL ABUNDANCE

Appendix E. Transmission Line Wetlands Total Species Richness and Total Abundance

Wetland Station ID	OW01	OW02	OW04	OW06	OW07	OW11	OW12	OW13	SE02	SE03
Species Detected	American Wigeon	Bufflehead	American Wigeon	American Coot	American Wigeon	American Wigeon	Green-winged Teal	Canada Goose	Bufflehead	American Wigeon
	Barrow's Goldeneye	Canada Goose	Bufflehead	American Wigeon	Canada Goose	Canada Goose	Solitary Sandpiper	Green-winged Teal	Green-winged Teal	Blue-winged Teal
	Blue-winged Teal	Common Goldeneye	Canada Goose	Blue-winged Teal	Green-winged Teal	Common Merganser	Wilson's Snipe	Lesser Yellowlegs	Killdeer	Bufflehead
	Bonaparte's Gull	Common Loon	Common Loon	Bufflehead	Killdeer	Green-winged Teal			Wilson's Snipe	Canada Goose
	Bufflehead	Greater Scaup	Greater Scaup	Cackling Goose	Lesser Yellowlegs	Hooded Merganser				Common Loon
	Cackling Goose	Greater Yellowlegs	Greater Yellowlegs	Canada Goose	Mallard	Lesser Yellowlegs				Greater Scaup
	Canada Goose	Green-winged Teal	Green-winged Teal	Canvasback	Northern Shoveler	Mallard				Green-winged Teal
	Common Goldeneye	Least Sandpiper	Lesser Yellowlegs	Common Goldeneye	Solitary Sandpiper	Northern Shoveler				Lesser Yellowlegs
	Common Loon	Lesser Scaup	Mallard	Common Loon	Wilson's Snipe	Trumpeter Swan				Mallard
	Greater Scaup	Lesser Yellowlegs	Ring-necked Duck	Eared Grebe		Wilson's Snipe				Northern Shoveler
	Green-winged Teal	Mallard	Sora	Greater Scaup						Red-necked Grebe
	Horned Grebe	Solitary Sandpiper	Trumpeter Swan	Greater Yellowlegs						Ring-necked Duck
	Lesser Scaup	Spotted Sandpiper	Wilson's Snipe	Green-winged Teal						Wilson's Snipe
	Lesser Yellowlegs	Trumpeter Swan		Killdeer						
	Mallard			Lesser Scaup						
	Mew Gull			Lesser Yellowlegs						
	Northern Pintail			Mallard						
	Pied-billed Grebe			Northern Shoveler						
	Red-necked Grebe			Pied-billed Grebe						
	Surf Scoter			Redhead						
	Trumpeter Swan			Red-necked Grebe						
	Wilson's Snipe			Ring-necked Duck						
				Trumpeter Swan						
				Wilson's Snipe						
Species Richness	22	14	13	24	9	10	3	3	4	13
Standwatch Total Abundance	389	91	78	581	160	34	11	8	NA*	140
Transect Total Abundance	0	NA**	NA**	16	NA**	NA**	0	4	11	2
Grand Total Abundance	**389**	**91**	**78**	**597**	**160**	**34**	**11**	**12**	**11**	**142**

*No standwatch surveys were conducted

**No transect surveys were conducted

Appendix E. Transmission Line Wetland

Wetland Station ID	SE04	SE05	SE06	SE07	SE09	SE10	SE11	SE12	SE14	WS01	WS02	WS03
Species Detected	Canada Goose	American Coot	Wilson's Snipe	Greater Yellowlegs	Bufflehead	American Wigeon	Wilson's Snipe	Canada Goose	Solitary Sandpiper	Canada Goose	Common Goldeneye	
	Solitary Sandpiper	Blue-winged Teal		Mallard	Green-winged Teal	Bufflehead		Mallard	Wilson's Snipe	Green-winged Teal	Ring-necked Duck	
	Wilson's Snipe	Green-winged Teal		Trumpeter Swan	Hooded Merganser	Greater Yellowlegs		Wilson's Snipe		Solitary Sandpiper	Wilson's Snipe	
		Killdeer		Wilson's Snipe	Lesser Yellowlegs	Green-winged Teal				Wilson's Snipe		
		Lesser Yellowlegs			Mallard	Killdeer						
		Mallard			Solitary Sandpiper	Mallard						
		Ruddy Duck				Northern Shoveler						
		Wilson's Snipe				Sora						
						Wilson's Snipe						
Species Richness	3	8	1	4	6	9	1	3	2	4	3	0
Standwatch Total Abundance	NA*	14	NA*	NA*	7	64	NA*	14	NA*	NA*	NA*	NA*
Transect Total Abundance	13	23	1	6	16	NA**	5	0	2	8	11	0
Grand Total Abundance	**13**	**37**	**1**	**6**	**23**	**64**	**5**	**14**	**2**	**8**	**11**	**0**

*No standwatch surveys were conducted

**No transect surveys were conducted

Appendix 4. 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

March 2025

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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

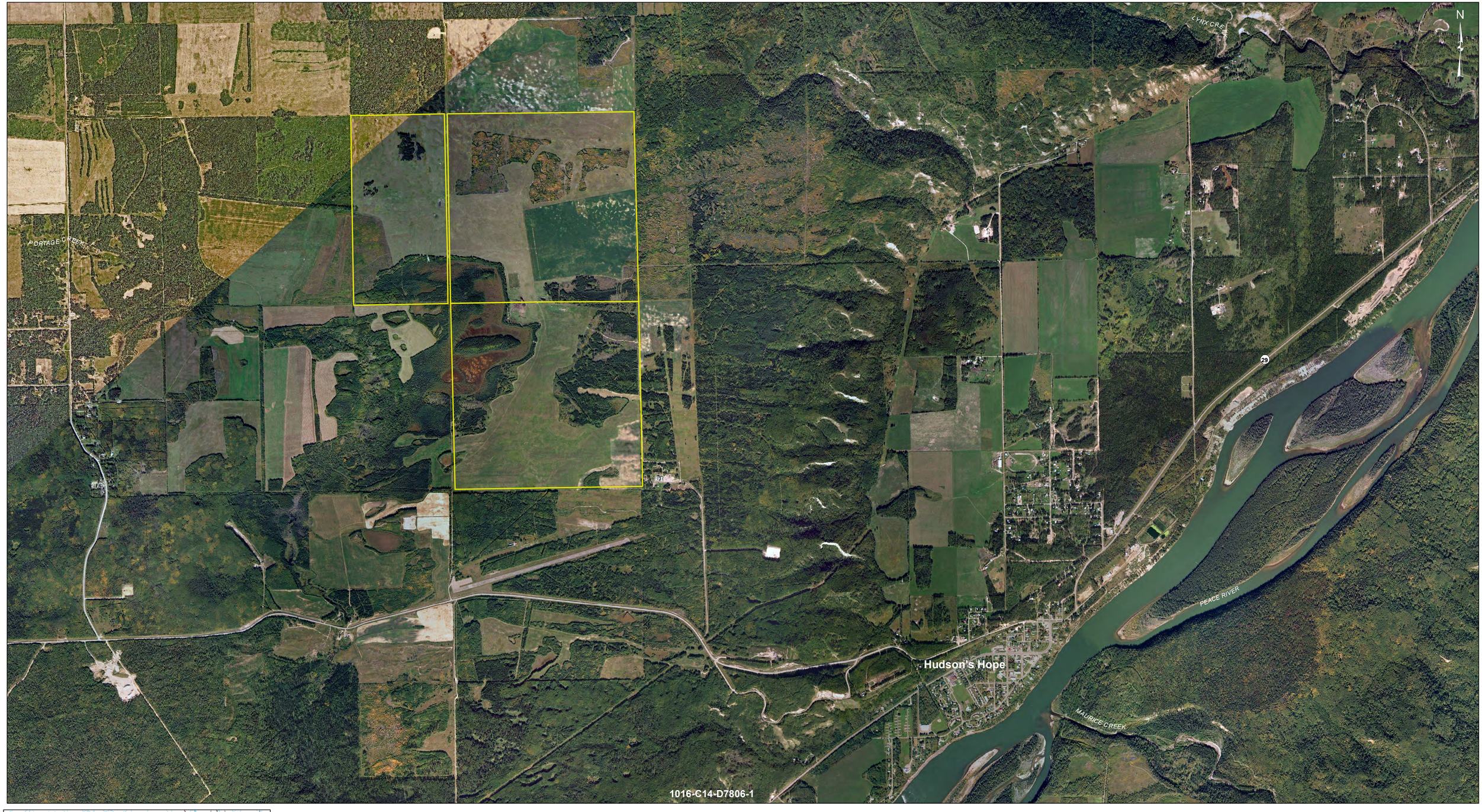
This document outlines how the Property will be managed to protect the wetland, maintain and enhance wildlife habitat values and maintain agricultural production.

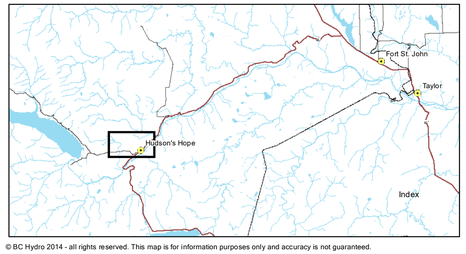
Management of these lands will assist BC Hydro in fulfilling the following conditions of the Federal Decision Statement (FDS) and provincial Environmental Assessment Certificate (EAC):

- **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

SITE C CLEAN ENERGY PROJECT

BC hydro

Marl Fen Wetland Mitigation Properties Overview

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

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

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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

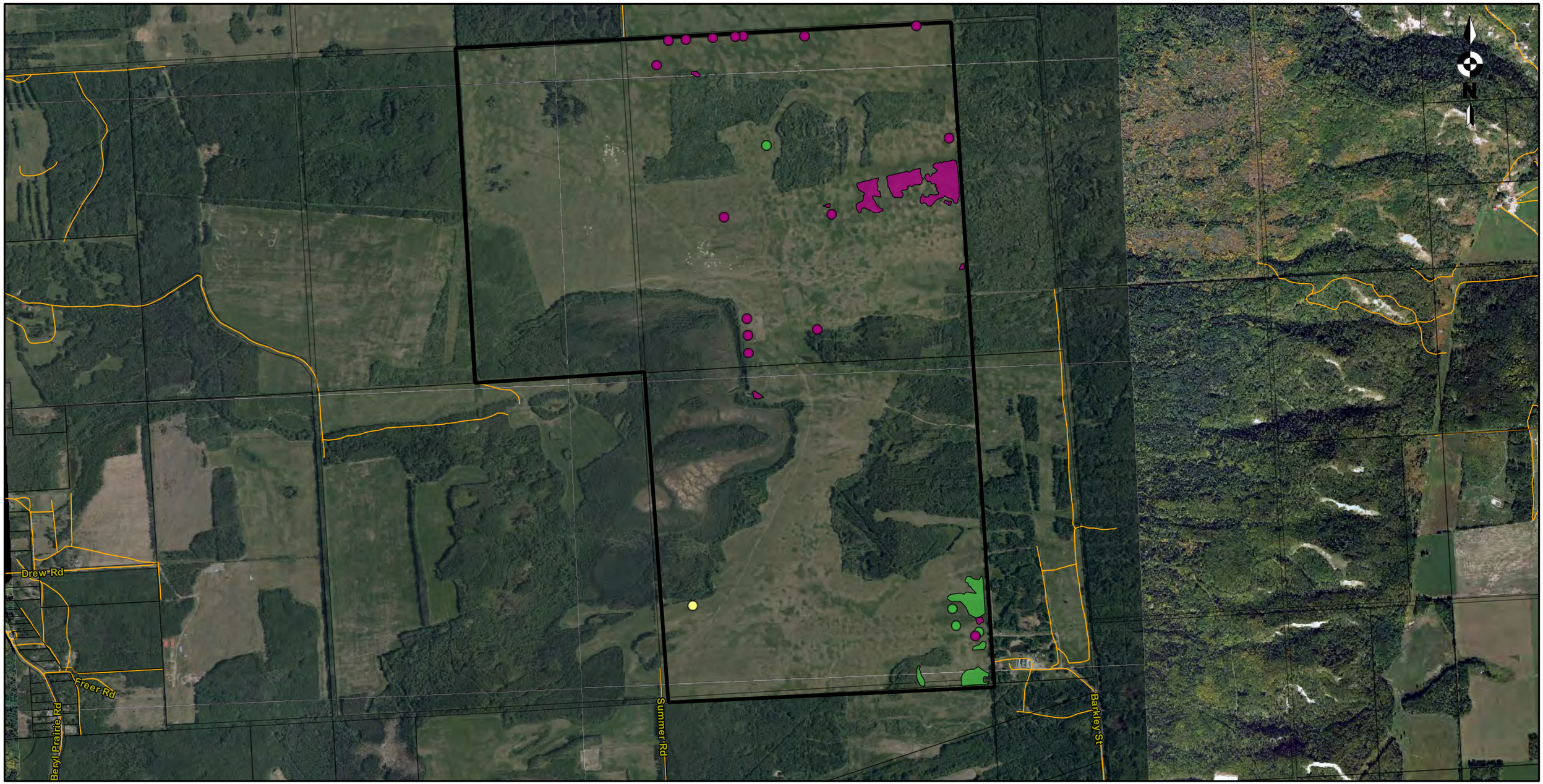
The infestations were treated four times in 2014 with aminopyralid, 2,4-D amine (**Table 3**). On October 3rd a post-treatment audit was conducted. During the audit, all noxious weed infestations treated were surveyed to assess the efficacy of the treatments. The audit confirmed that the chemicals had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

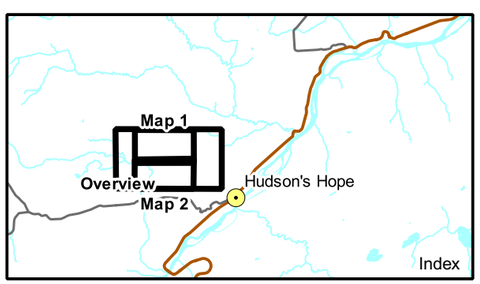
Table 3. Summary of 2015 noxious weed treatments

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.

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

3

7

4

2

1

Legend

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

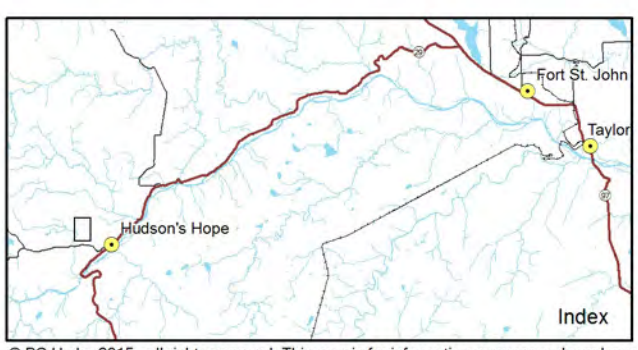


Figure 3. Location of cattle watering sites 1:10,000

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

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

Path: X:\ArcGISProjects\MitigationWetland\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.

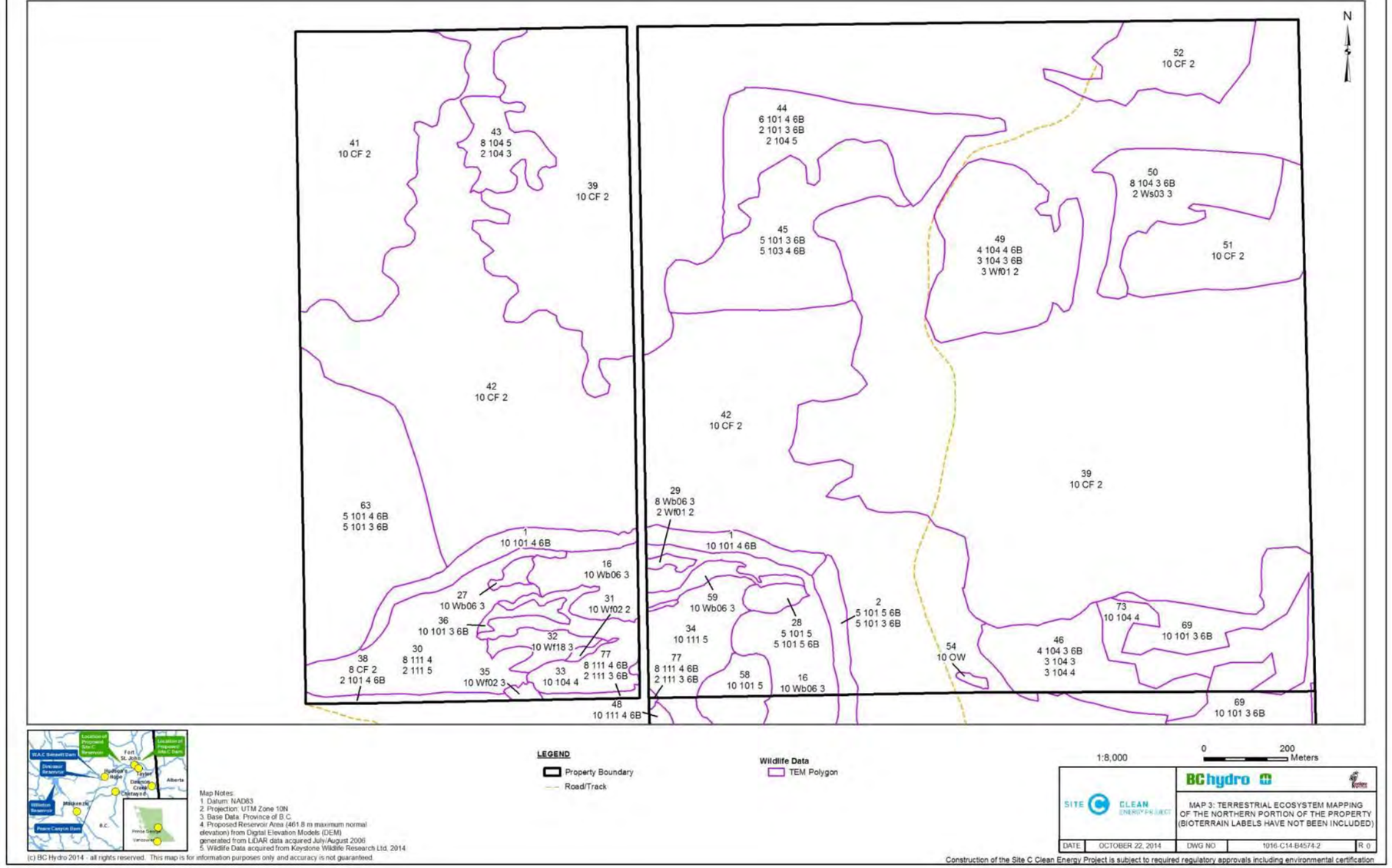


Figure 4. Terrestrial Ecosystem Map of Marl Fen Property: North

Source Simpson et al. (2014)

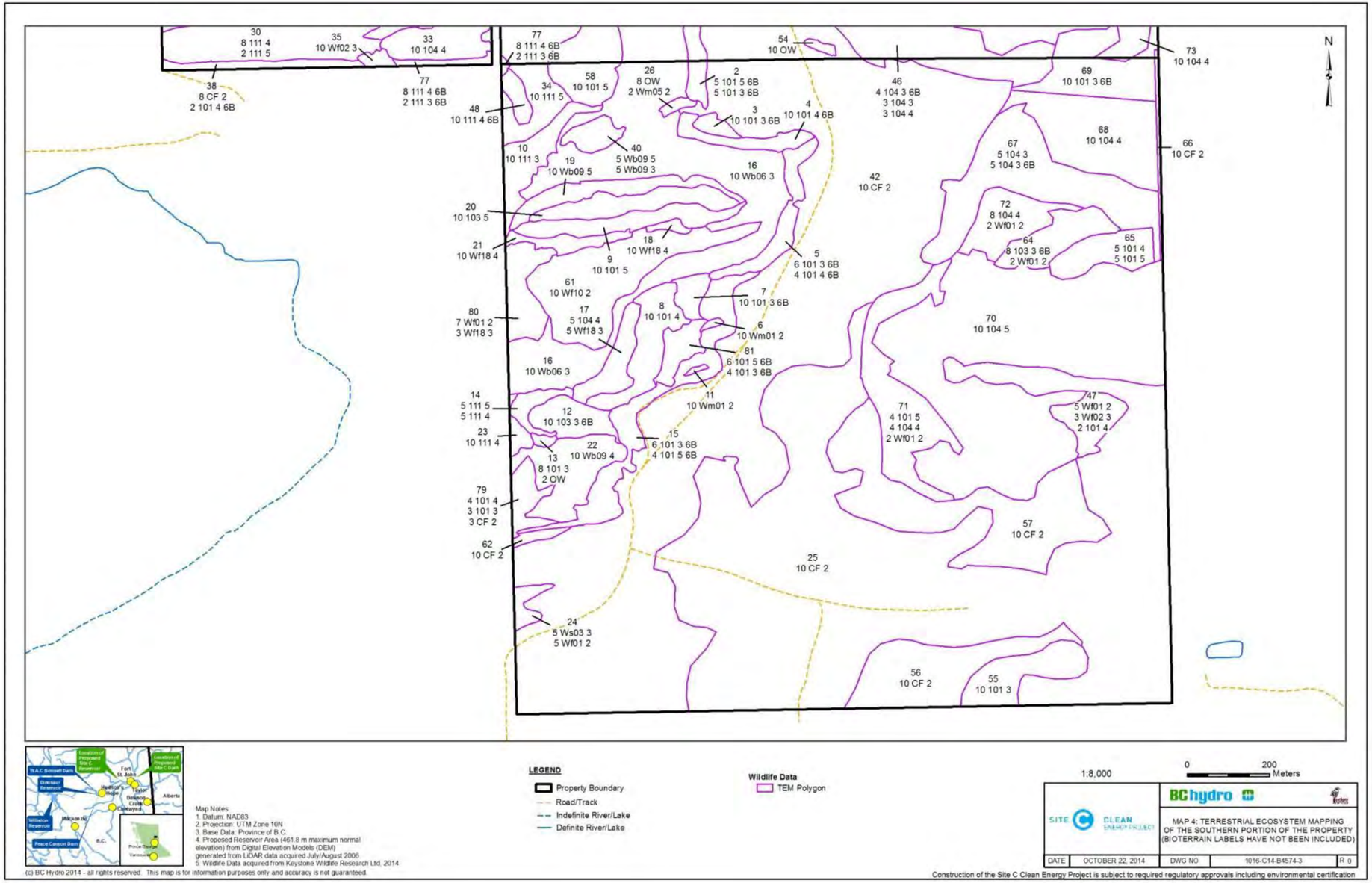


Figure 5. Terrestrial Ecosystem Map of Marl Fen Property: South

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

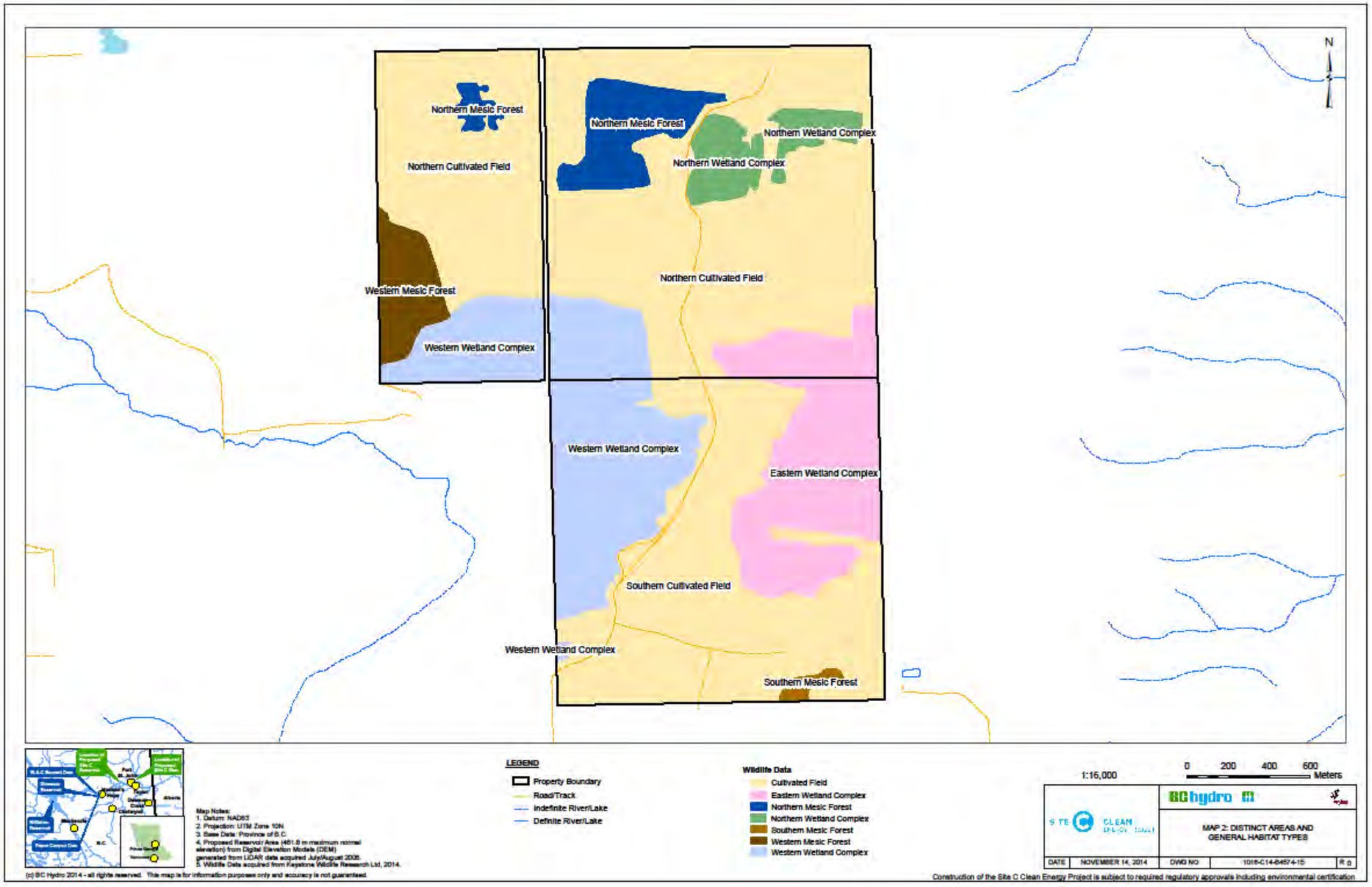


Figure 6. Sub-areas within the Property

Source: Simpson et al. (2014).

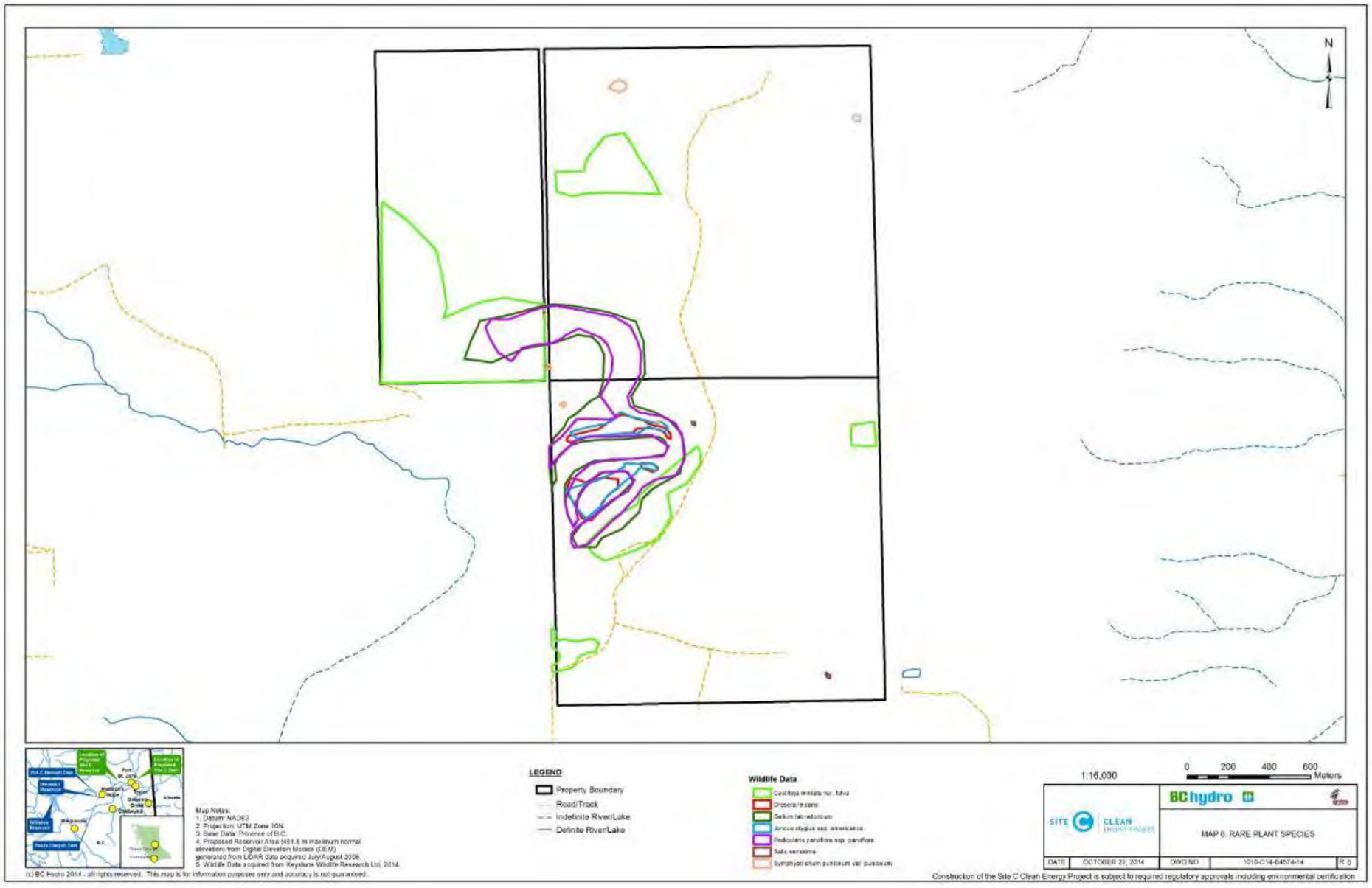


Figure 7. Rare vascular plant occurrences within Property

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.

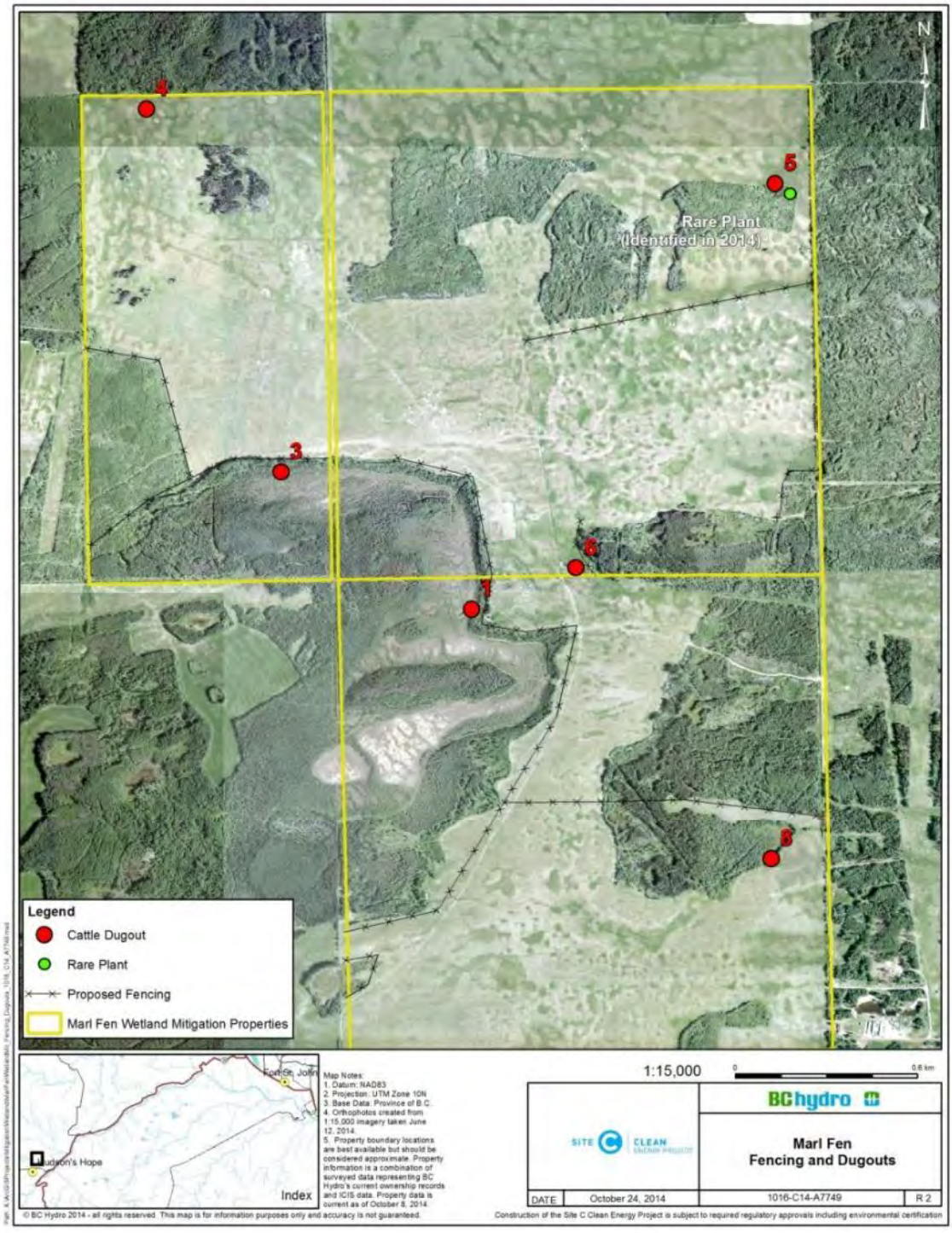


Figure 8. Location of worksites within the Marl Fen Property

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.

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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

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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.

This report is intended to be used by BC Hydro only, subject to the terms and conditions of its contract with Keystone Wildlife Research Ltd. Any other use or reliance on this report by any third party is at that party's sole risk.

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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].

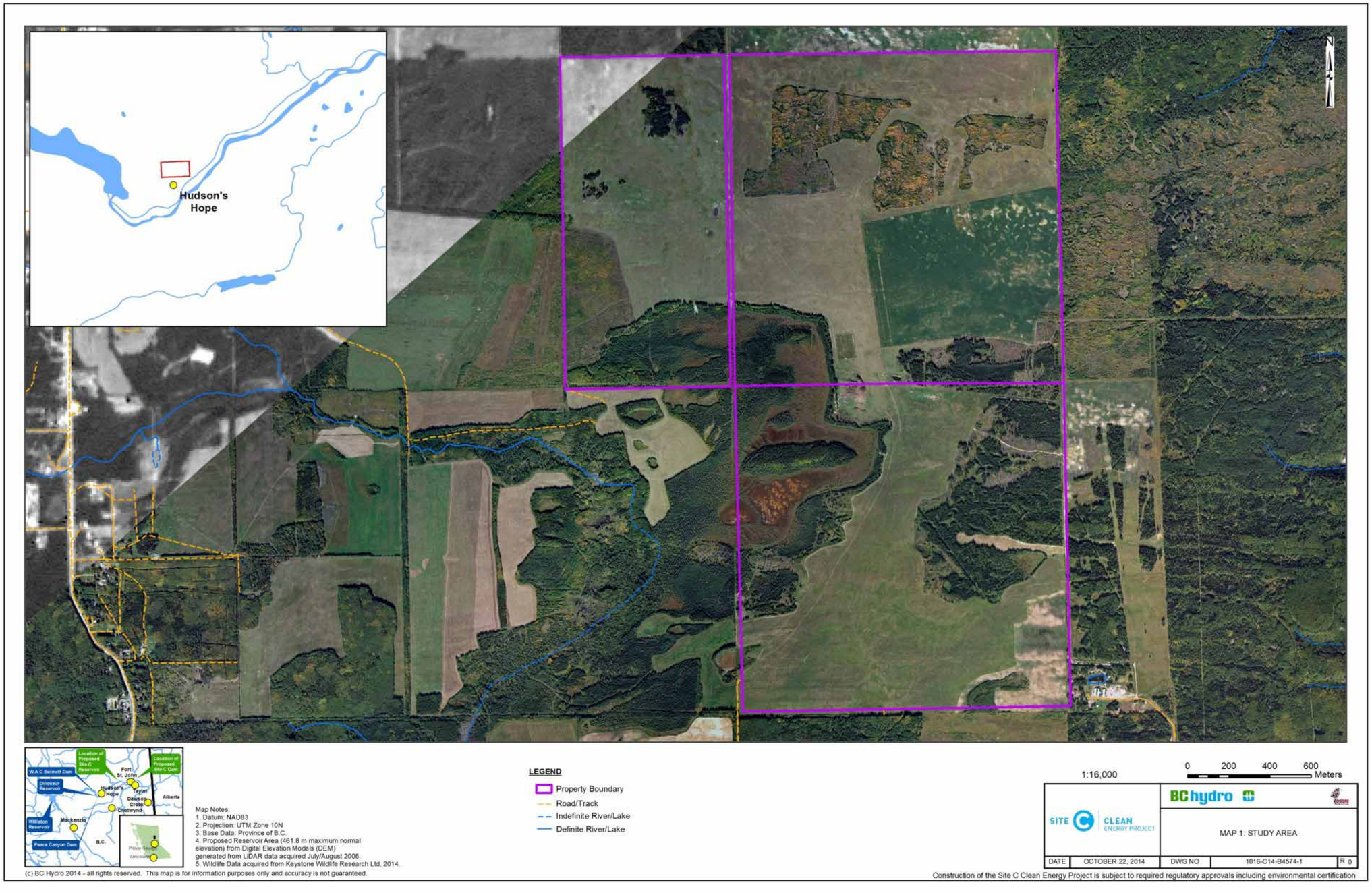
BC Hydro acquired the Property as it contains wetland habitat (**Map 1**) surrounded by cultivated field. As part of the pre-purchase work in 2012, baseline vegetation and wildlife surveys were conducted on the Property. These reconnaissance level surveys included surveys for the presence of rare plant 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.

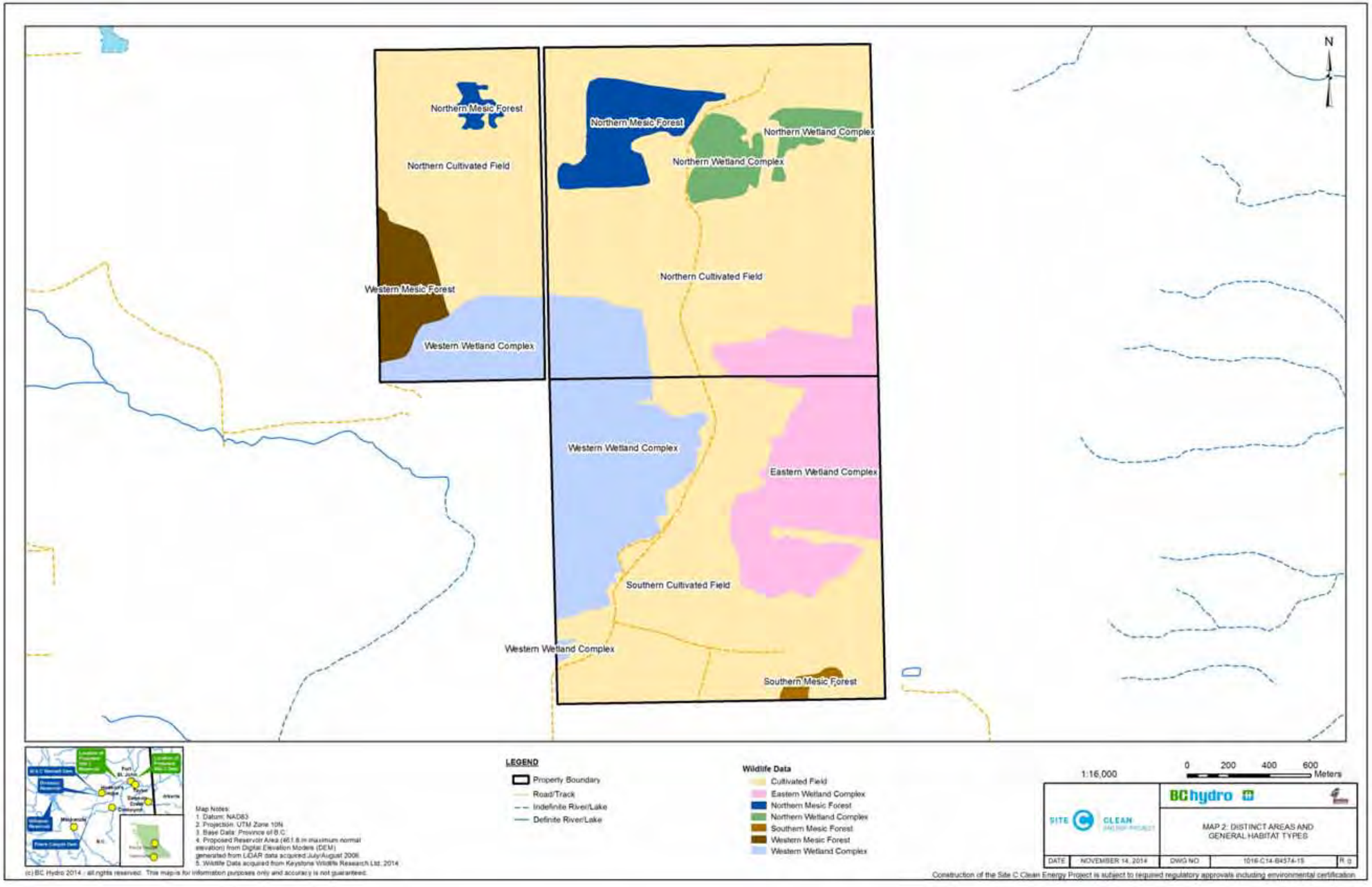
2.6 Bats

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.

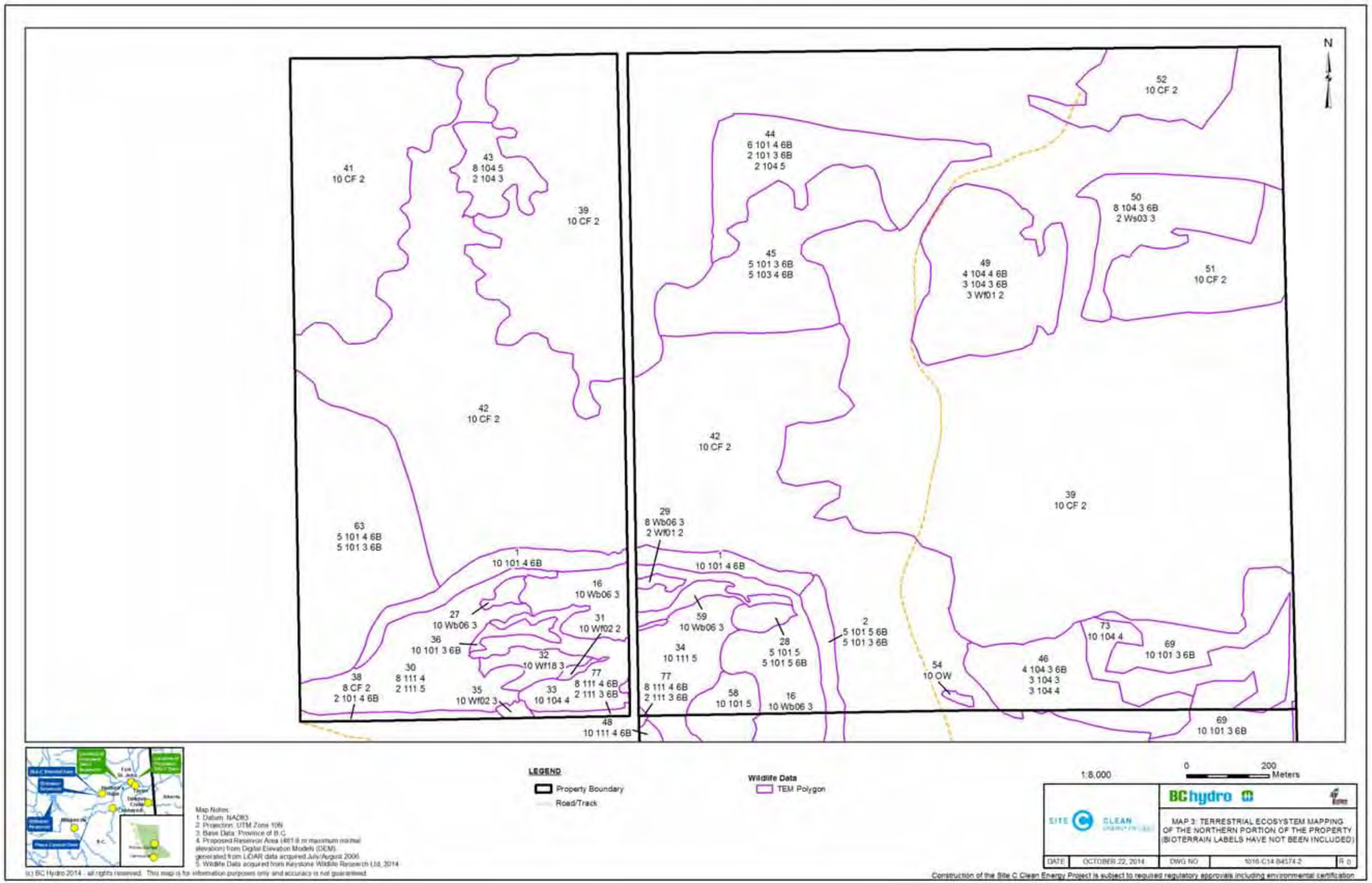
3.1 Terrestrial Ecosystem Mapping

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.

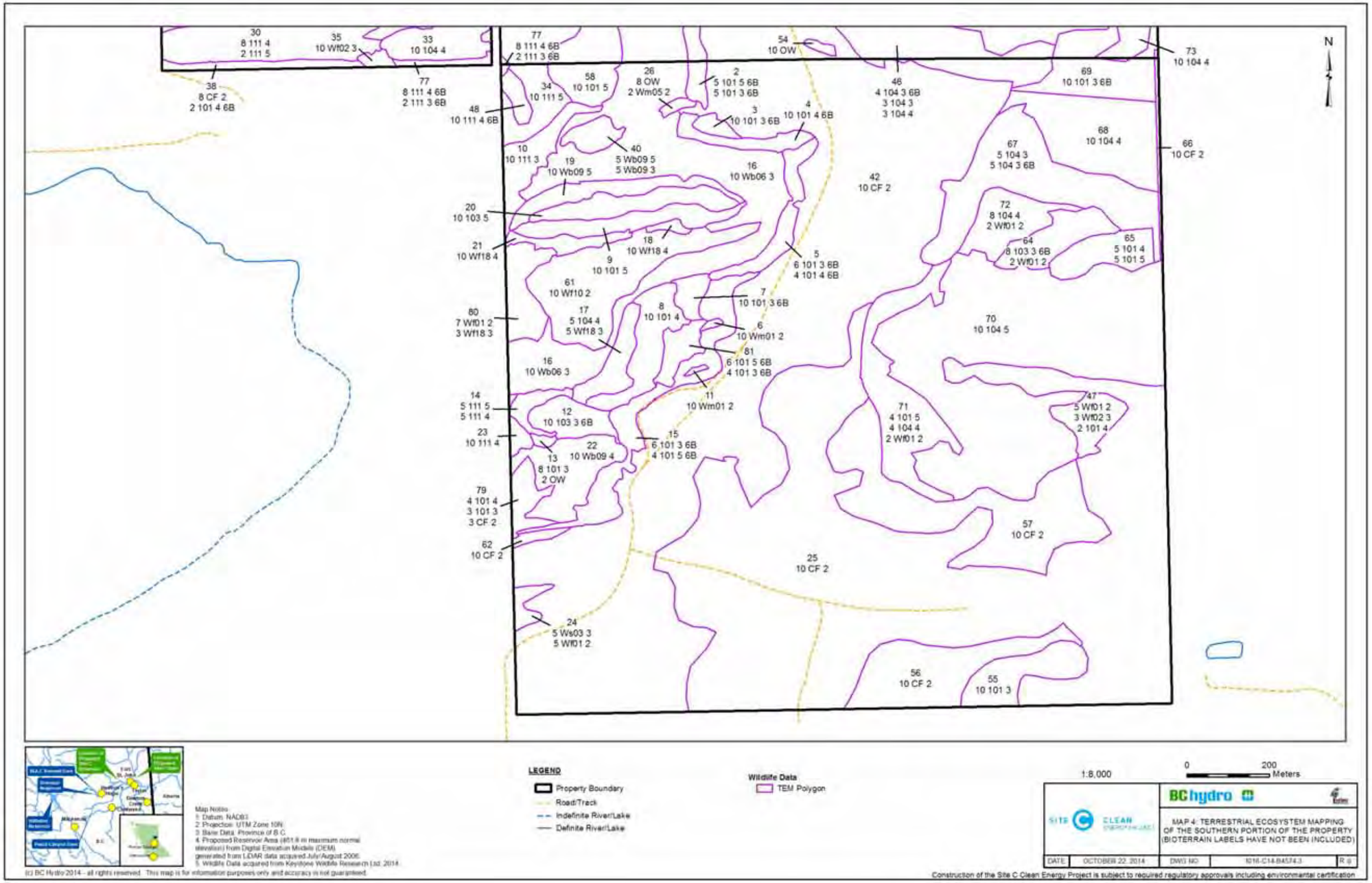
The Property is within the BWBSmw ecosystem. The majority (400 ha or 63%) of the Property is cultivated field (**Table 3.1**). A detailed summary of ecosystems on the Property by structural stage and site modifier is provided in **Appendix C**.

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.

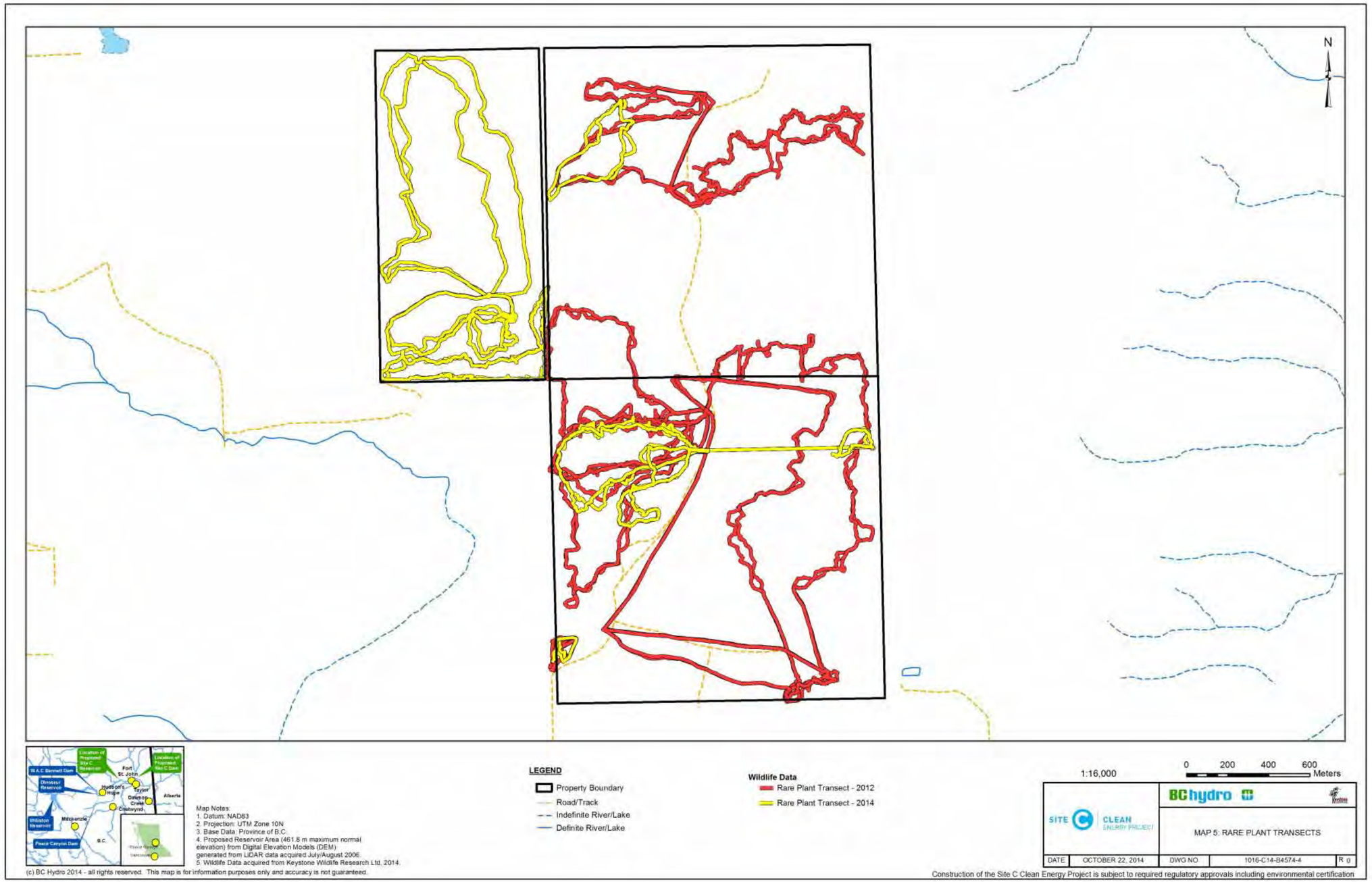
3.3 Rare Plant Inventory

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

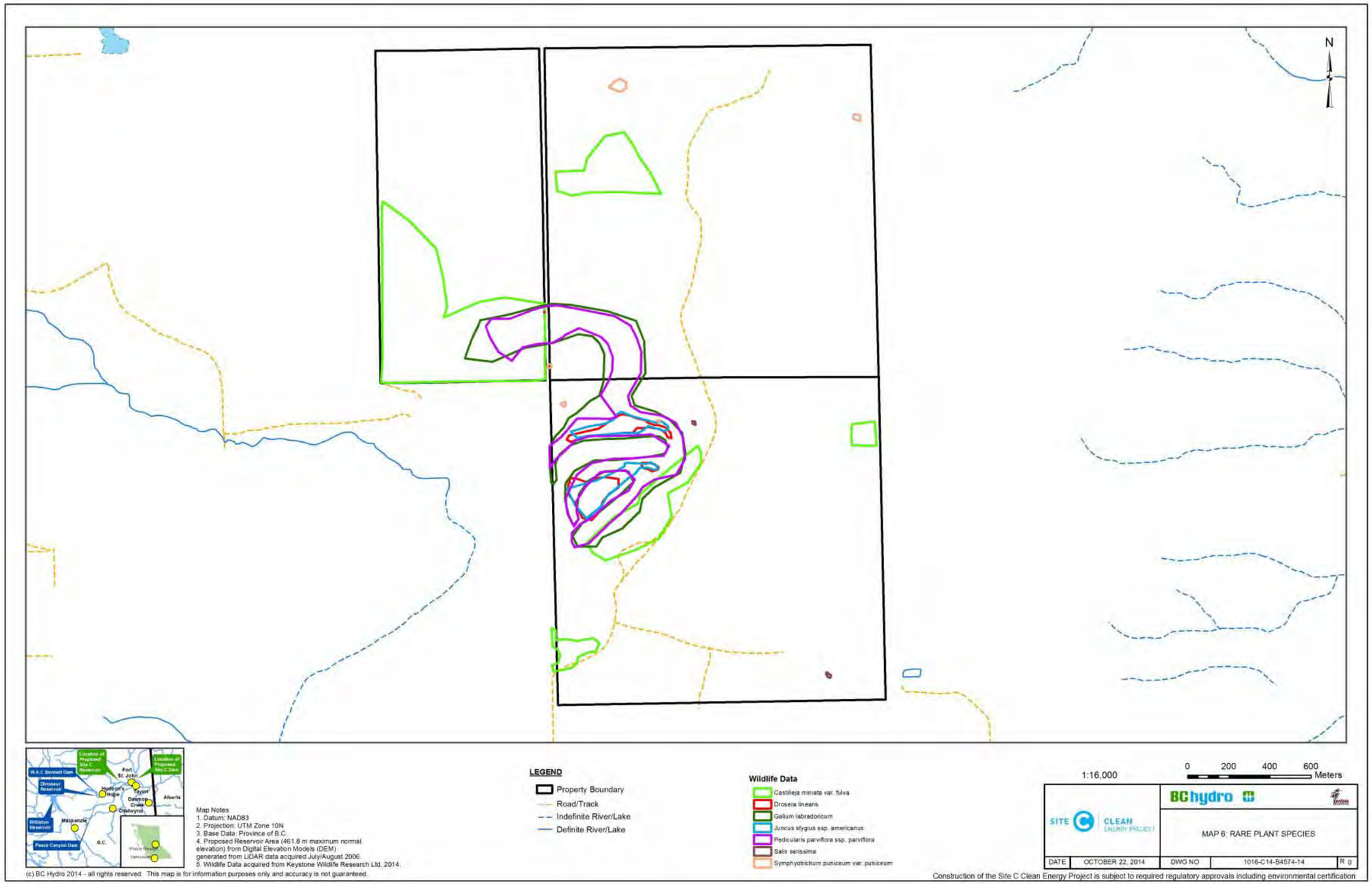
The pre-field review did not uncover any previously known rare plant occurrences on the Property. Analysis of vegetation maps and aerial imagery indicated the presence of habitats capable of supporting various rare plant species. In total 186 rare plant species thought to have potential for occurrence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

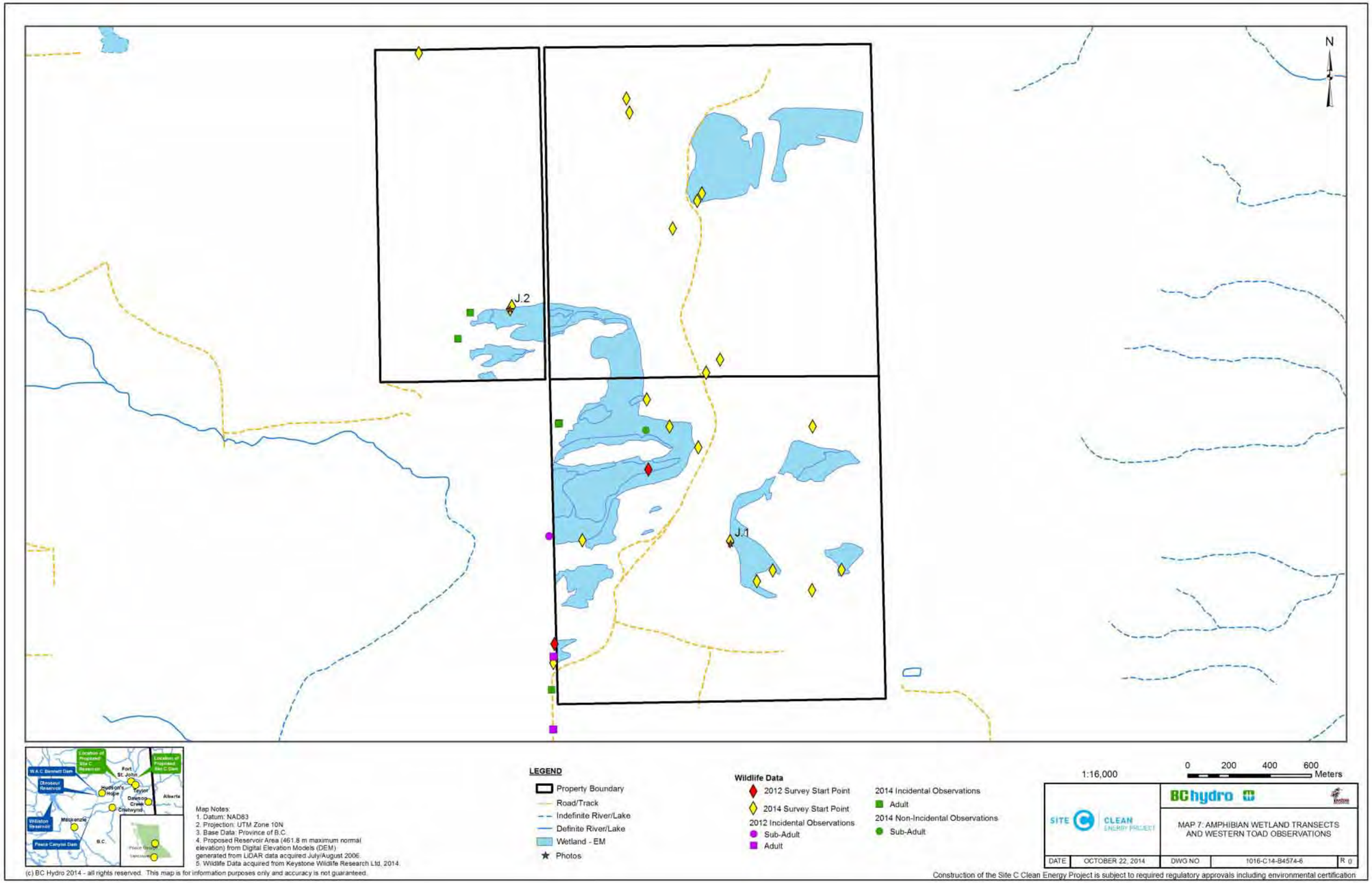
Table 3.5 Count of Amphibians Observed During Systematic Surveys in 2014

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.

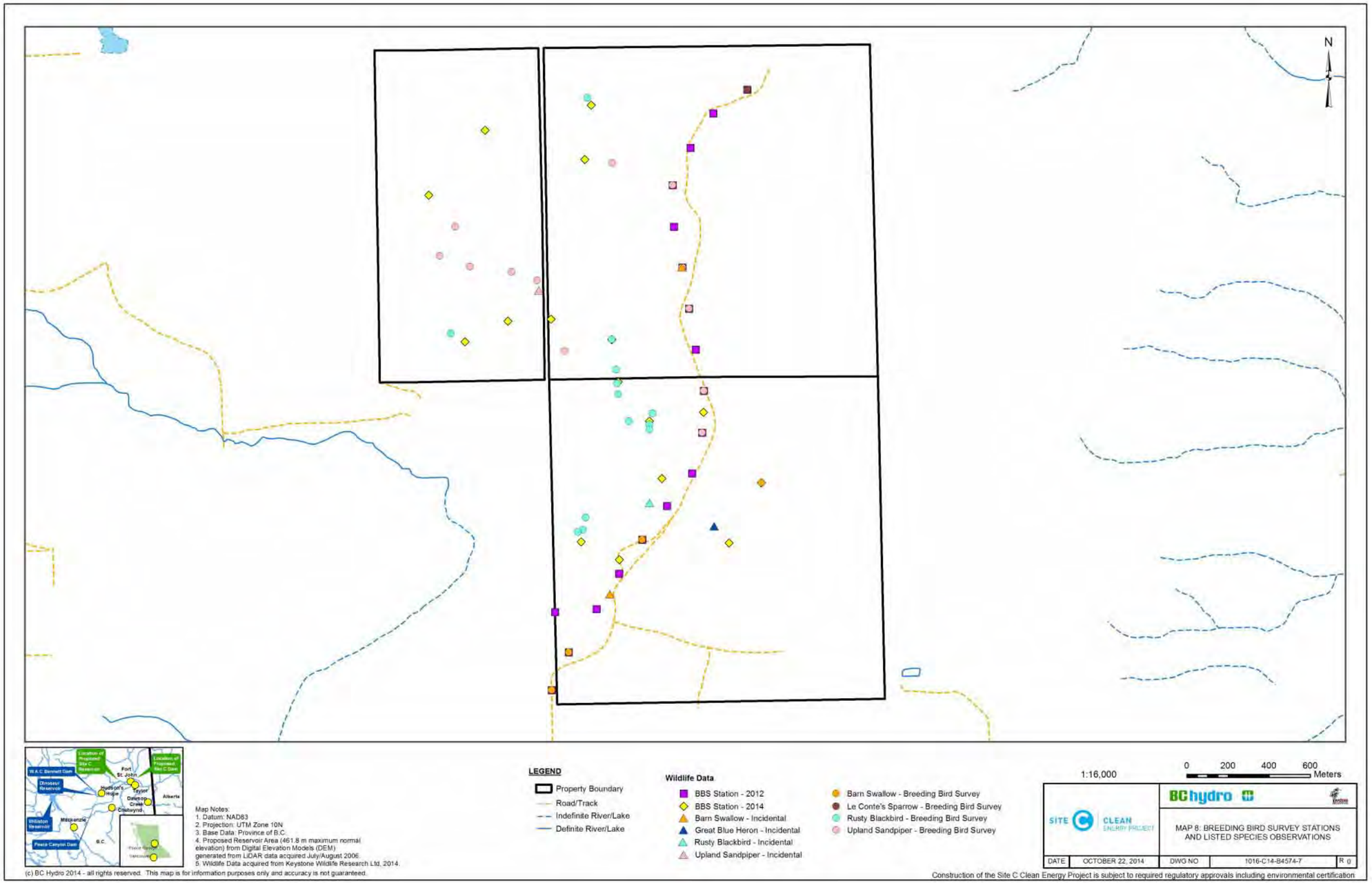
In total, 86 species have been detected on the Property (**Appendix I**). Fewer species were observed in 2014 (n=46) compared to 2012 (n=67). Four listed species were detected including the Blue-listed Rusty Blackbird, Le Conte's Sparrow, Great Blue Heron and Barn Swallow, and the Red-listed Upland Sandpiper (**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

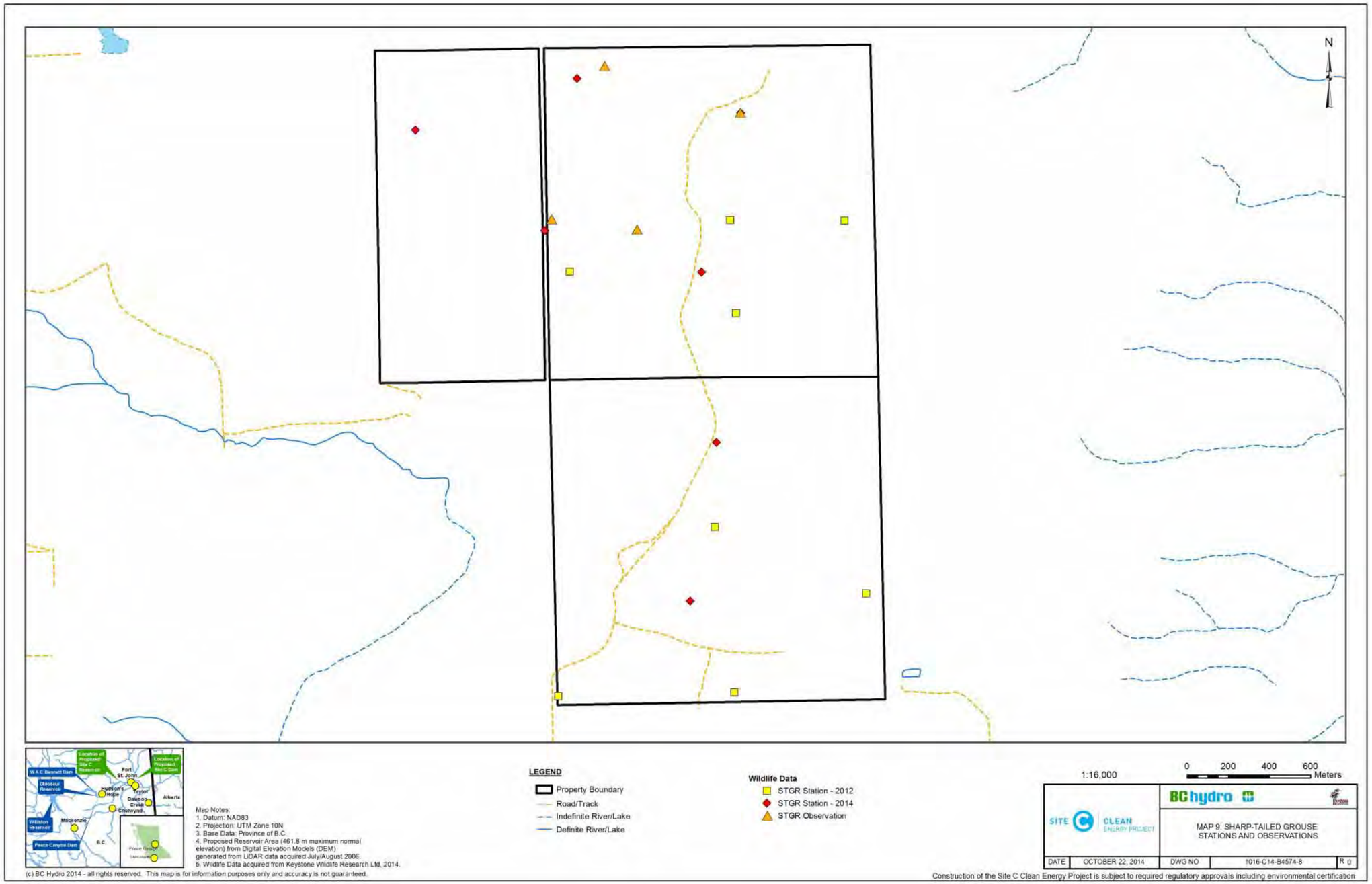
3.5.2 Sharp-tailed Grouse

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.

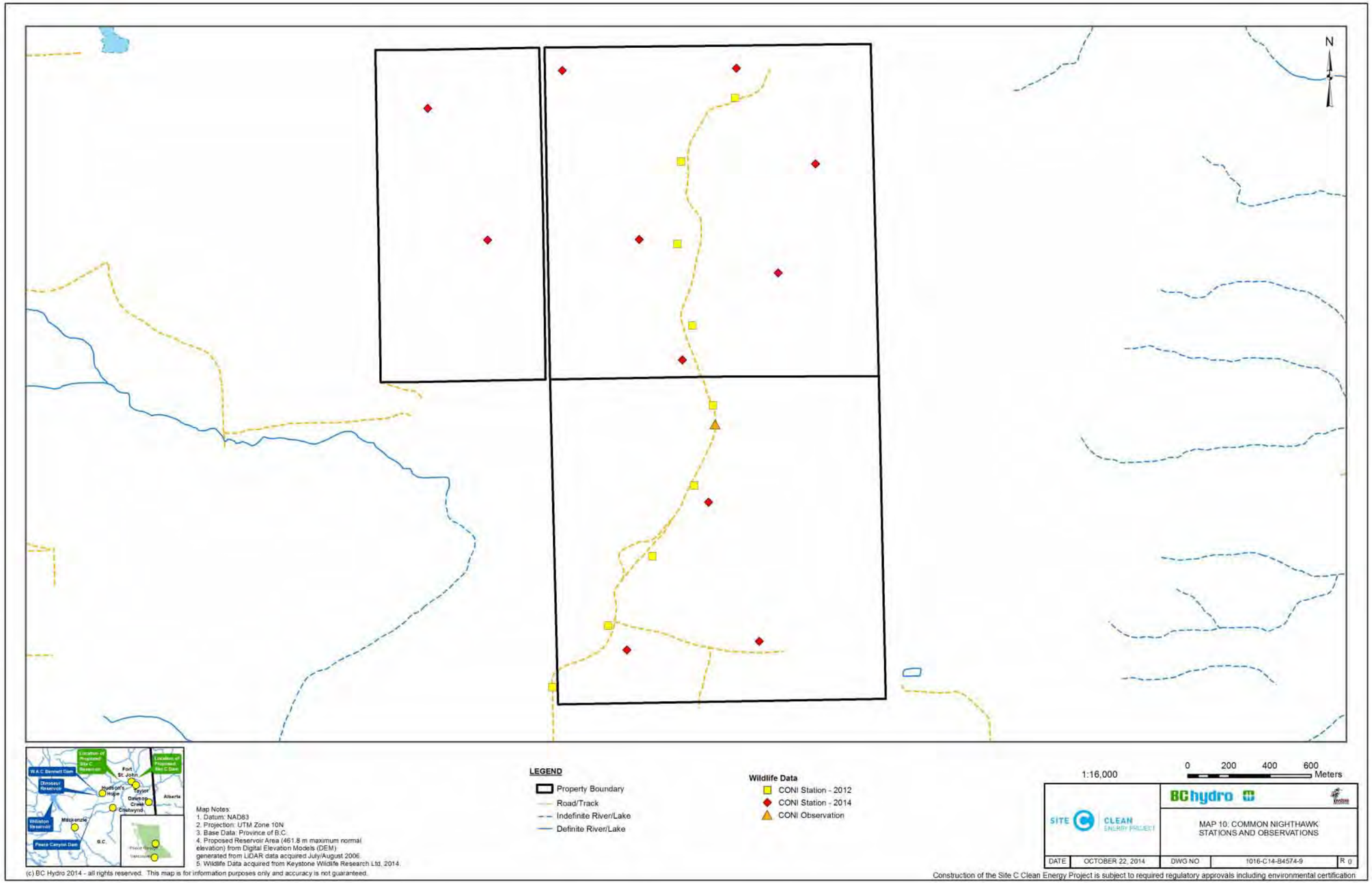


Map 9 Sharp-tailed Grouse Survey Stations and Observations

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.

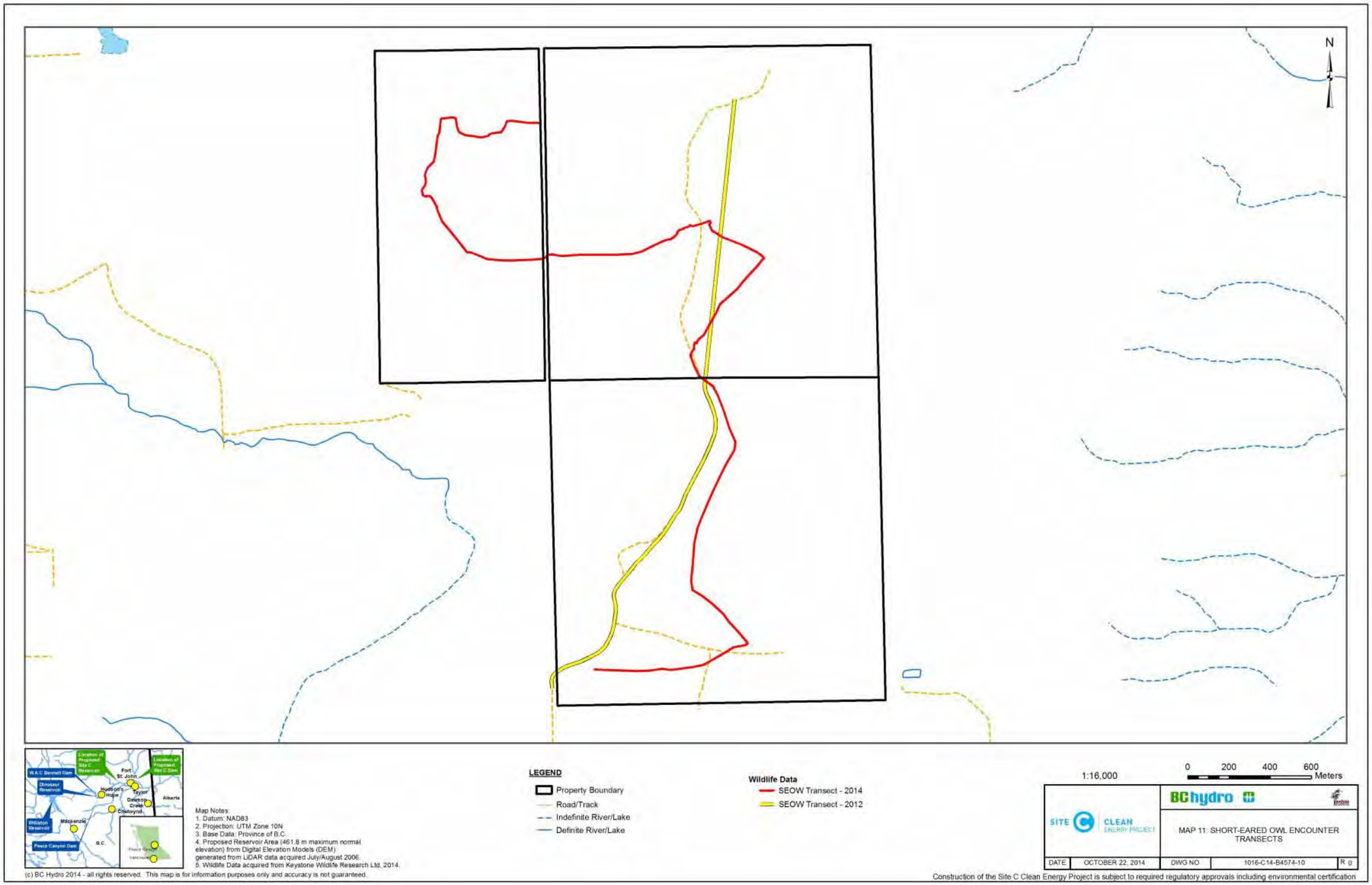
In 2014, seven stations were surveyed twice, on June 24 and July 6 (**Map 10**). An additional four stations were surveyed on July 6, as additional time allowed more stations to be added. Total survey time was 1 hour and 41 minutes. No observations or incidental detections of Common Nighthawk were recorded.



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**).

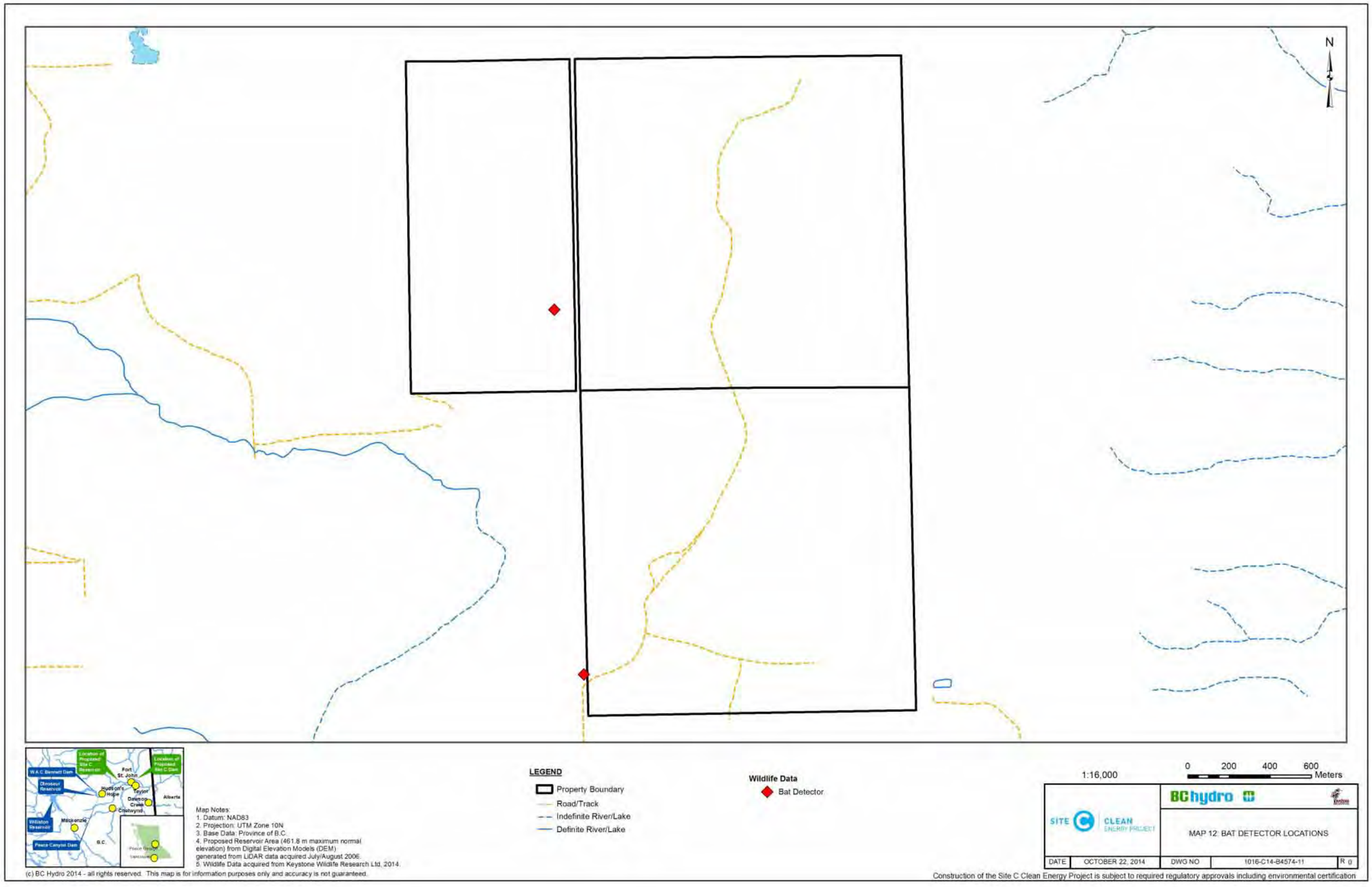
Table 3.8 Bat Species Recorded on Property

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.

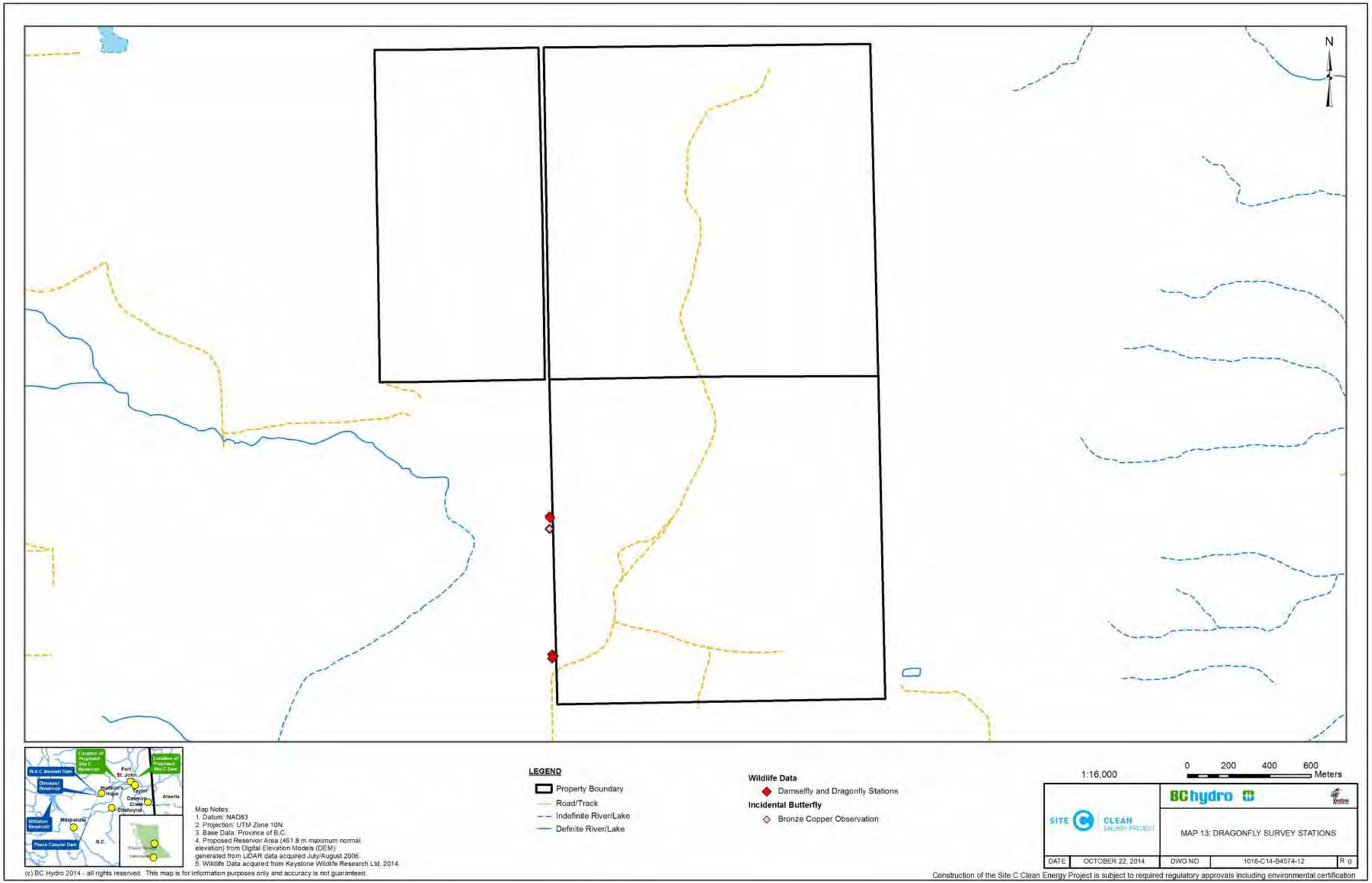
Surveys, conducted in the western wetland complex, included the collection and identification of aquatic life stages of dragonflies and damselflies. Wetlands were surveyed for exuviae that are typically left on emergent vegetation or woody vegetation and dip nets were used to sweep the bottom of the 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

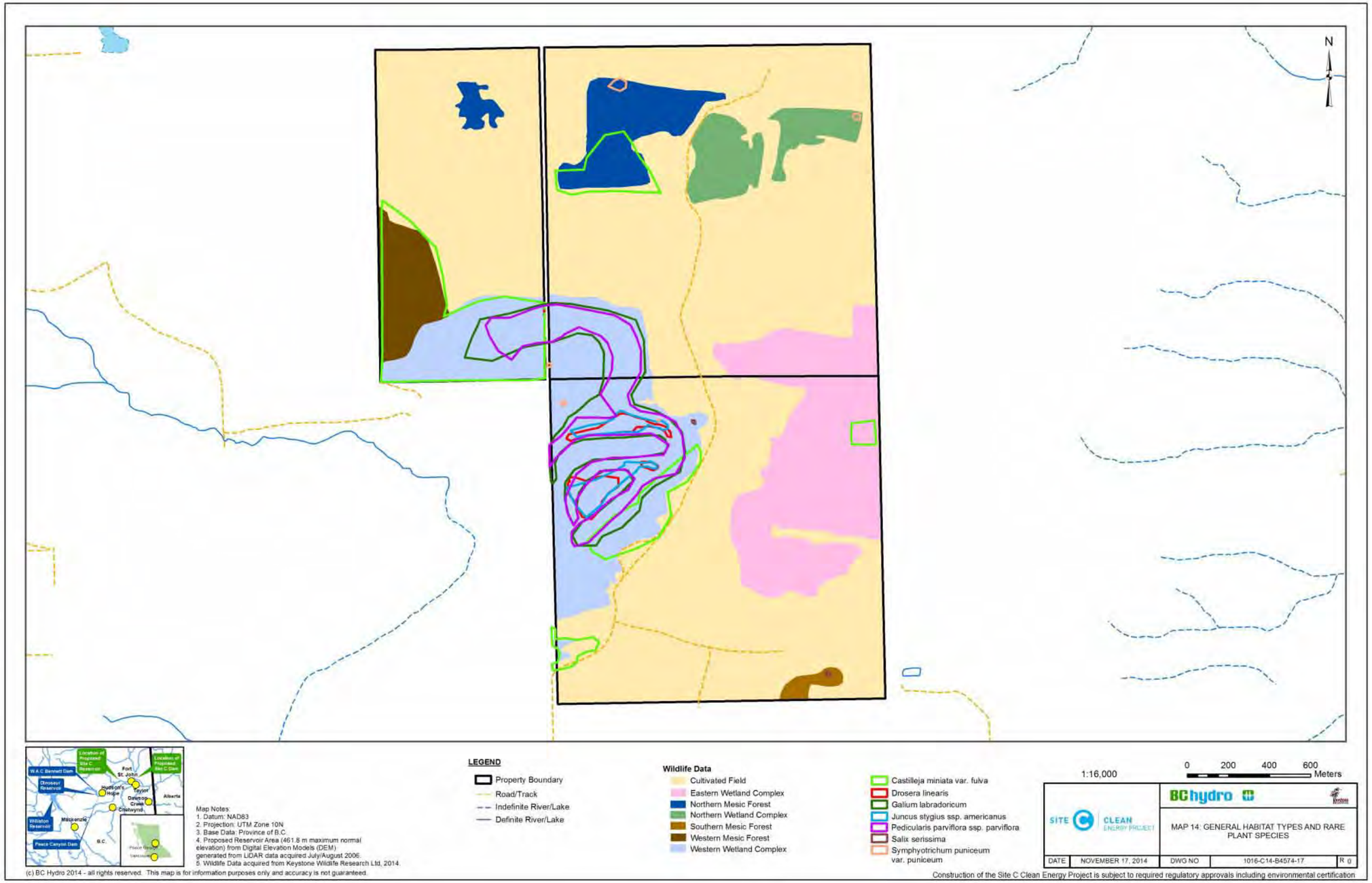
Mammals

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**).

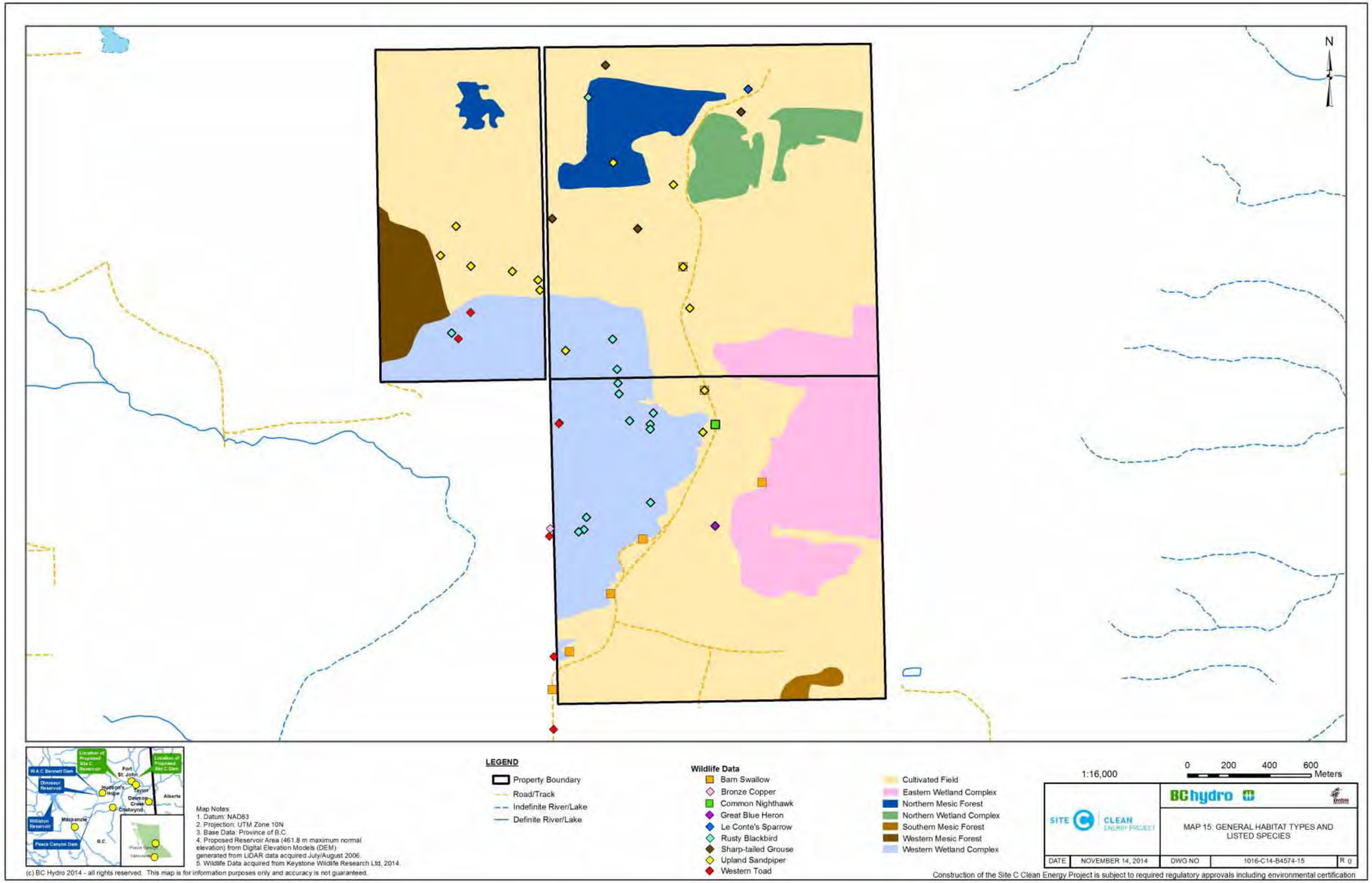
Other species observed incidentally in the general area adjacent to the Property include fisher (Blue-listed), mink, mule deer, and white-tailed deer.

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.

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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

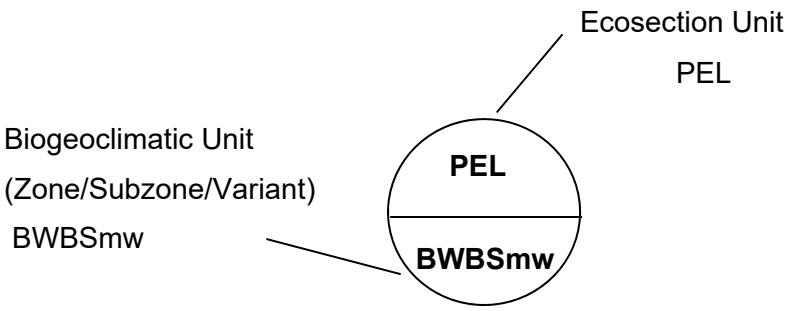
Ecosection Boundary

Study Area Boundary

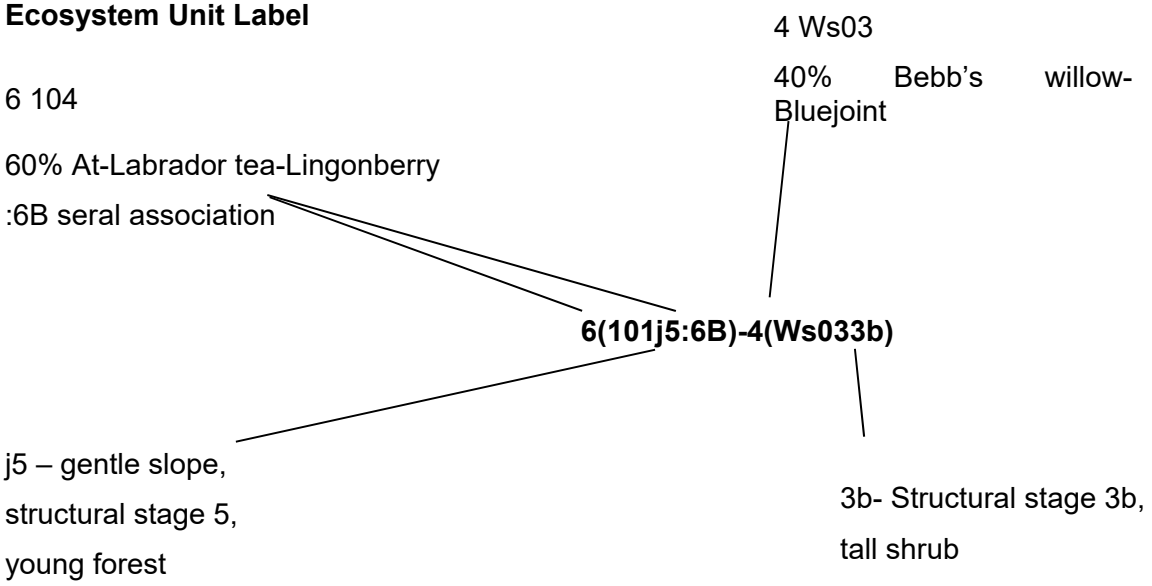
Ecosystem Map Unit

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.

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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.

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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.
Roger went over with dogs + got them out + fixed
fence

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

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 has 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 (Mad Fen)

Jun 9 - disced 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 ½ section of hayland to the north of hydro property - water is in private property
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 McIntosh + Jim Roberts + sent by E-mail to Nikki 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 19 Disced field 3 again

Jun 20 Moved 156 cow/calf pairs to Hydro.
Left them in feed yard to pair 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 Dysent.
" 25 Still raining - sick calf is a little better
27 Sunny - checked cows + started water. Drove around pasture to make sure everything is alright

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Jun 28 - Seeded oats in field 3

Jn 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 troughs.

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 Mikki 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 more dead calves. We decided to move cows to field 6

Aug 20 - checked + moved salt to field 6

Aug 26 - Moved cows to deeded pasture N 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. - checked cows every other day
To 26

Oct 26 - 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 side x 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 feed in 1 + 2

May 23 Moved cows to hydro - 150 cow/calf pairs Left them in fed 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. + undseeded 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.

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 tractor + 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 trees 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 segregate it with access to water on field 4 + 6

Sept 29 - brought cows home.

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Field Record - Hydro

Date 2027

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 access road was too soft + muddy

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 17 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 bottle oiler over to hydro to help control flys on cows. They rub 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 area's 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 or 5 - broke up field 4.

Page

land "W of"

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 5. Rutledge Management Plan 2025 Update

SITE C CLEAN ENERGY PROJECT

RUTLEDGE PROPERTY MANAGEMENT PLAN V2.0

Prepared by:

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Updated in 2024 by:
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Version 2.0
March 2025

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1.0 INTRODUCTION

BC Hydro has identified five land parcels, totalling approximately 208 hectares (ha) that will be retained and managed to provide habitat for rare plants and wildlife. 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 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 but have been identified as providing ungulate winter range by the Ministry of Environment although they have not been officially designated as Ungulate Winter Range (UWR) under the *Forest and Range Practices Act*. This plan has been prepared to add this UWR as compensation for the reduction of ungulate winter habitat resulting from the filling of the Site C reservoir.

The Property parcels located south of Highway 29 will be inundated with reservoir fill but hayfields here will continue to be used for production of forage until reservoir fill occurs. These lands are not discussed further in this plan.

The current 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 the long-term Property management plan.

Table 1. Legal descriptions of Rutledge property.

Parcel No.	Legal description	Area (ha)
254	Northwest 1/4 of Section 19, Township 82, Range 24 west of the 6th meridian Peace River District	64.56
254.1	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	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	Southeast 1/4 of Section 24, Township 82, Range 25 west of the 6th meridian Peace River District Except Plans 21821	47.73
258	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

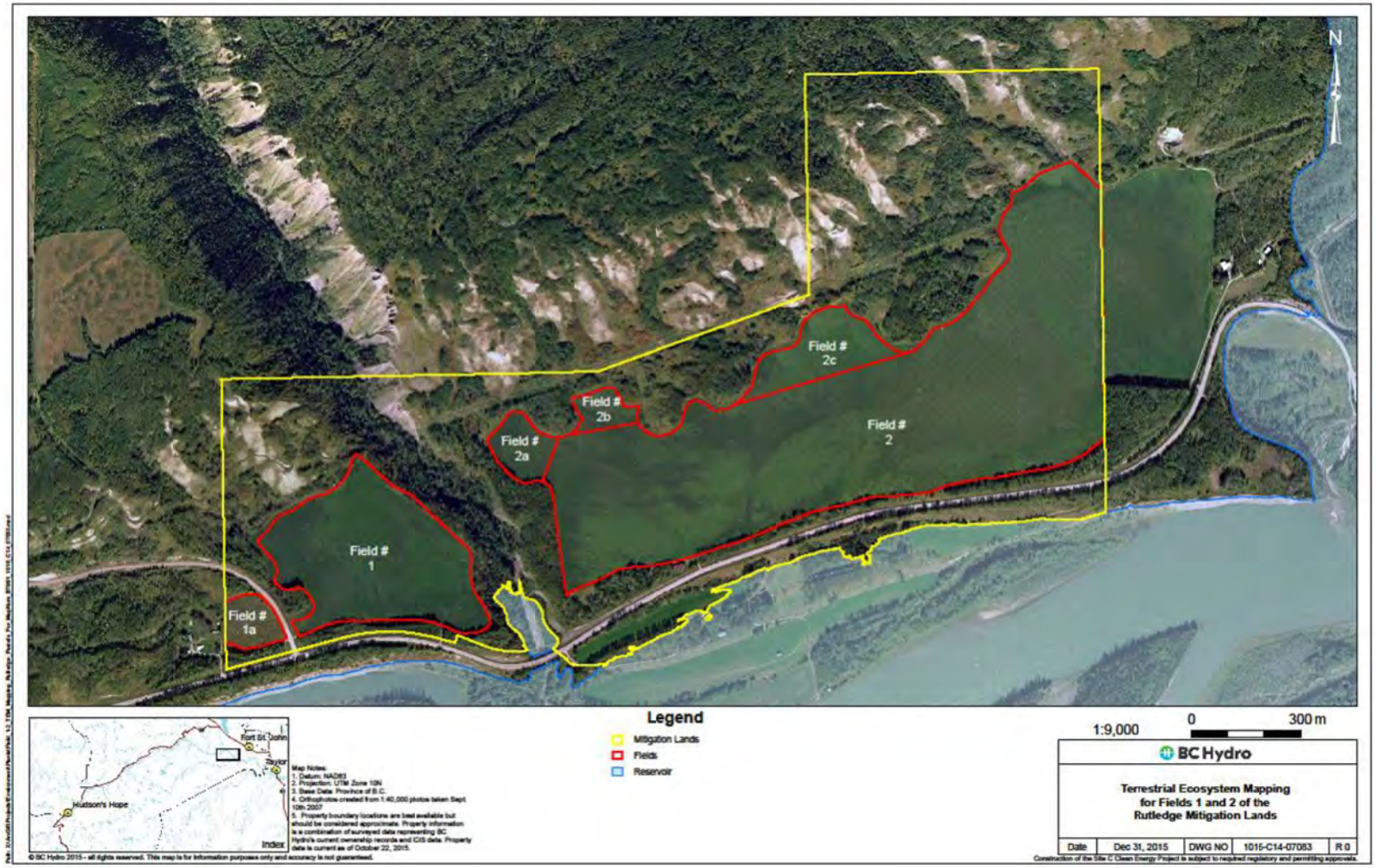

Figure 1. Rutledge Property Mitigation Fields

1.1 Plan objectives

This document outlines how the Property will be managed to protect the ungulate winter range 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 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 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, to resident hunters and Guide Outfitters for harvest and for the tourism value of their presence on the landscape. These ungulates are considered a high priority for conservation management. The current UWR's in the Peace River Valley will be partly inundated by the flooding of the Site C Clean Energy Project's reservoir, reducing the availability of winter range for these species. Therefore, the protection of new UWR's 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 best attain this goal. The biological criteria that were applied in

the selection of this UWR as an offset include 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, but under the Federal COSEWIC ranking are not ranked. None of these species are listed under the federal *Species at Risk Act* Schedules 1-3 (Canada 2024).

1.2.3 Expected Conservation Achievements /Outcome

This 3217 ha UWR is currently managed for elk, mule deer, and moose under UWR U-9-007 (NPL-015), which overlaps Farrell Creek to the north of the Rutledge Property. It will be impacted by reservoir inundation along Farrell Creek, so the protection of this new property will act as an offset of 208 ha of winter range lost through reservoir fill.

This document will provide the 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 results 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 *Wildlife Act* may by order establish the GWMs for this UWR. It is expected that the agriculture use of the Property will be maintained as it provides an intrinsic winter range value to the ungulates using this area.

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 south-west 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 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 droughty periods occur during the growing season (BC Ministry of Environment, 1983, and BC Hydro 2012 and 2013).

2.1.3 Land Capability for Agriculture

The Branham-Clayhurst soil map units, occupying Fields 1 and 2, have high capability for agriculture and are capable of supporting a fairly wide range of crops.

Based on the July 2014 site visit, Fields 1 and 2 appear to be dominantly Branham soils, with an agricultural capability of Class 2 due to climatic capability restrictions. The British Columbia Land Inventory (BCLI, 1979) rates these fields as Class 2 with a combination of minor limitations (Class 2X). The capability would not improve to Class 1 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 Clayhurst soils mapped as occurring within these units. Limited field observations to date noted that Branham soils mixed with patches of gravelly, sandy Clayhurst soils. Gravelly, sandy Clayhurst soils are rated as agricultural capability Class 4 due to low moisture holding capacity and low fertility. The agricultural capability of the Clayhurst component would improve one class (to Class 3) 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 2G 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 (ie, cut hay would be limited to one or possibly 2 crops per year, with the potential for additional aftermath grazing). The fine textured (Branham) 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 (Clayhurst) soil pockets which would require irrigation to achieve higher production levels.

Soil and moisture conditions observed during the July 2014 site visit, indicate that without irrigation a single cut of hay can be taken from the fields in most years. 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 2 or even 3 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 in an alfalfa, timothy, tall fescue mix, commonly used in the Peace River Valley. None of the fields have been, or are, 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. Seven noxious weeds were documented within the property: annual sow thistle (S*onchus oleraceus)*, Canada thistle (*Cirsium arvense),* common tansy (*Tanacetum vulgare),* oxeye daisy (*Leucanthemum vulgare),* perennial sow thistle (*Sonchus arvensis),* scentless chamomile (*Matricaria maritime),* and wild oats (*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 2016). Annual sow thistle and perennial sow thistle are only rated for education and awareness (PRRD 2016). Control of the noxious weeds will be the responsibility of the leaseholder.

2.2 Infrastructure on site

2.2.1 Access

The Rutledge 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 Highway 29 and Farrell Creek Road; Field 2 is accessed via a gate and short gravel driveway off Highway 29. There are no buildings on the property south or north of Highway 29.

2.2.2 Water and fencing

There are no irrigation improvements on the property north of Highway 29. The fields north of Highway 29 are not fenced.

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. The grasslands mapped as Fuzzy-spiked Wildrye-Wolf Willow (WW) are classified as a sensitive ecological community (Hilton *et al.* 2013a). None-of the ecosystems on the property are classified as at risk (Hilton *et al.* 2013a).

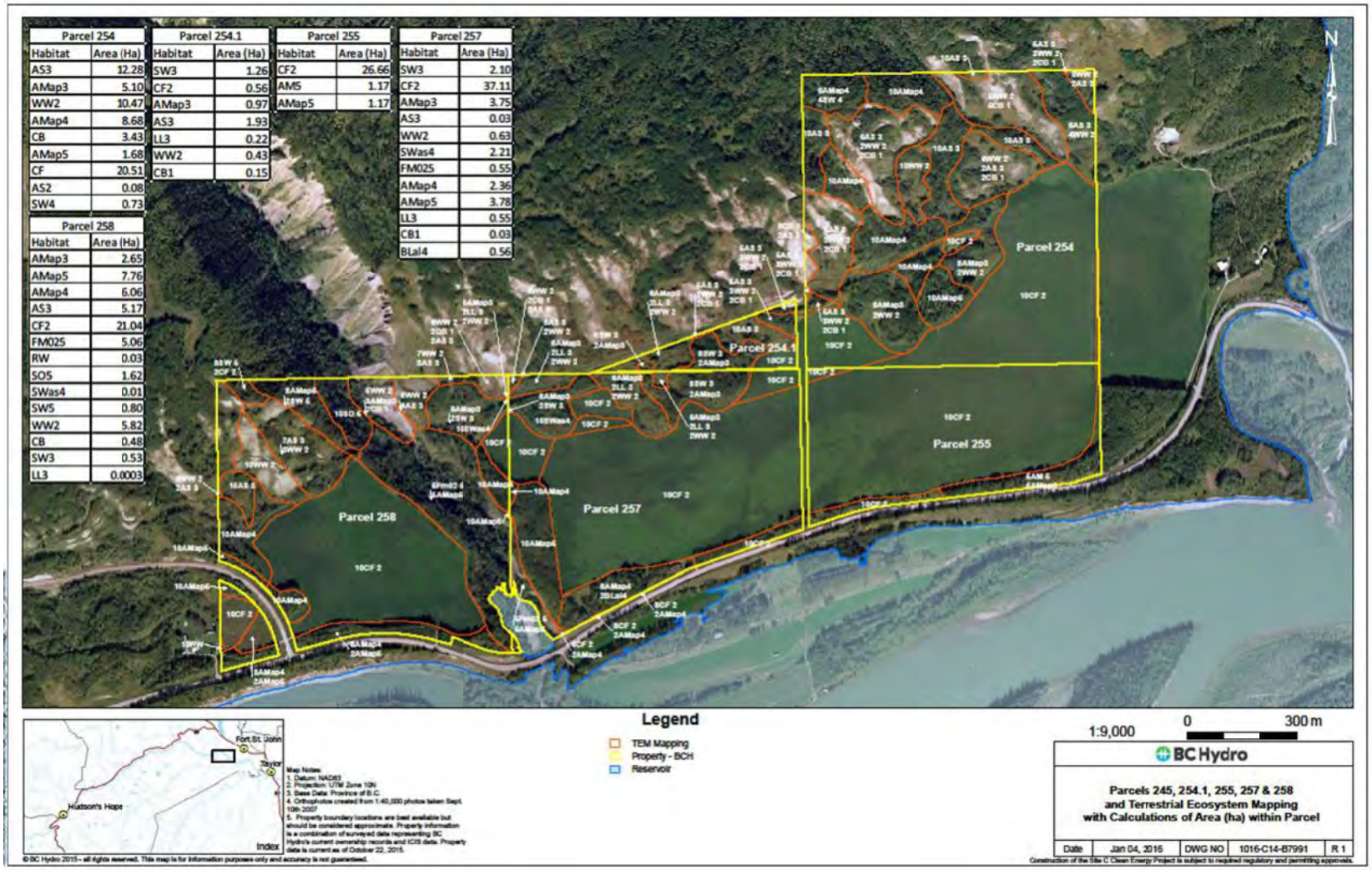

Figure 2. Habitats on the Rutledge property.

Table 2. Habitats mapped within the Rutledge property (Hilton *et al*. 2013a).

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 Highway 29 realignment corridor in 2015, during which two rare vascular plant species and two rare lichens were documented (Table 3). An additional 14 rare plants may occur within portions of the property not surveyed based on the habitats present (Table 3). A rare plant survey for the remainder of the property is planned for 2016.

Table 3. Rare plants potentially occurring on the Rutledge Property (Hilton *et al.* 2013a).

Common Name	Taxon	BC List	Documented on property
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	

Common Name	Taxon	BC List	Documented on property
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

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 steep 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 the 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 above Field 2. From there a prescribed fire burn plan would 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, as well as outline the 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.

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 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*). 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 is mowed every four (4) 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.

2.4.3 Riparian vegetation plantings

A 15-metre riparian vegetation zone will be established along the edge of the reservoir in parcels 256, 257 and 259 through planting of native shrubs and trees outside the five-year beach line (Figure 2). BC Hydro will determine if this work has been completed, then organize the planting. 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 the 15 m riparian vegetation zone is to replace deciduous and coniferous riparian vegetation lost due to reservoir creation. A mix of live staked Balsam poplar (60%), willow (30%) and red-osier dogwood (10%) will be planted at densities of 2,500 stems/ha. In the long term, the vegetation within this zone is expected 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.

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 Rutledge property lands based on their habitat preferences and occurrences documented in the baseline data (Hilton *et al*. 2013b, 2013c, 2013d, 2013e, Hilton and Simpson 2013, and Simpson *et al.* 2013).

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

Hilton *et al*. 2013b, 2013c, 2013d, 2013e, Hilton and Simpson 2013, and Simpson *et al*. 2013

Species	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	mb														
American Kestrel	mb						X								X
American Three-toed Woodpecker	mb	X	X		X			X				X			
Baltimore Oriole	mb	X			X			X			X				
Bank Swallow	mb					X									
Barn Swallow	mb										X				
Bay-breasted Warbler	mb	X						X				X			
Black-billed Magpie	y			X			X				X				X
Blackpoll Warbler	mb	X										X			
Black-throated Green Warbler	mb	X	X		X			X				X			
Bohemian Waxwing	y	X	X					X				X	X	X	
Boreal Chickadee	y	X	X		X			X				X			
Brown Creeper	mb	X										X			
Canada Warbler	mb	X	X									X	X		
Cape May Warbler	mb	X						X				X	X		
Clay-colored Sparrow	mb			X			X								X
Common Nighthawk	mb						X				X				X
Common Yellowthroat	mb														
Connecticut Warbler	mb	X							X				X		

Species	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
Eastern Phoebe	mb						X				X				X
Le Conte's Sparrow	mb						X								X
Least Flycatcher	mb	X	X		X			X			X	X			
Mourning Warbler	mb		X		X			X	X			X	X	X	
Nelson's Sparrow	mb														
Northern Flicker	mb	X	X	X	X			X	X			X	X	X	
Northern Shrike	mb			X			X				X				X
Olive-sided Flycatcher	mb							X							
Pileated Woodpecker	y	X	X					X				X			
Sharp-tailed Grouse	y	X	X	X	X		X	X	X			X	X	X	X
Western Tanager	mb	X							X				X		
Western Wood-Pewee	mb	X						X	X			X	X		
White-throated Sparrow	mb			X			X				X				X
White-winged Crossbill	y	X							X			X	X		
Yellow-bellied Sapsucker	mb	X	X									X	X	X	
Greater Yellowlegs	mb														
Killdeer	mb						X				X				
Upland Sandpiper	mb						X				X				X
Other non-wetland migratory birds present within the Project Area															
American Pipit	mb	X					X			X					
American Redstart	mb	X	X		X		X	X	X			X	X	X	X
American Robin	mb	X	X	X	X		X	X	X		X	X	X	X	X
Black and White Warbler	mb	X	X		X		X	X	X			X	X	X	
Black-capped Chickadee	y	X		X			X	X	X		X	X	X		
Blue-headed Vireo	mb	X					X	X	X			X	X		

Species	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
Calliope hummingbird	mb														
Cassin's vireo	mb											X			
Cedar Waxwing	mb	X		X			X	X	X		X	X	X		
Chipping Sparrow	mb	X	X		X		X	X	X		X	X	X	X	X
Cliff Swallow	mb					b				X					
Common Grackle	y	X	X	X	X		X	X	X			X	X	X	X
Dark-eyed Junco	y	X	X	X	X				X			X	X	X	
Dusky Flycatcher	mb	X	X		X				X			X	X		
Eastern Kingbird	mb	X	X	X								X			
Evening Grosbeak	y	X	X					X				X	X	X	
Fox sparrow	mb	X	X	X	X		X	X	X		X		X	X	X
Golden-crowned Kinglet	mb	X					X	X	X			X	X		
Grey Catbird	mb	X													X
Grey Crowned Rosy Finch	mb					X				X	X				
Hairy Woodpecker	mb	X					X	X	X			X	X		
Hammond's Flycatcher	mb	X	X					X				X	X	X	
Hermit Thrush	mb	X		X		X	X	X	X			X	X		X
House Sparrow	y						X				X				
House Wren	mb	X	X	X			X		X		X		X	X	X
Lincoln's Sparrow	mb	X	X	X	X		X	X	X		X	X	X	X	X
Magnolia Warbler	mb	X	X	X	X			X	X			X	X		
Northern Rough-winged Swallow	mb					X	X								X
Orange-crowned Warbler	mb	X	X	X	X	X	X	X	X		X	X	X	X	X
Ovenbird	mb	X	X		X		X	X	X			X	X	X	X
Pacific Wren	mb														

Species	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
Pacific Slope Flycatcher	mb	X		X				X	X			X	X		
Pine Siskin	mb	X		X		X	X	X	X		X	X	X		X
Purple Finch	mb	X		X		X	X	X	X		X	X	X		X
Red Crossbill	mb	X										X	X		
Red-breasted Nuthatch	y	X		X	X				X			X	X		
Red-eyed Vireo	mb		X	X	X	X	X	X			X	X		X	X
Rose-breasted Grosbeak	mb	X	X	X	X	X	X	X	X			X	X	X	X
Ruby-crowned Kinglet	mb	X					X	X	X			X	X		
Ruby-throated Hummingbird	mb	X	X												
Savannah Sparrow	mb	X	X	X	X		X	X			X	X	X	X	
Says Phoebe	mb	X	X												
Song Sparrow	mb	X	X	X		X	X	X				X	X	X	X
Swainson's Thrush	mb	X	X	X	X	X	X	X	X		X	X	X	X	X
Tennessee Warbler	mb	X	X	X	X		X	X	X		X	X	X	X	
Townsend's Solitaire	mb	X	X					X	X	X			X	X	X
Varied Thrush	mb	X	X		X		X	X				X	X	X	
Vesper Sparrow	mb		X	X			X				X			X	X
Violet-green Swallow	mb	X	X	X		X	X						X	X	
Warbling Vireo	mb	X	X	X	X	X	X	X	X			X	X		X
White-breasted Nuthatch	y		X					X						X	
White-crowned Sparrow	mb	X	X	X			X		X				X	X	
Winter Wren		X	X		X								X	X	
Yellow-rumped Warbler	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															

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 and to prevent wildlife from crossing Highway 29.
    - 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).
    - Along the south boundary of Fields 1 and 2 along Highway 29 an 8' woven wire wildlife fence to prevent ungulates from accessing Highway 29 in an effort to reduce animal-vehicle mortalities and to promote public safety.
- 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, the species currently protect 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 the document "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 British Columbia (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 important 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 the 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 is an important part of this Property. The forested areas have a crown closure of ~60% 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 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 (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 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, 2a, 2b,and 2c 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 in forest cover > 60 years old and at least 10% of the area available for forage (ie. 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. The main road here is Highway 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 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 no roads near the dry south facing slopes, with the Farrel Creek Road at the west end being the closest. 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 the leaseholder.

3.3 Ungulate Winter Range Objectives

Based upon the above suitable characteristics of the proposed UWR area, the following objectives are proposed to manage elk, mule deer and moose winter range.

Table 5 – Ungulate Winter Range Objectives for elk, mule deer and moose (Triton 2002)

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 new roads and no hunting or other recreational uses of the property permitted during the late winter season. • Place warning signs along Highway 29 to warn motorists of ungulate presence.
Reduce animal/vehicle mortalities along Highway 29.	• With reservoir filled ungulates may be pushed closer to the highway increasing animal/ vehicle mortalities.	• Wildlife fencing along Highway 29 (allowing animals to cross under at the culvert).

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 Highway 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 Highway 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 will 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.

Field 1 and 2 have a good alfalfa, timothy, tall fescue stands 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.

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 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.

No grazing will occur in the old field and forested habitat on the Property and livestock will only be permitted once fencing is in place.

Crop fields (Fields 1 and 2): A grazing rotation during the five-month period of mid-May through to mid-October will be followed for the intensively managed fields 1 and 2 only. This will generally entail 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

Results of the 2015 noxious weed inventory will be provided to the lease holder for inclusion in their weed management plan. BC Hydro will assist the leaseholder in development of the weed management plan through its Agricultural Leaseholder Noxious Weed Treatment Program. Through this program, leaseholders can access expert advice from a noxious weed control specialist in planning and implementing noxious weed control. After an audit by the weed control specialist of the efficacy of any chemical treatments, BC Hydro reimburses the leaseholder the cost of chemicals used.

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 degradable twine is to be permitted
- 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
- Wildlife fencing along Highway 29, providing access for water at the existing culvert undercrossing.
- Honeybees will be allowed

6.0 MONITORING AND FOLLOW-UP TO MANAGEMENT OF PROPERTY

6.1 Lease holder record keeping requirements

At a minimum the lease holder 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 following year's treatment
- Wildlife observations, including any issues with wildlife.

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 (TBD).

6.3 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.

7.0 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 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 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 Highway 29 an 8’ woven wire wildlife fence will be installed to prevent ungulates from accessing Highway 29 in an effort to reduce animal-vehicle mortalities and to promote public safety.

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