

Vegetation and Wildlife Mitigation and Monitoring Plan 2018 Annual Report

*Site C Clean Energy Project
March 29, 2019*

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1.0 Introduction

The Vegetation and Wildlife Mitigation and Monitoring Plan Annual Plan describes the measures that will be used to mitigate the 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 #14-02, or 'the EAC') and Federal Decision Statement (FDS) issued for the Project in 2014. The draft and first revision of the VWMMP was submitted to regulatory agencies and Aboriginal Groups for review and feedback on October 17, 2014, and April 7, 2015, respectively. The final VWMMP was submitted to the same recipients on June 5, 2015, and is 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 annual report is to describe the mitigation and monitoring measures that set out in the VWMMP that were implemented between January 1, 2018 and December 31, 2018.

2.0 Objective and Scope

The objective of the Vegetation and Wildlife Mitigation and Monitoring Plan Annual Report (the Report) is to describe the mitigation and monitoring measures implemented in 2018 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 the Vegetation and Wildlife Mitigation and Monitoring Plan (VWMMP), past annual reports, or the current Report, are listed in Tables 1 and 2 below.

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

Requirements of FDS condition 16.3.1 and parts of EAC conditions 9 and 15 were fulfilled in 2015, with results reported in the 2015 Annual Report, and are not addressed in this report:

- FDS Condition 16.3.1 - Field work to verify the modeled results for surveyed species at risk and determine habitat effects for those species (Section 6.4.1 of the 2015 Annual Report).
- EAC Condition 9 - Surveys of existing invasive species populations prior to construction. (Section 7.1.1 of the 2015 Annual Report).
- EAC Condition 9 - Rare and Sensitive community identification (Section 7.1.3 of the 2015 Annual Report)
- EAC Condition 15 - Verification of modelled results (Section 7.3.1 of the 2015 Annual Report).

Requirements of FDS condition 9.9.1 were fulfilled in 2016, with results reported in the 2016 Annual Report, and are not addressed in this report:

- FDS Condition 9.9.1 – Conducting a risk assessment for bird collisions under the current transmission line design (Section 6.1.3 of 2016 Annual Report).

Table 1. Federal Decision Statement Conditions and Relevant Annual Report Sections

FDS Condition	Condition	Annual Report Section
9.	Disturbance and destruction of migratory birds	Section 6.1 Federal Decision Statement Condition 9
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 Condition 9.1
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 Condition 9.2
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 migratory bird nests could occur, during construction, reservoir filling and operation.	Section 6.1.3 Condition 9.3
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 Condition 9.9.2
10	Non-wetland migratory bird habitat	Section 6.2 Federal Decision Statement Condition 10
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 Condition 10.3.1
10.3.2	migratory bird abundance, distribution and use of non-wetland habitat;	Section 6.2.2 Condition 10.3.2
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 6.2.3 Condition 10.3.4
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	Section 6.2.4 Condition 10.3.5

FDS Condition	Condition	Annual Report Section
	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.	Section 6.2.5 Condition 10.3.6
11	Wetlands used by migratory birds and for current use of lands and resources for traditional purposes	Section 6.3 Federal Decision Statement Condition 11
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 Condition 11.1
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 Condition 11.2
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 Condition 11.3
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 Condition 11.4.1
11.4.2	mitigation measures to maintain baseline wetland functions for those wetlands that will not be permanently lost;	Section 6.3.5 Condition 11.4.2
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 Condition 11.4.3
11.4.4	compensation measures to address the	Section 6.3.7 Condition 11.4.4

FDS Condition	Condition	Annual Report Section
	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	
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 Condition 11.8
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 Condition 11.9
16	Species at risk, at-risk and sensitive ecological communities and rare plants	Section 6.4 Federal Decision Statement Condition 16
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	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 Condition 16.3.3
16.3.4	conservation measures to ensure the viability of rare plants, such as seed recovery and plant relocation;	Section 6.4.2 Condition 16.3.4

FDS Condition	Condition	Annual Report Section
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 Condition 16.3.6
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.	Section 6.4.4 Condition 16.3.7

Table 2. Environmental Assessment Certificate Conditions and Relevant Annual Report Sections

EAC Condition	Condition	Plan Reference^(a)
VEGETATION AND ECOLOGICAL COMMUNITIES		
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 EAC Condition 9
	The Vegetation and Invasive Plant Management Plan must include at least the following:	
	Invasive Species	
	<ul style="list-style-type: none"> Surveys of existing invasive species populations prior to construction. 	2015 Annual Report (Section 7.1.1)
	<ul style="list-style-type: none"> Invasive plant control measures to manage established invasive species populations and to prevent invasive species establishment. 	Section 7.1.1 Invasive Plant Control
	Rare Plants and Sensitive Ecosystems	
	<ul style="list-style-type: none"> The EAC Holder must expand its modelling, including completing field work, to improve 	2015 Annual Report (Section 7.1.3)

EAC Condition	Condition	Plan Reference ^(a)
	<p>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</p>	
	<ul style="list-style-type: none"> 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. 	<p>Section 7.1.2 Inventory Areas Not Already Surveyed</p>
	<ul style="list-style-type: none"> 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. 	<p>Section 7.1.3 Spatial Database of Known Rare Plant Occurrences</p>
	<ul style="list-style-type: none"> 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. 	<p>Section 7.1.4 Rare plant avoidance</p>
	<ul style="list-style-type: none"> 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. 	<p>Section 7.1.5 Protect tufa seeps, wetlands and rare plants located adjacent to construction areas</p>
	<ul style="list-style-type: none"> 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). 	<p>Section 7.1.6 Experimental rare plant translocation program</p>
<p>10</p>	<p>The EAC Holder must fund or undertake directly with the use of a Rare Plant Botanist the following, during construction:</p>	<p>2017 Annual Report (Section 7.2)</p>
	<ul style="list-style-type: none"> Targeted surveys in the 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 	<p>2017 Annual Report (Section 7.2.1 and Appendix 9)</p>

EAC Condition	Condition	Plan Reference ^(a)
	<p>by the MOEs Conservation Framework requiring additional inventories</p> <ul style="list-style-type: none"> A study focused on clarifying the taxonomy of Ochroleucus bladderwort (<i>Utricularia ochroleuca</i>), including field, herbaria, and genetic work in consultation with FLNR and the MOE (BC Conservation Data Centre). 	2017 Annual Report (Section 7.2.2 and Appendix 10)
11	<p>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:</p> <ul style="list-style-type: none"> 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. <p>The EAC Holder must engage with FLNR, MOE and Aboriginal Groups with regard to the development of the compensation program.</p>	<p>Section 7.3 EAC Condition 11</p> <p>Section 7.3.1 Habitat Enhancement Projects in the RAA</p> <p>Section 7.3.2 Direct purchase of lands in the RAA to enhance or retain rare plant values</p> <p>Section 7.3.3 Engaging with FLNRORD, MOE and Indigenous Groups</p>
12	<p>The EAC Holder must develop a Wetland Mitigation and Compensation Plan.</p> <p>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.</p> <p>The Wetland Mitigation and Compensation Plan must include at least the following:</p> <ul style="list-style-type: none"> 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 	<p>Section 7.4 EAC Condition 12</p> <p>Section 7.4.1 Wetland Mitigation and Compensation</p> <p>Section 7.4.1.1 Information on location, size and type of wetlands affected by the Project</p> <p>2017 Annual Report (Section 7.3.1.2)</p> <p>2017 Annual Report (Section 7.3.1.3)</p>

EAC Condition	Condition	Plan Reference ^(a)
	<p>where excavation, spoil placement, and staging activities occur.</p>	
	<ul style="list-style-type: none"> 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. 	<p>2017 Annual Report (Section 7.3.1.4)</p>
	<ul style="list-style-type: none"> 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). 	<p>2017 Annual Report (Section 7.3.1.5)</p>
14	<p>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.</p> <p>The Vegetation and Ecological Communities Monitoring and Follow-up Program must include at least the following:</p>	<p>Section 7.5 Condition 14</p>
	<ul style="list-style-type: none"> Definition of the study design for the rare plant translocation program (see condition 9). 	<p>7.5.1 Definition of the study design for the Experimental Rare Plant Translocation Program</p>
	<ul style="list-style-type: none"> 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. 	<p>7.5.2 Plan for monitoring translocations</p>
	<ul style="list-style-type: none"> 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. 	<p>7.5.3 Measurement criteria for effectiveness monitoring of habitat enhancement and compensation programs</p>
WILDLIFE RESOURCES		
15	<p>The Wildlife Management Plan must be developed by a QEP.</p>	<p>Section 4.0 Qualified Professionals</p>
	<p>The Wildlife Management Plan must include at least the following:</p>	
	<ul style="list-style-type: none"> Field work, conducted by a QEP, to verify the 	<p>2015 Annual Report (Section</p>

EAC Condition	Condition	Plan Reference ^(a)
	<p>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 FLNR.</p>	7.3.1)
	<ul style="list-style-type: none"> Measures to avoid, if feasible, constructing in sensitive wildlife habitats. If avoiding sensitive wildlife habitats is not feasible, condition 16 applies. 	Section 7.6.1 Measures to avoid, if feasible constructing in sensitive wildlife habitats
	<ul style="list-style-type: none"> 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 7.6.2 Setback buffers to avoid direct impacts to sensitive habitats
	<ul style="list-style-type: none"> Protocol for the application of construction methods, equipment, material and timing of activities to mitigate adverse effects to wildlife and wildlife habitat. 	Section 7.6.3 Mitigation of adverse effects to wildlife and wildlife habitat
	<ul style="list-style-type: none"> 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 7.6.4 Protocol to ensure that lighting is focused on work sites
	<ul style="list-style-type: none"> 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. <p>The EAC Holder must ensure that all workers are familiar with the Wildlife Management Plan.</p>	Section 7.6.5 Environmental training of workers
16	<p>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.</p>	Section 7.7 EAC Condition 16
	<p>The Vegetation and Wildlife Mitigation and Monitoring Plan must include the following compensation measures:</p>	
	<ul style="list-style-type: none"> 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 7.7.1)
	<ul style="list-style-type: none"> Establishment of nest boxes for cavity-nesting 	Section 7.7.1 Nest boxes for

EAC Condition	Condition	Plan Reference ^(a)
	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.	cavity-nesting waterfowl
	<ul style="list-style-type: none"> 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 7.7.2 A design for bat roosting habitat in HWY 29 bridges
	<ul style="list-style-type: none"> Following rock extraction at Portage Mountain, creation of hibernating and roosting sites for bats. 	Section 7.7.3 Creation of hibernating and roosting sites for bats VWMMP Section 8.7.6
	<ul style="list-style-type: none"> 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 7.7.4 Resting sites for fisher
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 7.8 EAC Condition 19
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 7.9 EAC Condition 21
	The Vegetation and Wildlife Mitigation and Monitoring Plan must be developed by a QEP.	Section 4.0 Qualified Professionals
	The Vegetation and Wildlife Mitigation and Monitoring Plan must include at least the following:	
	<ul style="list-style-type: none"> Monitor Bald Eagle nesting populations adjacent to the reservoir, including their use of artificial nest structures. 	Section 7.9.1 Monitoring of Bald Eagle nesting populations
	<ul style="list-style-type: none"> Monitor waterfowl and shorebird populations and their use of natural wetlands, created wetlands, and artificial wetland features. 	Section 7.9.2 Monitoring waterfowl and shorebird populations
	<ul style="list-style-type: none"> Survey songbird and ground-nesting raptor populations during construction and operations 	Section 7.9.3 Survey songbird and ground-nesting raptor populations
	<ul style="list-style-type: none"> Require annual reporting during the construction phase and during the first 10 years of operations to 	Section 7.9.4 Annual reporting beginning 180 days following

EAC Condition	Condition	Plan Reference ^(a)
	EAO, beginning 180 days following commencement of construction.	commencement of construction
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 <i>Species at Risk Act</i> .	Section 7.10 Status of listed species

(a) VWMMP: Vegetation and Wildlife Mitigation and Monitoring Plan. Submitted to FLNRORD, MOE and the Environmental Assessment Office on June 5, 2015.

3.0 Consultation

Consultation regarding the development and implementation of individual programs conducted in 2018 is provided below.

3.1 Canadian Wildlife Services

In 2018 BC Hydro continued to consult with the Canadian Wildlife Service (CWS) during plan development and implementation. Consultation with CWS in 2018 continued with regard to the Wetland Function Assessment (WFA), the Wetland Monitoring Program, the Downstream Vegetation Monitoring Plan, and various migratory bird monitoring plans (e.g., songbirds, woodpeckers, common nighthawk, and waterbirds). 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 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 (see Section 3.2) to provide ongoing engagement between BC Hydro, Ministry of Environment (MOE) and Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD) 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. Environment Canada joined the committee in July of 2016.

The VWTC met in person or via conference call twelve (12) times between January and December 2018 to address the Program Areas laid out in Schedule A of Conditional Water Licenses 132990 and 132991. Table 3 summarizes the status of each Program Area discussed as of December 31, 2018.

Table 3. Status of Schedule A Program Areas as of December 31, 2018.

Program Area	Status as of December 1, 2018
Completed	
1. Ungulates	Complete
2.2. Wetlands and Riparian Habitat: Downstream Vegetation Monitoring	Complete
4. Bats	Complete
5.1. Snakes – Downstream Monitoring	Complete
5.2. Snakes – Hibernacula Mitigation and Monitoring	Complete
6.1. Amphibians – Downstream Monitoring	Complete
6.2 Amphibians – Migration Mitigation	Complete
7. Eagles	Complete
8.3 Breeding and Migratory Birds – Common	Complete

Program Area	Status as of December 1, 2018
Nighthawk	
9. Ground Nesting Raptors	Complete
10. Cavity Nesting Species	Complete
11.2. Rare Plants – Regional Surveys	Complete
12. Sharp-tailed Grouse	Complete
13. Lighting Effects	Complete
14. Carnivore Den Sites	Complete
15. Other Raptors	Complete
16. Other Species at Risk	Complete
In Progress	
2.1. Wetlands and Riparian Habitat: Wetland Function Assessment	In progress
3. Fisher	In progress
8.1. Breeding and Migratory Birds - Songbirds	In progress
8.2. Breeding and Migratory Birds – Waterbirds	In progress
8.4. Breeding and Migratory Birds – Woodpeckers	In progress
8.5. Breeding and Migratory Birds – Nest Monitoring	In progress
11.1. Rare Plants - Translocation	In progress

4.0 Qualified professionals

The Qualified Professionals involved in the development and implementation of vegetation and wildlife mitigation and monitoring programs in 2018 are listed in Table 4.

Table 4. Qualified Professionals involved in development and implementation of programs in 2018

Qualified Professional	Area of Work
Brock Simons, M.Sc., R.P.Bio. BC Hydro	Vegetation and Wildlife
Lisette Ross, M.Sc., P.Biol., Native Plant Solutions	Wetland Function Assessment, Wetland Monitoring Program
Lynn Dupuis, M.Sc., P.Biol., Native Plant Solutions	Wetland Function Assessment, Wetland Monitoring Program
Llwellyn Armstrong, M.Sc., Ducks Unlimited Canada	Statistician - Wetland Function Assessment Wetland Monitoring Program
Melissa Mushanski, M.Sc., Native Plant Solutions	Wetland Monitoring Program
Justin Vitt, Native Plant Solutions	GIS – Wetland mapping, Wetland Monitoring Program
Susan Witherly, M.Sc., Ducks Unlimited Canada	GIS – Wetland mapping

Qualified Professional	Area of Work
Natasha Bush, B.Sc. P.Ag., EcoLogic Consultants Ltd.	Experimental Rare Plant Translocation, Wetland Monitoring Program, and Hwy 29
Dan McAllister, M.Sc., P.Ag., EcoLogic	Experimental Rare Plant Translocation, Wetland Monitoring Program and Hwy 29
Jamie Fenneman, Ph.D. R.P.Bio., Ecologic	Experimental Rare Plant Translocation and Wetland Monitoring Program
Ryan Durand, M.Sc. R.P.Bio., EcoLogic	Experimental Rare Plant Translocation, Wetland Monitoring Program and Hwy 29
Jason Jones, Ph.D. R. P. Bio., P. Biol., EcoLogic	Experimental Rare Plant Translocation, Songbird and Raptor Monitoring, Woodpecker Monitoring, Fisher Mitigation, Wetland Monitoring Program and Hwy 29
Holly Buehler, M.Sc., EcoLogic	Experimental Rare Plant Translocation, Wetland Monitoring Program and Hwy 29
Randy Krichbaum, M.Sc., P.Biol., R.P.Bio.- Eagle Cap Consulting Ltd.	Pre-construction Rare Plant Surveys and Experimental Rare Plant Translocation
Margaret Krichbaum, B.Sc.- Eagle Cap	Pre-construction Rare Plant Surveys and Experimental Rare Plant Translocation
Jeff Matheson M.Sc., R.P.Bio., P.Biol.	Experimental Rare Plant Translocation, Regional Rare Plant Surveys.
Claudio Bianchini, R.P. Bio., Bianchini Biological Services	Breeding bird and raptor monitoring
Todd Heakes, Tetra Tech Canada Inc.	Breeding bird and raptor monitoring
Kerrith McKay, McKay Environmental Consulting Ltd.	Breeding bird and raptor monitoring
Elyse Hofs, B.Sc., Dipl.T., Tetra Tech Canada Inc.	Breeding bird and raptor monitoring
Charlie Palmer, M.Sc., P.Biol., R.P.Bio, Hemmera Envirochem Inc.	Cavity nesting bird mitigation, waterbird monitoring, Portage Mountain bat monitoring, bald eagle monitoring
Ashleigh Ballevena, B.Sc., R.P.Bio, Hemmera	Bald eagle data management
Beth Boyce, B.Sc., EPt	Bald eagle data management
Brian Paterson, B.Sc., R.P.Bio, Hemmera	Bald eagle monitoring field lead, Portage Mountain bat data detector downloads, waterbird monitoring
Kyle Routledge, B.Sc., R.P.Bio, Hemmera	Waterbird monitoring field lead, cavity nesting bird mitigation field lead
Toby St. Clair, M.Sc., Hemmera	Waterbird monitoring field lead, western toad and gartersnake monitoring
Felix Martinez-Nunez, M.Sc., R.P.Bio, Hemmera	Waterbird monitoring field lead, Portage Mountain bat monitoring field lead and acoustic analyst
Jay Brogan M.Sc., R.P.Bio., Hemmera	Waterbird monitoring field lead, western toad and gartersnake monitoring
David Clegg, A.Ag., Hemmera	Western toad mitigation road surveys
Jared Hobbs, M.Sc., R.P.Bio, Hemmera	Gartersnake monitoring plan

Qualified Professional	Area of Work
Dan Webster, B.Sc., P.Ag., R.P.Bio., P.Biol., Eco-Web Ecological Consulting Ltd.	Portage Mountain bat monitoring, bald eagle monitoring
Kyle Brown, Eco-Web Ecological Consulting Ltd.	Western toad mitigation road surveys
Sigrid Moe, R.B. Tech., Eco-Web Ecological Consulting Ltd.	Western toad mitigation road surveys, Portage Mountain bat detector downloads
Jodi Fleming, B.Sc., P.Ag., BIT, Eco-Web Ecological Consulting Ltd.	Portage Mountain bat monitoring, western toad and gartersnake monitoring

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 Federal Decision Statement (FDS) conditions; Section 7.0 describes those measures that were implemented to meet the requirements of the Environmental Assessment Certificate (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.

Several of the programs outlined in the Vegetation and Wildlife Mitigation Plan were not implemented in 2018. Table 5 below outlines which programs were not implemented, and when they will be implemented and reported in annual reports.

Table 5. Summary of programs not implemented in 2018

Condition Number	Program to be Implemented	Planned Implementation Year	Planned Inclusion in Annual Report
FDS 9.3	Nest Monitoring	2021	2021
FDS 10.3.3	Littoral zone enhancements	2019	2019
	Riparian plantings	TBD	TBD
FDS 16.3.6	Wetlands and Riparian Habitat: Downstream Vegetation Monitoring	2019	2019
EAC 16	Construction of artificial snake hibernacula	2019	2019
EAC 21	Monitor amphibian use of migration crossing structures	TBD	TBD

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 2018 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 August¹. 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 within are present in areas scheduled to be cleared. 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.

In 2018, pre-clearing nesting activity surveys were completed between April and August along the planned Highway 29 realignment, as well as and various other locations where small-scale clearing was occurring. If active or suspected nest areas were identified, then protective buffers were established around the nest area, as determined by a Qualified Environmental Professional (QEP).

After each area was surveyed, a free-to-work survey report was produced. The report maps the area surveyed and indicates which areas were free-to-work, any conditions placed on work activities, location of buffered nests and the expiry date of the free-to-work period.

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 17 October 2014. The most recent revised construction schedule, updated on 24 October 2018, can be found in Appendix 1.

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 in 2016, 2017 and 2018 as part of the monitoring

¹ https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#_zoneB_calendar

program. The Breeding Bird Follow-up Monitoring – Songbirds 2018 Annual Report can be found in Appendix 2.

6.1.3.2 Common nighthawk surveys

Common Nighthawk is designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Threatened under Schedule 1 of the Species at Risk Act (SARA), and listed as Yellow (secure) in British Columbia. Common nighthawk surveys were conducted in 2010 and 2012 in support of the EIS. Surveys are again occurring 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 Annual Report can be found in Appendix 3.

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 2018 Annual Report can be found in Appendix 4.

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’). Waterbirds 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. As aerial surveys have been shown to make identifying most waterbirds to the species level, it is expected that the aerial component of waterbird surveys will be discontinued and not applied in 2018. The Waterbirds Follow-up Monitoring 2018 Annual Report can be found in Appendix 5.

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 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 bottom of the guy wires are marked with bright yellow plastic guards, which will increase their visibility, and further reduce risk to birds.

The transmission line has not yet been constructed, but once constructed the mitigations implemented will be documented in the appropriate VWMMP Annual Report.

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 2018 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, for which the results of 2018 surveys are summarized 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, for which the results of 2018 surveys are summarized 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 10.3.4

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 (Marl Fen, Rutledge and Wilder Creek) that were retained (in part) to provide habitat for non-wetland migratory birds. Management plans for those properties were included in the 2015 annual report. No new properties were added to the program in 2018.

6.2.4 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.*

BC Hydro has not been made aware of any current use of its fee simple lands for traditional purposes by Aboriginal peoples. The purchase and retention, by BC Hydro, of fee simple lands is not expected to affect current use of lands and resources for traditional purposes by Aboriginal people. 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.

6.2.5 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 2018 results of the implementation of those plans are summarized 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

This section of the annual report summarizes the components of the VWMMP implemented to fulfill FDS condition 11 in 2018 in accordance with the requirements of FDS condition 11.9. For context, the complete requirements of FDS condition 11 are shown 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 trothed, their boundaries flagged and coordinates recorded using GPS. This information was also used when determining the location of access roads that will be 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. Please refer to In 2018 BC Hydro revised the Wetland Function Assessment (WFA) in response to comments from CWS, FLNRORD and MOE. A revised version of the WFA was distributed to the VWTC on 18 April 2018.

BC Hydro continues to manage the Marl Fen property, which was retained (in part) to protect the marl fen that makes up part of the property. The management plan for that property was included in the 2015 annual report. In 2017, with support by Ducks Unlimited, BC Hydro identified a good candidate wetland for restoration on private land and has been working with the landowner and the Agricultural Land Commission (ALC) to secure an appropriate covenant to the title and commence restoration activities. In 2018, at the suggestion of Indigenous Groups, BC Hydro has been focussing efforts on finding opportunities for wetland protection and enhancement on BC Crown lands, so that benefits can be realized for use of those lands and resources for traditional purposes. A candidate site has been identified, and planning for wetland enhancement at the site is ongoing.

A wetland monitoring program has been developed through consultation with and review by MoE, FLNRORD, and CWS by way of the VWTC. Based on the requirements for wetland monitoring described in FDS Condition 11, a monitoring program must be informative enough to allow for:

- 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 spring and fall waterfowl and shorebird surveys conducted in 2018). Baseline data regarding current use of wetlands for traditional purposes by Aboriginal people have been gathered by the BC Hydro Indigenous relations team through groundtruthing with FN groups, who will also gather and compile data regarding changes to use of wetlands for traditional purposes.

The priority for the wetland monitoring program in 2018 was to sample wetland habitats for which baseline data may be insufficient, and which are likely to soon be impacted by clearing or construction activities. The wetland monitoring program annual report for 2018 is in Appendix 6. The wetland monitoring program is currently being revised to incorporate field learnings and data gathered to focus the program for 2019.

6.3.3 Condition 11.4.3

This section summarizes actions taken in accordance with the following requirement of Condition 11.2: *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 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 as a result 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.*

Considerable baseline data on the biogeochemical, hydrological and ecological functioning of wetlands and associated riparian habitat were collected during baseline surveys for the EIS, and subsequent surveys of wetlands likely to be impacted by the transmission line RoW. See Section 6.3.2 for a description of the full wetland monitoring program that was implemented in 2018.

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.*

Wetland function will be maintained for wetlands that will not be permanently lost through timing of works (e.g. winter to minimize ground disturbance), maintenance of hydrology through the installation of culverts during road construction (see Section 7.5.1.2), and approaches to minimize impacts to wetlands through careful construction practices (see Section 6.3.1). The wetland monitoring program and Wetland Function Assessment tool 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 the plan for monitoring and evaluating changes to baseline 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 the 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, FLNRORD and MOE.

6.4 Federal Decision Statement Condition 16

This section of the annual report summarizes the programs as implemented in 2018 in accordance with the requirements of FDS condition 16.6.

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

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| <p>16. Species at risk, at-risk and sensitive ecological communities and rare plants</p> <p>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.</p> <p>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.</p> <p>16.3. The plan shall include:</p> <ul style="list-style-type: none">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; and16.3.7. 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.

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 2018 the following measures were implemented to mitigate effects on species at risk and at-risk and sensitive ecological communities and rare plants:

- Completion of pre-construction rare plant surveys focussed on Highway 29 corridors, and proposed access roads into the eastern reservoir clearing areas. (Section 6.4.1.1)
- Completion of amphibian dispersal mitigation and salvages (Section 6.4.1.2)
- Implementation of protection measures for wetland and riparian areas, in which rare plant occurrences are generally concentrated, in the CEMP (See Section 6.3.1).
- The Environmental Features Map was updated with the 2018 rare plant data on 12 October, 2018 and posted in the data room for contractors to access for planning purposes.
- Further development and implementation of the Experimental Rare Plant Translocation program in consultation with MOE, FLNRORD and CWS (Section 7.1.6).
- Avoidance of hibernacula and suspected maternity roosts at Portage Mountain. The 2017 Annual Report described how impacts to hibernacula at Portage Mountain will be avoided. Monitoring of bat activity at Portage Mountain began in 2017 for evaluating the effectiveness of mitigation (Section 6.4.3).

6.4.1.1 Pre-construction rare plant surveys

Pre-construction rare plant surveys were conducted in 2018 in areas of the planned Project footprint not previously surveyed. The resultant data served as inputs to the final design of access roads, as well as to provide information for potential propagule sources for the Experimental Rare Plant Translocation Program (see Section 7.1.6). 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 2018 pre-construction rare plant survey report, which includes methods and results from surveys conducted in 2015-2018, is 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 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]; 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 Vegetation and Wildlife Mitigation and Monitoring Plan. Notify BC Hydro of such installations within 5 days of installation;
- Implement amphibian salvage and relocation procedures as required. Amphibian salvages could be required when avoidance of areas containing metamorphosing tadpoles cannot be avoided, when mass migration events cross access roads, or prior to the destruction of wetlands supporting amphibians (Wildlife Act Permit FJ16-226024, expires December 31, 2023).

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 FLNRORD, MoE and CWS within the VWTC, and can be found in Appendix 6 of the 2017 Annual Report. This procedure was finalized June 26, 2017, and since that time has been required for inclusion in all contractors' EPPs for works that could impact amphibians. 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.

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 propagule collection phase of an Experimental Rare Plant Translocation program was developed in consultation with MOE, FLNRORD and CWS. Collection of seeds began in 2017 and continued in 2018 (see Section 7.1.6).

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 2018. 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.

6.4.3.2 Ground Nesting Raptor Surveys

Ground nesting raptor surveys were conducted in 2018 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 7.9.3.2). Short-eared owl is provincially Blue-listed and federally listed as Special Concern on Schedule 1 of SARA.

6.4.3.3 Bat Mitigation Monitoring at Portage Mountain

To avoid destroying the hibernacula at Portage Mountain that are being used by little brown myotis and northern myotis, BC Hydro redesigned the 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 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 Section 7.7.3 of this annual report and is described in detail in Appendix 8 of the 2016 Annual Report.

To prevent damaging rock structures associated with the hibernacula, the BC MoE² 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 evaluated the accuracy of noise modelling predictions at the hibernacula by monitoring noise during test blasting at Portage Mountain Quarry in August of 2018. That monitoring found that blasting within the re-designed quarry boundaries is not likely to exceed

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

the thresholds for noise and vibration defined within the BC MOE Best Management Practices Guidelines for Bats in British Columbia. All measurements for hibernacula locations demonstrated an air overpressure of less than 150 decibels, a shock wave less than 15 p.s.i., and peak particle velocity (PPV) less than 15 mm/second.

In addition, BC Hydro is conducting year-round monitoring of bat use at Portage Mountain, with the following objectives:

- confirm that the bat species previously recorded at Portage Mountain remain present during quarry operations;
- evaluate any changes in the use of hibernacula 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; and
- emergence counts with bioacoustic surveys to help determine whether maternity roosts are present, and to evaluate the efficacy of spatial setback mitigation from suspected maternity roosts.

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 gartersnake in wetlands downstream of Site C, and implemented in 2018. Western toad is federally listed as Special Concern under COSEWIC, SARA Schedule 1 – Special Concern, but is considered not at risk in BC. The 2018 annual report of this program is in Appendix 8.

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 implemented in 2018 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).

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 revised its ranking of species at risk in 2018. The following documents were reviewed to identify changes to rankings of species documented in the LAA during baseline surveys³:

³ Ministry of Environmental Protection and Sustainability. 2018. 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: 14 March 2019.

- 2018 BC Conservation Status Rank Review and Changes: Vascular and Non-Vascular Plants
- 2018 BC Conservation Status Rank Review and Changes: Invertebrate and Vertebrate Animals

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

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. A summary of the lists are provided below and can be accessed at <http://www.env.gov.bc.ca/atrisk/help/list.htm>:

- **Red-list:** Includes any indigenous species or subspecies that have, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia. Extirpated taxa no longer exist in the wild in British Columbia, but do occur elsewhere. Endangered taxa are facing imminent extirpation or extinction. Threatened taxa are likely to become endangered if limiting factors are not reversed. Not all Red-listed taxa will necessarily become formally designated. Placing taxa on these lists flags them as being at risk and requiring investigation.
- **Blue-list:** Includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia. Taxa of Special Concern have characteristics that make them particularly sensitive or vulnerable to human activities or natural events. Blue-listed taxa are at risk, but are not Extirpated, Endangered or Threatened.
- **Yellow-list:** 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 subspecies 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 where more inventory and/or data gathering is needed

6.4.4.1 Rare Plants

In 2018 the conservation status of 28 species with potential to occur in the Site C Project area changed (Table 6). All changes for previously listed species represented reductions in conservation status, largely due to the results of regional rare plant surveys (see Section 7.2.1 and Appendix 9 of the 2017 Annual Report) showing that rare plants identified during Site C baseline surveys are not as rare as previously believed. Creeping sulphur (*Fulgensia subbracteata*) was added to the list, and is ranked as Red-listed.

Table 6. 2018 BC Conservation Status Rank for Plants Occurring in and around the Site C Project Area

Scientific Name	Common Name	2017 Status	2018 Status
<i>Antennaria neglecta</i>	field pussytoes	Blue	Yellow
<i>Avenula hookeri</i>	spike-oat	Blue	Yellow
<i>Botrychium crenulatum</i>	dainty moonwort	Blue	Yellow
<i>Calamagrostis montanensis</i>	plains reedgrass	Blue	Yellow
<i>Carex heleonastes</i>	Hudson Bay sedge	Blue	Yellow
<i>Epilobium halleanum</i>	Hall's willowherb	Blue	Yellow
<i>Geum triflorum</i> var. <i>triflorum</i>	old man's whiskers	Red	Yellow
<i>Glyceria pulchella</i>	slender mannagrass	Blue	Yellow
<i>Lempholemma polyanthes</i>	mourning phlegm	Blue	Yellow
<i>Leptogium intermedium</i>	fourty-five vinyl	Blue	Yellow
<i>Leptogium tenuissimum</i>	birdnest vinyl	Red	Yellow
<i>Malaxis brachypoda</i>	white adder's-mouth orchid	Blue	Yellow
<i>Phaeophyscia kairamoi</i>	five o'clock shadow	Blue	Yellow
<i>Potentilla pulcherrima</i>	pretty cinquefoil	Red	Yellow
<i>Silene drummondii</i> var. <i>drummondii</i>	Drummond's campion	Blue	Yellow
<i>Sphenopholis intermedia</i>	slender wedgegrass	Blue	Yellow
<i>Stuckenia vaginata</i>	sheathing pondweed	Blue	Yellow
<i>Usnea cavernosa</i>	pitted beard	Blue	Yellow
<i>Fulgensia subbracteata</i>	creeping sulphur	[not tracked]	Red
<i>Artemisia herriotii</i>	Herriot's sage	Red	Blue
<i>Carex sprengei</i>	Sprengel's sedge	Red	Blue
<i>Chrysosplenium iowense</i>	Iowa golden-saxifrage	Red	Blue
<i>Drosera linearis</i>	slender-leaf sundew	Red	Blue
<i>Pedicularis parviflora</i>	small-flowered lousewort	Red	Blue
<i>Penstemon gracilis</i>	slender penstemon	Red	Blue
<i>Polypodium sibiricum</i>	Siberian polypody	Red	Blue

Scientific Name	Common Name	2017 Status	2018 Status
<i>Ranunculus rhomboideus</i>	prairie buttercup	Red	Blue
<i>Rorippa calycina</i>	persistent-sepal yellowcress	Red	[not tracked]

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 2018. In addition, no recovery strategies for federally listed species likely to occur within the Site C Project Area were released in 2018.

In 2018, the BC Conservation Data Centre (CDC) listing did not change for any wildlife species that occur in the LAA. However, the rank for Cape May warbler (*Setophaga tigrina*; provincially Blue-listed) changed from S3B (Vulnerable) to S3S4B (Apparently 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 2018 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, FLNR, 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 EAO, Environment Canada, FLNR, 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

Refer to Section 4.15 of CEMP and the Invasive Weed Mitigation and Adaptive Management Plan (IWMAMP). Numerous invasive plant control measures for the Project continued in 2018:

- invasive plant removal through hand pulling;
- on-going inventories of invasive plant locations;
- extensive 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;
- In 2018, BC Hydro utilized the Main Civil Works contractor's onsite wash station to keep vehicles free of dirt and invasive plants. Use of that wash station will continue until a permanent wash station is constructed. Procurement is ongoing for a permanent wash station, which is planned to be installed in 2019.
- 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 2018 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 updated with the 2018 rare plant data on 12 October 2018 and posted in the data room for contractors to access in their planning.

The 2018 rare plant data was submitted to Jennifer Penny, Program Botanist at the BC Conservation Data Center, MOE, on 11 January 2018.

Voucher specimens were submitted to the Herbarium at the University of British Columbia in the fall of 2018.

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 2018 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.

The way in which 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 has been 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 mats over occurrences to reduce soil compaction, use rubber-tired equipment, and implement designated travel routes to and from work sites. Additional mitigation for rare plant occurrences that cannot be avoided is through the Experimental Rare Plant Translocation program, through which rare plant propagules are being collected, propagated, out-planted and monitored (see Sections 7.1.6, 7.5.1 and 7.5.2).

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.*

In accordance with the CEMP, a wetland on the north bank of the dam construction site was established as a work avoidance zone, within which no construction activity will be permitted. This zone will be maintained throughout construction.

Within the transmission right of way Riparian Vegetation Management Areas/Machine Free Zones have been established around wetlands. Within this zone clearing will be carried out by either hand-falling or having machines reach in from the edge of the RVMA (machines are not allowed to enter the RVMA). No burning, mulching or chipping is allowed within an RVMA. Vegetation with a normal mature height less than 3 m and conifers less than 2m will not be removed from the RVMA.

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).*

A field program was conducted in 2018, as part of Site C Project's Experimental Rare Plant Translocation Program. Field activities conducted in 2018 were propagule collection, ex-situ propagation, and the first year of translocation implementation. A technical memorandum summarizing the results and recommendations arising from the

2018 field program can be found in Appendix 9.

7.3 EAC Condition 11

This section of the annual report summarizes the programs implemented in 2018 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 FLNR, MOE and Aboriginal Groups with regard to the development of the compensation program.

7.3.1 Habitat Enhancement Projects in the 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 Ducks Unlimited for wetland compensation activities (Section 6.3.2), and Ecologic Consultants through the Sauteau-EBA Environmental Services Joint Venture for the Rare Plant Translocation Program (Section 7.1.6).

7.3.2 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 are provided in the 2015 Annual Report for the VWWMP.

7.3.3 Engaging with FLNRORD, MOE and Indigenous Groups

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

BC Hydro continues to engage in the development of the compensation program for the loss of rare and sensitive habitats and to protect occurrences of rare plants through the VWTC. 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 forums, and a wetland and rare plant focussed environmental forum that was held in Fort St. John on 13 November 2018.

7.4 EAC Condition 12

This section of the annual report summarizes the programs implemented in 2018 in accordance with the requirements of Condition 12.

Details regarding the Wetland Mitigation and Compensation Plan and wetland mapping are described in Section 7.4.1 and 7.4.1.1, respectively. Additional details regarding maintaining hydrological balance at wetlands, sedimentation barriers, stormwater management, implementation of approved work practices and Develop with Care are presented in Section 7.3 of the 2017 VWMMP Annual Report.

For context, the complete 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, FLNR, 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, FLNR, 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.

7.4.1 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 6.3.2 for a summary of wetland mitigation plan development for 2018.

7.4.1.1 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 the Maple Leaf Forestry dataset. The TEM was generated in and around the Project Activity Zone (PAZ), including 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; however, because up to three wetland types (and potentially more than three wetlands) can be found within a TEM polygon,

the TEM habitat mapping's usefulness for characterizing wetlands that may be affected is limited.

Detailed wetland mapping was created by BC Hydro to be a finer scale wetland mapping inventory 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 was done in 2018 through the wetland monitoring program (Section 6.3.2).

7.5 EAC Condition 14

This section of the annual report summarizes the programs as implemented in 2018 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.

7.5.1 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)⁴. The goals of the experimental rare plant translocation program are to contribute to:

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

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

The secondary objectives of the ERPT program are to:

1. support the conservation of the target species by promoting a self-sustaining population;
2. maintain local genetic diversity of target species;
3. re-establish individuals of target species in high-risk areas into secure, analogous habitat; and
4. 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 the creation of the reservoir).

⁴ Maslovat, C. 2009. Guidelines for translocation of plant species at risk in British Columbia. British Columbia Ministry of Environment, Victoria, BC.

2. Document the survival of the translocated rare plants through population monitoring at re-location sites.
3. Manage translocated populations for seven years after translocation to maximize plant survival and fitness.
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 publically 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.

The program at its current state of development consists of four main phases over seven years of study (2016 to 2022):

- 1. Literature review and program development (2016-2017).** 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 2020).** The standards for collecting and storing propagules for ex-situ conservation (e.g., timing, sampling, labelling, cleaning, processing, stratification, sowing, and provenance) are being refined for this program and incorporate guidance outlined in Maslovat (2009) and by the European Native Seed Conservation Network (2009)⁵. 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 a number of occasions as appropriate based on seed availability and readiness.
- 3. Ex-situ propagation (2017 and 2021).** 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 includes 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. 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

⁵ ENSCONET. 2009a. Seed Collecting Manual for Wild Species. Main editors: Royal Botanic Gardens (UK) & Universidad Politécnica de Madrid (Spain). Edition 1: 17 March 2009.

coat prior to stratification. Seeds that do not require stratification are being 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 and 2021).** The detailed methods for translocation implementation are being refined based on data collected during field activities. Translocation implementation includes preparation at pre-translocation sites 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. 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 out-planting occurred in September 2018, with follow up planting planned for spring 2019. Additional planting is planned to occur in the fall and spring of 2020 and will incorporate the key findings from previous planting efforts. Some stock will be withheld from planting as insurance should inclement conditions negatively affect the initial out-planting stock.
- 5. Post-translocation care, maintenance and monitoring (2018-2022).** Post-translocation care, maintenance, and monitoring will commence immediately after each translocation event is completed. Post-translocation plant care and site management will assess the health and establishment of the translocated populations and to identify and address any factors affecting the survival or health of the translocated plants. The first four years of follow-up site visits and data collection (i.e., short-term monitoring) will inform the frequency and level of effort of post-translocation care and additional long-term monitoring in subsequent years. 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 thus require more active management. Monitoring the success or failure of the methods will assist in identifying opportunities for improvement within an adaptive management framework. Importantly, this information can also help to inform other translocation projects, thereby improving the overall success of translocation efforts.

7.5.2 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 1) characterize donor and recipient sites, 2) collect and store plant propagules, 3) conduct ex-situ propagation; and 4) 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 (e.g. Carlsen et. al 2011; Ryneer et. al. 2013));
3. the survival of the translocated rare plant species through monitoring of population size, extent, threats, resilience, and persistence (Pavlik 1996; Vallee et al. 2004, Maslovat 2009, Weeks et al. 2011); and
4. the success of follow up procedures applied to address any declines in survival or fitness of the translocated plants.

7.5.3 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.

7.6 EAC Condition 15

This section of the annual report summarizes the programs implemented in 2018 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 FLNR.
- 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, FLNR, 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.

7.6.1 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 4 of the CEMP:

- Avoid construction activity within Important Wildlife Areas, including designated setback buffers determined by a QEP, where feasible:
 - 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 (see Section 6.1.1);
 - 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;
- Guidance to minimize impacts to raptor nests;
- Protocol for conducting 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).

7.6.2 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 described in Section 7.5.1, Revision 4 of the CEMP (Section 4.17) specifies that construction activity is to be avoided within Important Wildlife Areas, including designated setback buffers determined by a QEP, where feasible.

Procedures for determining appropriate situation and species-specific disturbance setback buffers to be applied around locations where bird nests are likely to be present are discussed in Section 6.1.1 (migratory birds) and described in Appendix 1 (migratory birds, sharp-tailed grouse, bald eagle and other raptors).

7.6.3 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.*

Much 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. Revision 4 of the CEMP (Section 4.17) specifies 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 conducted, with disturbance setback buffers determined by a QEP.

7.6.4 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 Revision 4 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.

7.6.5 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(s) prior to starting work on-site. A component of these training sessions is environmental training for workers. Completion of these sessions required prior to the issuance of site access cards.

7.7 EAC Condition 16

This section of the annual report summarizes the programs implemented in 2018 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, FLNR, 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, FLNR 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.

7.7.1 Nest boxes for cavity-nesting waterfowl

In 2017, 269 nest boxes were constructed for cavity nesting bird species. Of these, 76 nest boxes were constructed for waterfowl; 9 for bufflehead, 49 for Barow's goldeneye, common goldeneye or hooded merganser; and 18 for common merganser. Also in 2017, 96 nest boxes were installed on the north side of the Peace River on trees and structures on BC Hydro owned and managed lands, and private lands where permission was granted. Of those, 16 nest boxes were designed to be suitable for waterfowl; two for bufflehead, 10 for Barow's goldeneye, common goldeneye or hooded merganser; and four for common merganser. No nest boxes were installed in 2018, as further implementation is being held until additional mitigation areas are identified.

7.7.2 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 (3) bridges and the bridge at Lynx Creek will be inundated by the reservoir. New bridges will be constructed at these locations.

BC Hydro had previously reached an agreement with the Ministry of Transportation and Infrastructure 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 Kathryn Graham, Regional Manager, Environmental Services, MOTI, that MOTI no longer supports the placement of bat roosting boxes on bridges. Therefore, the bat boxes cannot be integrated into the designs of any new bridges, including the planned Farrell Creek, Halfway River, Cache Creek and Lynx Creek bridges.

7.7.3 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.*

To avoid destroying 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. This relocation achieved a 300 m no activity/no access buffer around the 16 documented hibernacula. This mitigation is described in detail in Appendix 8 of the 2016 Annual Report.

In February of 2016 the BC Ministry of Environment released Best Management Practices Guidelines for Bats in British Columbia “Bat BMPs”⁶. These guidelines recommend a 100 m buffer be established around the core area of bat habitat, which for Portage Mountain is defined as all the hibernacula entrances 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.

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

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 (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).

As described in Section 6.4.3.3, BC Hydro evaluated the accuracy of noise predictions at the hibernacula by monitoring noise during test blasting at Portage Mountain Quarry in August of 2018. Also as described in Section 6.4.3.3, BC Hydro is conducting year round monitoring of bat use at Portage Mountain.

Through the broader Site C bat mitigation and monitoring program, BC Hydro is constructing and installing bat roosting boxes in suitable habitat near the future reservoir and dam site. In 2018, 60 bat roost boxes were constructed and installed.

7.7.4 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.*

Twenty-five (25) coarse woody debris (CWD) piles for fisher were created within the dam site area in 2016. An additional 31 CWD piles were created for fisher along the transmission line in 2018. Signs were also installed at existing CWD piles indicating that they were designated fisher habitat to prevent their inadvertent disturbance by construction activities.

In addition to CWD piles, BC Hydro is also constructing and installing fisher den boxes to help mitigate the loss of denning habitat due to reservoir clearing. In 2018, BC Hydro installed 10 den boxes on the south side of the Peace River near the Moberly River.

7.8 EAC Condition 19

This section of the annual report summarizes the programs implemented in 2018 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, FLNR 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.

7.9 EAC Condition 21

This section of the annual report summarizes the programs implemented in 2018 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 FLNR, 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 with EAO, FLNR, 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.

7.9.1 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 2018. In 2018, 48 bald eagle nests were surveyed and 44 were observed. Of the 44 nests observed, seven bald eagle nests were newly identified in 2018; six were identified as bald eagle nests during the surveys and one was reported as a bald eagle nest by a third party. A summary of the methods and results of bald eagle nest monitoring in 2018 is presented in Appendix 10.

7.9.2 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 for 2018 is presented in Section 6.1.3.4 and Appendix 3.

7.9.3 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.*

7.9.3.1 Songbirds

A summary of the songbird monitoring program for 2018 is presented in Section 6.1.3.1 and Appendix 2.

7.9.3.2 Ground nesting raptors

Ground nesting raptor surveys in 2018 were conducted at two cleared portions of the Site C reservoir along the Peace River and Highway 29 (Bear Flats area). Ground nesting raptor surveys were completed three times over May and June 2018 through stationary standwatches. No ground nesting raptors or their nests were observed at any of the cleared portions of the footprint along the Peace River or Highway 29. The ground nesting raptor monitoring 2018 annual report can be found in Appendix 11.

7.9.4 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 2018 during the construction phase of the Site C Clean Energy Project.

7.10 Status of listed species

This section of the annual report summarizes the programs implemented in 2018 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 FLNR 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.

7.10.1 Rare Plants

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

7.10.2 Wildlife

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