Construction Environmental Management Plan

Site C Clean Energy Project

Revision 2: February 4, 2016
# Construction Environmental Management Plan

## Site C Clean Energy Project

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## Revision History

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<th>Version</th>
<th>Date</th>
<th>Comments</th>
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<td>Draft</td>
<td>10-17-2014</td>
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<td>Draft</td>
<td>02-26-2015</td>
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<tr>
<td>Rev 0</td>
<td>05-19-2015</td>
<td>Final Plan</td>
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<tr>
<td>Rev 1</td>
<td>06-05-2015</td>
<td>Final Plan, Revision 1</td>
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</table>
| Rev 2   | 02-04-2016 | - Clarified requirements to identify applicable permits and authorizations (S. 2.4)  
- Added requirement to include a table detailing revision history (S. 2.4)  
- Clarified reporting requirements and timeframes for submitting reports (S. 2.4.2 and 2.4.3)  
- Added requirement to include a rationale for edits to EPPs (S. 2.4.4)  
- Clarified the requirements for incident reporting (S. 2.5)  
- Added provision for BC Hydro to require additional mitigation measures if ambient air quality does not meet the provincial objectives (S. 4.1)  
- Revised the restriction on blasting near bat hibernacula (S. 4.2)  
- Deleted reference to obsolete MWLAP Field Guide (S. 4.6)  
- Added requirement to include an noise management program (S. 4.11)  
- Updated the language for 85th Avenue industrial lands noise (S. 4.11)  
- Updated requirements for contents of spill kits (S. 4.13)  
- Added controls for application of road salt (S. 4.14)  
- Buffer around nests if a bird builds or occupies a nest in an active construction zone changed to a minimum 5 m (S. 4.17) |

These revisions are not material within the meaning of Section 2.6 because:
- the revisions will not result in a reduction of any monitoring or reporting requirements
- the revisions will not result in the deletion or reduction of an environmental specification
- the revisions will not otherwise make an adverse effect more likely, nor become more adverse and be significant.
### GLOSSARY

| Aboriginal Groups | • Blueberry River First Nations  
|                  |   • Dene Tha’ First Nation  
|                  |   • Doig River First Nation  
|                  |   • Duncan’s First Nation  
|                  |   • Fort Nelson First Nation  
|                  |   • Halfway River First Nation  
|                  |   • Horse Lake First Nation  
|                  |   • Kelly Lake Métis Settlement Society  
|                  |   • McLeod Lake Indian Band  
|                  |   • Métis Nation British Columbia  
|                  |   • Prophet River First Nation  
|                  |   • Saulteau First Nations  
|                  |   • West Moberly First Nations  |
| CEMP | • Construction Environmental Management Plan |
| Construction | Any activity associated with building the Site C project, including but not limited to:  
|              |   • clearing  
|              |   • site preparation  
|              |   • quarrying  
|              |   • excavation  
|              |   • material handling and processing  
|              |   • material placement  
|              |   • concrete works  
|              |   • road and bridge building  
|              |   • site reclamation  |
| Dam Site Area | • The grey area shown in Figure 2 |
| Environmental Features Map | • GIS spatial data that identifies known environmental, heritage and cultural features and environmentally sensitive areas.  
|                          |   • This data will be updated as additional information is collected. |
| Environmental Incident | An event, act or omission that is, or has the potential to cause, a violation of any of the Environmental Requirements. Examples of Environmental Incidents include, but are not limited to:  
- Spills of oil, fuel, hazardous chemicals  
- Unauthorized discharges of deleterious substances into fish-bearing water bodies  
- Unauthorized alteration, disruption, or destruction of aquatic or terrestrial habitat  
- Alteration of, or damage to, heritage or archaeological resources  
- Fires related to construction activities  
- Unauthorized release of air pollutants |
| Environmental Monitor | A Qualified Environmental Professional who observes and reports on construction activities in relation to the requirements under the applicable EPP |
| Environmental Requirements | The Environmental Specifications  
- The conditions included in the Environmental Assessment Certificate for the Project (BC Environmental Assessment Office, 2014)  
- The conditions included in the decision statement issued by the Minister of Environment of Canada (CEAA, 2014)  
- The permits, authorizations and approvals for the Project issued by regulatory agencies  
- Statutory requirements |
| Environmental Specifications | The specifications set out in Section 4 of this CEMP |
| Environmentally Sensitive Area | Location of an environmental feature of importance, including but not limited to:  
• Watercourse crossing  
• Location of rare or endangered plant  
• Sensitive ecosystem sites (wetlands, tufa seeps, marl fens, grasslands, and old-growth forests)  
• Raptor nest site  
• Nest or den site of rare or endangered wildlife  
• Culturally important feature  
• Rare plant sites  
• Active bear, wolf, fox or coyote den sites |
<table>
<thead>
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<tr>
<td>EPP</td>
<td>Environmental Protection Plan</td>
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</tbody>
</table>
| Important Wildlife Areas | Wildlife habitat areas that many animals use around the same time each year, including, but not limited to:  
• wetlands  
• snake hibernacula  
• bat hibernacula  
• sharp-tailed grouse leks  
• beaver lodges, dams and food caches  
• active furbearer and large carnivore den sites  
• active bird nests  
• mineral licks  
• habitat used by ungulates for winter range  
• amphibian breeding sites and migration routes |
<p>| Independent Engineer | A person, retained by BC Hydro, with professional qualifications and demonstrated experience and knowledge, who provides information regarding the design and construction of the Project under the direction of the Comptroller of Water Rights |
| Independent Environmental Monitor | A person, retained by BC Hydro, with professional qualifications, demonstrated experience and knowledge of environmental monitoring for construction projects in BC, including experience working in a third party role, who monitors the environmental impacts of a project and reports the findings to government (BC Environmental Assessment Office, 2014) |</p>
<table>
<thead>
<tr>
<th><strong>Invasive Plants</strong></th>
<th>• A noxious weed designated by weed control regulation in British Columbia to be a noxious weed, and includes the seeds of the noxious weed, as well as invasive species identified under the Peace River Regional District Invasive Plant Program</th>
</tr>
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<tbody>
<tr>
<td><strong>Ordinary High Water Mark</strong></td>
<td>• The visible high water mark of any river, stream, wetland or other body of water where the presence and action of the water are so common and usual and so long continued in all ordinary years as to mark upon the soil of the bed of the river, stream, wetland or other body of water a character distinct from that of the banks, both in vegetation and in the nature of the soil itself. (BC Ministry of Environment, 2014)</td>
</tr>
<tr>
<td><strong>Project Activity Zone</strong></td>
<td>• Area within which the Project components will be found or will occur, but not including existing transportation infrastructure that will be used without modification to transport materials or personnel required for the Project. (BC Hydro 2013)</td>
</tr>
<tr>
<td><strong>Qualified Environmental Professional (QEP)</strong></td>
<td>• An applied scientist or technologist who specializes in a relevant applied science or technology including, but not limited to: agrology, forestry, biology, engineering, geomorphology, geology, hydrology, hydrogeology or landscape architecture. A Qualified Environmental Professional must be a member in good standing registered with the appropriate professional organization in British Columbia, and acting under that association’s Code of Ethics and subject to disciplinary action by that association. He or she must also be someone who, through demonstrated suitable education, experience, accreditation and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within his or her area of expertise. (BC Environmental Assessment Office, 2014)</td>
</tr>
<tr>
<td><strong>The Project</strong></td>
<td>• Site C Clean Energy Project</td>
</tr>
<tr>
<td><strong>Raptors</strong></td>
<td>• Eagles, hawks and owls</td>
</tr>
</tbody>
</table>
### RISC
- BC Integrated Land management Bureau Resources Information Standards Committee

### RSEM
- Relocated Surplus Excavated Material

### Sensitive Wildlife
- Wildlife species that require specific habitats or habitat features which could be affected by Project activities within or adjacent to the habitat or feature
- Wildlife species that are known to be intolerant of human caused disturbance during critical times of the year (e.g. breeding season, winter season)

### Stop Work Procedure
- A procedure to be provided in each EPP that is to be followed in the event that a construction activity must be stopped for non-compliance with an EPP. The procedure must be developed in accordance with Section 2.4.3 of this CEMP

### Work Avoidance Zone
- Areas where construction activities are prohibited, or restricted to specified activities

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**References**

BC Environmental Assessment Office, 2014. Site C Clean Energy Project Environmental Assessment Certificate, Schedule B. Access via: [http://a100.gov.bc.ca/appsdata/epic/documents/p371/d38033/1413310195243_2bQVJ9jQcGC4X6vQzLvMGnsQ6CmV2F3sM8QyMCTp5cJQmp4ddLcR!-351597226!1413309200763.pdf](http://a100.gov.bc.ca/appsdata/epic/documents/p371/d38033/1413310195243_2bQVJ9jQcGC4X6vQzLvMGnsQ6CmV2F3sM8QyMCTp5cJQmp4ddLcR!-351597226!1413309200763.pdf)


1.0 Introduction

1.1 BC Hydro

BC Hydro is a Crown corporation owned by the Province of British Columbia. BC Hydro’s mandate is to generate, manufacture, conserve, purchase, and sell electricity to meet the needs of its customers. BC Hydro serves 95 per cent of B.C.’s population, delivering electricity safely and reliably to approximately 1.9 million customers.

As the largest electric utility in British Columbia, BC Hydro operates an integrated system with 31 hydroelectric facilities and three thermal generating plants, totalling approximately 12,000 MW of installed generating capacity. The hydroelectric facilities provide over 95 per cent of the total electricity generated and are located in the Peace, Columbia, and Coastal regions of B.C.

BC Hydro owns and operates two hydroelectric generation facilities on the Peace River that together account for greater than 30% of the capacity of the electrical power generation facilities in B.C. The existing facilities are operated as part of a coordinated system to allow BC Hydro to respond to seasonal and hourly changes in electricity demand.

W.A.C. Bennett Dam was completed in 1968 and is located 168 km upstream of the Alberta border. The Peace Canyon Dam was constructed in 1976 approximately 23 km downstream of the W.A.C. Bennett Dam near the town of Hudson's Hope. Water discharged from the G.M. Shrum Generating Station or released from discharge facilities (spillways, low level outlets) at W.A.C. Bennett Dam flows directly into the Dinosaur Reservoir. Water discharged from the Peace Canyon Dam and Generating Station enters the Peace River and flows downstream past the Site C dam site.

1.2 Project Overview and Description

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River. The Project will provide up to 1,100 MW of capacity and about 5,100 GWh of energy each year to the province’s integrated electricity system.

The components of the Project are:

- Dam, generating station, and spillways
- Reservoir
- Hudson’s Hope shoreline protection berm
- Substation and transmission lines to Peace Canyon Dam
- Highway 29 realignment
- Quarried and excavated construction materials
- Worker accommodation
- Road and rail access.

This Construction Environmental Management Plan (CEMP) applies to all activities undertaken in construction of the Project.
1.3 BC Hydro Environmental Responsibility Policy

The Project will be constructed and operated to meet the objectives of BC Hydro’s Environmental Responsibility Policy which currently states:

“Consistent with our purpose to provide reliable power at low cost for generations, BC Hydro is committed to producing, acquiring, delivering and consuming electricity in an environmentally, socially and financially responsible manner.

We recognize that our energy system causes both positive and negative impacts on the environment and on those with whom we share public resources. Conservation is a key means to avoid negative environmental impacts. Where negative impacts cannot be avoided, we will work to minimize and offset them and sustain resources over the long term.

Specifically, BC Hydro will:

- Meet environmental requirements defined by legislation, regulation, government directives, and other environmental standards that apply to BC Hydro.
- Perform beyond environmental requirements where it makes sound business sense.
- Make decisions about environmental risk and opportunity in accordance with our values in a structured and systematic way to balance competing objectives.
- Continually improve our environmental performance and our environmental management systems exercising due diligence.
- Work to reduce historic environmental impacts.
- Develop and foster an electrical energy conservation culture in B.C. that leads to customers choosing to make a dramatic and permanent reduction in electricity consumption.
- Seek products, services and new supplies of energy that take into account environmental responsibility.
- Work cooperatively with stakeholders and First Nations on resource use, management, and conservation to increase public benefits from affected resources.
- Publicly report on our environmental performance.”
2.1 Environmental Management Roles and Responsibilities

Environmental management is the responsibility of BC Hydro, the Independent Environmental Monitor (IEM), BC Hydro’s contractors and their qualified environmental professionals and environmental monitors. Compliance with environmental requirements will involve ongoing discussions with the regulatory agencies. The relationships between these various parties for the construction phase of the Project are shown in Figure 1. Specific roles and responsibilities are described in the section below.

Roles and responsibilities of BC hydro and contractors are summarized in Table 1. More detail is provided in the sub-sections of Section 2.
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<tr>
<th>BC Hydro</th>
<th>Contractors</th>
<th>Independent Environmental Monitor</th>
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<tr>
<td>Develop and maintain the CEMP</td>
<td>Appoint a QEP to prepare EPP(s) and manage and supervise Environmental Monitors</td>
<td>Audit and review compliance of construction activities with the Environmental Requirements</td>
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<tr>
<td>Lead communication with stakeholders and Aboriginal groups</td>
<td>Appoint Environmental Monitor(s)</td>
<td>Report directly to regulators on the compliance of the construction activities with the Environmental Requirements during construction</td>
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<td>Review contractor’s EPP’s</td>
<td>Ensure that all construction activities are conducted in compliance with the applicable EPP</td>
<td>Review contractor’s EPP’s</td>
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<td>Audit compliance with the requirements of EPPs</td>
<td>Ensure that their workers and subcontractors are appropriately trained and supervised</td>
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<td>Report to regulators and the IEM</td>
<td>Ensure that their Supervisors and Environmental Monitors attend an environmental overview training workshop</td>
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<td>Report environmental incidents internally and to Aboriginal Groups</td>
<td>Ensure that the tailboard meetings take place</td>
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<td>Monitor air quality, noise and vibration</td>
<td>Inform BC Hydro should the conditions differ materially from those anticipated under the applicable EPP</td>
<td>Undertake corrective and preventative measures in response to non-conformance with the EPP</td>
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<td>Ensure that all permits necessary to undertake the construction activities</td>
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<td>Ensure that all permits necessary to undertake the construction activities</td>
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<td>Report environmental information to BC Hydro</td>
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<td>Immediately report every Environmental Incident as described in S. 2.5</td>
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<td>Investigate the cause of every Environmental Incident and implement preventive and corrective actions</td>
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2.1 BC Hydro

BC Hydro will:

- Develop and maintain the Construction Environmental Management Plan (CEMP) that specifies the requirements for Environmental Protection Plans (EPPs)
- Lead communication with regulatory agencies, local governments, interested and potentially affected Aboriginal Groups, and public stakeholders, including property owners and local residents
- Audit compliance with the requirements of the applicable EPP including, but not limited to:
  - Conformance of construction activities to the Environmental Requirements;
  - The effectiveness of implemented mitigation measures
  - That implemented mitigation measures are maintained for as long as those mitigation measures are required
  - That applicable permits and approvals have been obtained
  - That spill response and emergency equipment and procedures are implemented and maintained
  - Worker training and supervision
  - Response to environmental incidents
  - Waste records
- Prepare and submit monthly reports to the Independent Environmental Monitor, EAO and CEAA summarizing:
  - reports submitted by contractor Environmental Monitors
  - results of the BC Hydro field inspections
  - environmental incidents and applicable corrective action
  - compliance of construction activities with the Environmental Requirements
- Monitor air quality, noise and vibration
2.2 Independent Environmental Monitor

BC Hydro will retain an Independent Environmental Monitor (IEM). The IEM will have authority and responsibility to audit and review:

- compliance of construction activities with the Environmental Requirements
- BC Hydro’s auditing of contractor’s environmental monitoring as described in Section 2.1
- BC Hydro monthly environmental reports as described in Section 2.1
- contractor environmental monitoring as described in Sections 2.3.1
- contractor environmental monitoring reports as described in Sections 2.3.1
- environmental incident reports as described in Section 2.5
- the content and frequency of environmental overview training and pre-work orientation and tailboard meetings as described in Section 3.

The IEM will:

- develop a work plan that describes the activities that the IEM will undertake, including but not limited to:
  - the frequency of on-site inspection of construction activities
  - the QEPs from the IEM’s staff, their positions and their responsibilities, to be involved in the on-site inspection activities
  - the QEPs from the IEM’s staff, their positions and their responsibilities, to be involved in the review of documents.
- communicate with the Independent Engineer during construction to coordinate their activities to provide information to the Comptroller of Water Rights for proper regulation of the construction of the works; and
- report directly to the Independent Engineer, the executive director of the Environmental Assessment Office and the President of the Canadian Environmental Assessment Agency and the Comptroller of Water Rights on the compliance of the construction activities with the Environmental Requirements during construction.
2.3 Contractors

Contractors must:

• Appoint Qualified Environmental Professionals to develop EPPs in accordance with Section 2.4
• Ensure that all of the contractor’s construction activities are carried out in accordance with an EPP
• Appoint Qualified Environmental Professional(s) to manage and supervise the contractor’s Environmental Monitors
• Ensure that their workers and subcontractors are appropriately trained, supervised and have the necessary experience and competency to implement the requirements of the EPPs
• Ensure that their Supervisors and Environmental Monitors attend an environmental overview training workshop as described in Section 3.1 of this CEMP
• Ensure that the tailboard meetings described in Section 3.2 of this CEMP take place
• Inform BC Hydro should the conditions of the environment or construction practices change materially from that as anticipated under the applicable EPP.
• Undertake corrective and preventative measures in response to non-conformance with the EPP, and ensure that such measures have been implemented in a timely manner
• Ensure that all permits necessary to undertake the construction activities have been obtained, either by BC Hydro or by the contractor, prior to commencing such construction activities.
• By January 30 of each year report to BC Hydro the following information:
  o The quantity of each type of fuel consumed at the Project site during the preceding year
  o The production throughput for the preceding year of on-site processes that contribute to greenhouse gas emissions

2.3.1 Environmental Monitors

Contractors must appoint Environmental Monitors who will monitor construction activities with respect to compliance with the applicable EPPs, under the direction of a Qualified Environmental Professional.

The responsibilities of the Environmental Monitors are:

• Conducting monitoring of construction in accordance with the applicable EPP
• Providing technical assistance on environmental matters to construction personnel
• In consultation with the contractor’s Qualified Environmental Professional, providing recommendations for modifying and/or improving environmental mitigation measures, as necessary
• Documenting construction activities, mitigation measures, and environmental incidents by field notes and photographs

• Taking field measurements and conducting analyses in accordance with the EPP

• Completing inspection checklists for each monitoring site visit consistent with the monitoring requirements in the EPP

• In consultation with the Qualified Environmental Professional, identifying and providing recommendations for resolving potential problems to the contractor and BC Hydro

• Preparing and submitting to BC Hydro and the Independent Environmental Monitor weekly Environmental Monitoring Reports during construction periods in accordance with the relevant EPPs.

• Preparing and submitting to BC Hydro and the Independent Environmental Monitor an Environmental Completion Report at the end of construction activities that describes compliance with the applicable EPPs, and any reportable environmental incidents, including the responses to those incidents, that may have occurred in the course of work
2.4 Environmental Protection Plans

An EPP will be prepared by Qualified Environmental Professionals with the expertise relevant to the construction activities covered by the EPP.

In developing the EPP, the QEP will take into consideration:

- any guidance issued by regulatory authorities with respect to the Environmental Requirements or Environmental Specifications that may be applicable
- the Environmental Requirements
- contract requirements

The EPP will include:

- a description of the particular construction activities and location to which the EPP applies
- mapping at a suitable scale, including identification of any environmentally sensitive areas
- identification of required relevant mitigation measures and how they will be implemented
- provisions for working in extreme cold temperatures where applicable
- identification of applicable permits and authorizations
- description of how the contractor will comply with the conditions of those permits and authorizations
- a table detailing revision history.

2.4.1 Environmental Monitoring

Each EPP will provide for environmental monitoring of construction activities sufficient to reliably determine whether the construction activities are being conducted in compliance with the EPP. The minimum requirements for environmental monitoring are as follows:

- Minor environmental risk activities – less than 10% of the activity must be monitored
- Low environmental risk activities – 10% to 40% of the activity must be monitored
- Moderate environmental risk activities – 40% to 90% of the activity must be monitored
- High environmental risk activities – 100% of the activity must be monitored

Each EPP must provide the following details with respect to monitoring:

- The type and frequency of observations and data collection, methodologies to be employed, and protocols to be followed, including, but not limited to:
  - Regular inspection of:
    - sediment and erosion control measures
    - RSEM areas and management measures required for Acid Rock Drainage/Metal Leaching
    - construction equipment on site for leaks or spills
bulk fuel storage facilities, including monitoring of fuel deliveries and transfers
- adequacy of the emergency response and spill containment and recovery equipment, and spill response training programs
- construction activities to evaluate appropriate implementation of mitigation measures
- construction waste management programs
  - Water quality monitoring upstream and downstream of construction areas including RSEMs, including measurement of common parameters (e.g., pH, temperature, turbidity, dissolved oxygen, conductivity, total suspended solids), especially during construction (e.g., concrete pours) in the vicinity of watercourses
  - Monitoring the quality of point discharges relative to the applicable requirements

2.4.2 Reporting

Each EPP will provide for weekly reporting of environmental information and provide for reporting whether construction activities are being conducted in accordance with the EPP including, but not limited to:

- For the reporting period, a description of:
  - construction activities
  - environmental monitoring activities
  - identified environmental issues and corresponding mitigation measures implemented
- Results of any testing of environmental attributes as they become available
- Photographs (accompanied by identifying information such as date, location) documenting construction activities, environmental issues, and corresponding mitigation measures.
- An Environmental Completion Report at the conclusion of the construction activities covered by the EPP, including, but not limited to:
  - a summary of construction activities
  - a summary of environmental monitoring activities during construction
  - a description of environmental incidents and issues encountered during construction, and the management and mitigation measures used to resolve the issues
  - representative site photographs

Weekly reports shall be submitted to BC Hydro within one week of the reporting period. Environmental Completion Reports shall be submitted within 30 days of the completion of the construction activities covered by the EPP.

Each EPP will provide that, for any monitoring data collected, sampling conducted, or analyses performed the following information shall be reported, in a format acceptable to BC Hydro:
• the place, date and time of sampling;
• the analyses that were performed and the dates they were performed;
• the analytical techniques, methods, or procedures used in the analyses;
• the names of the persons who collected and analyzed each sample; and
• the results of the analyses.

2.4.3 Stop Work

Every EPP must provide for a Stop Work Procedure. Every Stop Work Procedure must:

• Identify the person(s) employed by the contractor with the authority to direct that a construction activity that is being conducted in breach of the EPP must be immediately stopped (the contractor's designated person);
• The direct contact information for that (those) person(s);
• Provide that the contractor’s designated person, the Independent Environmental Monitor, and BC Hydro each have the authority to stop a construction activity that is being conducted in breach of an EPP, in accordance with the Stop Work Procedure.

The EPP must provide that any order to stop work that is issued shall include a description of the nature of the non-compliance, including a description of the activity, the location, the time and the element of the EPP that is being breached. When an order to stop work is issued, the Environmental Monitor must also immediately notify BC Hydro and the Independent Environmental Monitor.

Once work has been stopped due to a stop work order, it must not re-start until the Environmental Monitor is satisfied that the work will be compliant with the EPP.

Within five working days of any order to stop work being issued, the contractor must provide to BC Hydro and the Independent Environmental Monitor a written environmental incident investigation report that meets the requirements of Section 2.5 Environmental Incidents.

2.4.4 EPP Review and Revision

The Qualified Environmental Professional that prepares an EPP is responsible for ensuring that it meets the requirements of this CEMP. In addition, each EPP must be provided to BC Hydro at least 30 days prior to commencement of the construction activities covered by that EPP. BC Hydro and the IEM may review the EPP and may require the QEP, the contractor, or both, to demonstrate that the EPP complies with the requirements of this CEMP prior to commencement of the construction activities covered by that EPP.

Any revisions to an EPP must be provided to BC Hydro prior to construction activities covered by the revised EPP. BC Hydro and the IEM may review the revised EPP and may require the QEP, the contractor, or both, to provide a rationale for the revision, and to demonstrate that the revised EPP complies with the requirements of this CEMP prior to commencement of the construction activities covered by that revised EPP.

EPPs may require revisions as a result of amendments of the CEMP or in response to relevant changes, for example, changes in:
2.5 Environmental Incidents

In the event of an Environmental Incident contractors must:

- Immediately report the Environmental Incident to:
  - the appropriate authority if required by statute to be reported;
  - BC Hydro; and
  - the Independent Environmental Monitor.

- Within five working days (or such longer time as the nature of the incident requires) of an Environmental Incident reported to Regulators or an order to stop work, provide to BC Hydro and the Independent Environmental Monitor a written environmental incident investigation report that includes appropriate photo documentation and describes the:
  - Nature of the incident
  - Approximate magnitude and duration of the incident
  - Area or habitat affected
  - Environmental resources affected
  - Results of any sample analysis taken in conjunction with the incident (e.g., water samples)
  - Root cause(s) of the incident
  - Immediate actions taken
  - Preventive and corrective actions to control or limit the activity causing the incident, including a time frame for implementation
  - Communications held with the contractor’s employees and with BC Hydro
  - Communications with the Independent Environmental Monitor or regulatory agencies

- Reports will be available to regulators upon request

- Contractors must implement the identified preventive and corrective actions in the time frame specified

- The contractor’s QEP must confirm in a written report to BC Hydro that the identified preventive and corrective actions have been taken within five working days of implementation of each action

In the event of an Environmental Incident BC Hydro must:

- Report internally in accordance with corporate reporting policies and procedures
- Notify Aboriginal Groups as required
2.6 CEMP Review and Revision

During construction of the Project, at least once every 12 months, and more often as may be required, BC Hydro will review this CEMP.

Further information may become available as detailed design progresses and as the results of pre-construction surveys are received. Information may also be received from contractors, Aboriginal Groups, the public and regulatory agencies. During construction, corrective or preventative actions may be taken in response to incidents. It may be beneficial to take this information into account in a revision of this CEMP.

A material revision of this CEMP is one which would be relevant to the question of whether an adverse effect is more likely to occur, or become more adverse, and be significant, and would include, in particular:

- A reduction of monitoring or reporting requirements
- Deletion of an environmental specification, or making a specification less stringent

If BC Hydro proposes to make a material revision of this CEMP, to the extent practical in the circumstances, BC Hydro will provide draft text of the proposed material revision for review and comment to i) the executive director of the Environmental Assessment Office (the “Executive Director”), ii) the President of the Canadian Environmental Assessment Agency (the “President of the Agency”), iii) BC Ministry of Environment, BC Ministry of Forests Lands and Natural Resource Operations, Environment Canada, Natural Resources Canada, and iv) Aboriginal Groups who would potentially be affected by the proposed revision.

The period of time provided for review and comment on a proposed material revision will depend on the nature or urgency of the revision and the relative interests or jurisdiction of government agencies and of the rights and relative interests of potentially affected Aboriginal group, and any legal requirement to consult. If BC Hydro proposes material revisions to the body of this CEMP, a copy of the CEMP showing the proposed revisions will be provided. If BC Hydro proposes to materially revise an appendix, a revised copy of the appendix only will be provided.

BC Hydro will also provide an opportunity to review and provide comments on proposed material revisions to those contractors who have been required to develop EPPs. The opportunity to review and provide comments will be given utilizing the communication protocols provided for in the contracts.

An opportunity to review and provide comments will not be provided for proposed revisions that would not be material, for example, revisions to:

- correct typographical or grammatical errors
- reflect changes that are necessary as a result of other amendments, for example, updating page numbers, updating the version number or date of the CEMP, updating the glossary, etc.
- revise or update citations to references, guidance documents or statutory documents
- add monitoring or reporting requirements
- add an environmental specification or make an existing specification more stringent

Each time the CEMP is revised, all EPPs must be reviewed by a QEP and revised, where necessary.
3.0 Orientation, Training and Tailboard Meetings

The activities identified in this section shall be conducted as part of the Project to provide a basis for informing contractors, BC Hydro, and their crews of environmental requirements specified in this CEMP.

3.1 Environmental Overview Training

Prior to the start of field activities, Field Crew Supervisors, Qualified Environmental Professionals and Environmental Monitors shall attend an environmental overview and training workshop. The workshop will include, but is not limited to, the following topics, as applicable to the construction activities to be undertaken:

- The requirements of the EPPs
- Potential effects of the Project and proposed mitigation measures
- Environmental Requirements
- Requirements of the CEMP
- The roles and responsibilities of BC Hydro, the contractor, Environmental Monitors, and other members of the Project team
- The requirement for Environmental Monitors to immediately advise the contractor’s representative who has the authority to stop work, and BC Hydro, of construction activities that are not being conducted in accordance with the applicable EPP
- Environmental reporting and communication structures
- Environmental mapping of sensitive areas
- Procedures for reporting of environmental incidents and emergencies

3.2 Pre-work Orientation and Tailboard Meetings

Pre-Work Orientation training shall be provided for each worker prior to beginning construction activities at a site, so that workers are aware of the requirements set out in the EPP applicable to the construction activities to be conducted. Pre-Work Orientation training shall include Bear-Aware training or equivalent.

Field crew Tailboard Meetings shall be held prior to the commencement of construction activities and at regular intervals thereafter. The frequency of subsequent tailboard meetings will be dependent upon the nature of the construction activities and the environmental risks associated with that work. Specific information to be discussed in Tailboard meetings includes, but is not limited to:

- Environmentally Sensitive Areas, potential effects and mitigation
- Construction activities planned
- All applicable mitigation measures, including, for example, Work Avoidance Zones applicable to the planned construction activities, as described in the EPP
- All Pre-Work Orientation Meetings and Tailboards shall be documented by the contractor, and documentation provided to BC Hydro upon request.
4.0 Environmental Specifications

In this section, specifications are provided that must be implemented under EPPs, where applicable to the construction activities. These specifications are largely standard construction practices. In some places, specific commitments made by BC Hydro are specified.

4.1 Air Quality Management

Emissions of criteria air contaminants from Project activities have the potential to affect human health.

BC Hydro will implement an ambient air quality monitoring program in the vicinity of the project. Where measured ambient air quality does not meet the British Columbia Ambient Air Quality Objectives (BC Ministry of Environment, 2015), BC Hydro may require additional mitigation measures such as changes in construction methods or engineered controls to address the issue.

EPPs will address, at a minimum, the following requirements if applicable:

General

- Control of emissions of fine particulate matter (PM$_{2.5}$ and PM$_{10}$), dust and greenhouse gases
- Pollution prevention, keeping clean areas clean and continuous improvement, as described in A National Commitment to Pollution Prevention (CCME 1993) and Guidance Document on Continuous Improvement and Keeping Clean Areas Clean (CCME 2007)
- Retain vegetative barriers, or install temporary barriers, where practical
- Manage smoke from the burning of clearing debris in accordance with the Smoke Management Plan (Appendix A).

Drilling

- Equip on-site drills with dust suppression systems such as dust collectors or wet drilling systems
- Where wet drilling is prohibited by technical specifications, use another type of dust suppression system

Material Handling

- To reduce dust, when loading materials onto vehicles, stockpiles and conveyors adjust drop heights to less than two metres where feasible
- With materials that may emit dust, cover loads when hauling
- Load trucks so that loads do not spill during movement

Conveyors

- Enclose transfer points where feasible
- Ventilate transfer points through particulate matter control equipment (i.e., cyclone, baghouse or similar control device) at all times when the conveyors are in operation
• For open transfer points, manage dust by water spray, fog nozzles or equivalent
• Minimize the vertical distance between material transfer points to the extent feasible
• When required, clean the ground under conveyors and transfer points to remove accumulations of particulate matter
• Manage dust associated with the off-site portion of the 85th Avenue Industrial lands conveyor belt by enclosing it, or by providing an alternative that is as effective in managing dust associated with operation of the conveyor

Concrete Batch Plant Operations
• Enclose cement and fly-ash storage bins, and associated transfer points
• Operate particulate matter control equipment (i.e., cyclone, bag house or similar control device) during filling of silos
• Regularly inspect and maintain emissions controls in accordance with supplier specification
• Fully enclose the weigh hopper, and ventilate it through particulate matter control equipment (i.e., cyclone, baghouse or similar control device) at all times when it is being filled
• At truck-mix plants, fit the truck loading bays with a telescopic chute, flexible sleeve, or equivalent, long enough to enter the hatches on the truck

Material Extraction and Processing
• Use water sprays as required to suppress dust, except where this would result in not meeting technical specifications of the material being extracted or processed
• Enclose all processing equipment to the fullest extent practical to contain fugitive emissions
• Inspect enclosures regularly and repair as required to control potential emissions
• Equip crushers and screens with particulate matter control equipment (i.e., cyclone, baghouse or similar control device) and water spray bars to knock down fugitive emissions
• Minimize vertical drop distance of materials to transfer points to the extent feasible

Roads and Highways
• Dust shall be controlled on unpaved roads using water or an alternate accepted dust suppressant (calcium chloride or magnesium chloride)
• Dust suppressants shall be applied in accordance with Environmental Best Practices For Highway Maintenance Activities (BC MOTI 2010)
• Oil shall not be used as a dust suppressant
• Use of water for dust control will be in accordance with an authorization under the Water Act
• Limit general site traffic to established haul routes
• Define a program for sweeping or cleaning off on-site paved roads based on weather conditions, traffic volumes and other factors

Vehicles and Equipment
• Inspect and maintain vehicles and equipment in accordance with manufacturers’ specifications
• Use modern machinery and commercially available low sulphur fuels
• Minimize engine idling to the extent feasible
• Optimize trucking loads to reduce the number of trips between the source and destination

Asphalt Production
• Inspect and maintain the burner and air systems in accordance with manufacturers’ specifications in order to ensure that fuel consumption is reduced and carbon monoxide and volatile organic carbon emissions are controlled
• Control the flow of aggregate to ensure that it remains clear of the combustion zone of the burner’s flame
• Install thermocouples and other sensors to monitor temperature and pressure change within the burner system
• Regularly calibrate these sensors in accordance with manufacturers’ specifications to ensure that they are functioning at their optimum levels

Air Quality Monitoring and Reporting
BC Hydro will monitor air quality in the vicinity of the project, and report the monitoring results, in accordance with the Air Quality Monitoring Program (Appendix B). Results will be provided to contractors.

References


4.2 Blasting Management

Dust, noise, and vibration from blasting have the potential to affect the health of humans, wildlife and fish. Potential adverse effects include noise, ground vibration, air blast overpressure, fly-rock, dust, and pollution.

All blasting must be conducted in accordance with Part 21 Blasting Operations of the Guidelines for *Workers Compensation Act* and OHS Regulation.

EPPs will address, at a minimum, the following requirements if applicable:

**Timing Windows**

- Blasting must be conducted in accordance with *Guidelines for Raptor Conservation* (BC MOE 2013);
- Blasting is prohibited:
  - within 1 km of an active raptor nest from April 1 to July 31; or
  - within 300 m of bat hibernacula from September 15 to May 15.
- Blasting is prohibited at the West Pine Quarry from January 1 to March 31.
- Blasting levels are limited at the West Pine Quarry to no greater than historical levels from May 15 to June 14.

**Noise and Vibration**

- Comply with applicable environmental guidelines and setbacks for use of explosives near watercourses, including Fisheries and Oceans Canada’s *Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters* (Wright and Hopky 1998), or an Authorization

**Worker and Public Safety**

- Implement mitigation measures to control fly rock
- Secure and limit access to blasting areas to qualified personnel involved in, and necessary for, blasting operations
- Prohibit smoking in and around explosives storage locations and blasting areas
- Maintain fire-fighting equipment in explosive storage facilities and at handling areas
- Design blasts (e.g., reducing maximum instantaneous charge, explosive type, blast pattern, size, etc.) to control blasting energy to only that required. Blast design and supervision shall be undertaken by qualified professionals holding appropriate and valid certification

Blasting in potentially acid generating rock must be done in accordance with Appendix E Acid Rock Drainage and Metal Leachate Management Plan.

**Explosives Transportation and Storage**

- Comply with all applicable legislation and regulations in connection with the use, storage, and transportation of explosives
• Transport explosives components separately and store them in separate and secure designated facilities, located safe distances from other facilities as recommended by qualified professionals

Control of Blast Debris and Dust

• Dust and overpressure shall be controlled by using appropriate blast hole patterns, detonation systems and stemming to prevent venting of blasts
• Safe overpressure limits shall be established by a qualified specialist

References


Wright, D.G. and G.E. Hopky, Department of Fisheries and Oceans. 1998. Guidelines for Use of Explosives in or Near Canadian Fisheries Waters. Access via:
4.3 Contaminated Sites Management

Potentially contaminated sites within the Project footprint have been identified and categorized based on the potential for contamination. Thirteen sites were classified as potentially contaminated, and 33 sites were classified as requiring further investigation. In addition, previously unidentified contaminated sites or materials (e.g., soil and groundwater) may be encountered during construction activities.

BC Hydro will:

- provide the locations of known contaminated or potentially contaminated sites to contractors;
- carry out further investigation on the remaining sites noted above
- conduct a risk assessment for each site based on the investigation results and the Project activities
- remediate the site if required by risk assessment

The objective of the general Contaminated Sites Environmental Management Plan is to outline the general procedures that would be followed if suspected contaminated materials are encountered during construction.

EPPs will address, at a minimum, the following requirements if applicable:

**Discovery of Potentially Contaminated Soil**

- Assess all excavated and imported soils for indicators of potential soil contamination. Indicators of potentially contaminated soils include, but are not limited to:
  - Unusual appearance or odour
  - Staining or sheens
  - Buried debris or trash (e.g., drums, automotive parts, cleaning rags, tanks) or
  - Suspect waste (e.g., batteries and metal parts)
- If potentially contaminated soils are encountered during excavation, segregate these soils from uncontaminated soil and stockpile them separately
- If potentially contaminated soils are encountered during the placement of imported soil, segregate the entire truckload of imported soil and stockpile it separately and immediately notify BC Hydro
- This soil shall be sampled and characterized by a contaminated sites approved professional, in accordance with *Technical Guidance on Contaminated Sites 1: Site Characterization and Confirmation Testing* (BCMOE 2009)
- If confirmed to be contaminated, secure contaminated soils and restrict access to authorized personnel and
- Only further handle potentially contaminated soils (e.g., placed or moved) after it has been sampled and confirmed to be non-contaminated by a contaminated sites approved professional
Handling, Storage and Movement of Contaminated Soil

- Take the following precautions when stockpiling potentially contaminated soils:
  - cover with plastic sheeting or tarps to prevent erosion
  - install a berm around the stockpile to prevent runoff from leaving the area
  - locate the stockpile at least 15 m from the Ordinary High Water Mark of any water course or wetland
- Handle and store contaminated or potentially contaminated soil under the direction of a contaminated sites approved professional, or by authorized personnel under the supervision of the contaminated sites approved professional
- Track and document the transport of all contaminated material in accordance with the Contaminated Sites Regulation

Removal of Wood Poles

Soil around wood poles may contain wood preservatives and be considered contaminated under the provincial Contaminated Sites Regulation.

Where a wood pole IS to be removed completely from the ground:

- All excess soil removed from within one meter of the pole site during wood pole renewal work must be disposed of at a facility authorized to accept this waste.

Where a wood pole IS NOT to be removed completely from the ground:

- Poles scheduled for replacement shall be cut about 0.5 m below the surrounding ground level and the hole backfilled with native material.

Wood poles may be stored for up to 90 days. Temporary wood poles storage areas must be located at least 10 m from water bodies and Environmentally Sensitive Areas. Storage areas must be less than 46.5 m².

Reference

4.4 Erosion Prevention and Sediment Control Management

Construction of the Site C dam may result in the generation of sediment. Other Project construction activities such as relocation of Highway 29, clearing, and transmission line construction may also generate sediment. Sediment has the potential to affect fish, fish habitat and riparian habitat, surface water quality and land use, such as agriculture.

Sediment control system including ditches, retention ponds and settling ponds shall be designed by a Qualified Environmental Professional. Design details including calculations shall be submitted to BC Hydro. BC Hydro will make available to contractors the work that it has done regarding construction sediment inputs. Sediment and erosion control structures (for example straw bales, vegetation matting) shall be certified weed free.

EPPs must identify areas of high erosion and sediment potential.

EPPs will address, at a minimum, the following requirements if applicable:

**Sediment Control**

- Effective sediment and erosion control measures shall be installed before starting construction to reduce the potential for introduction of sediment into watercourses in accordance with *Land Development Guidelines for the Protection of Aquatic Habitat* (Fisheries and Oceans Canada 1993) and *Standards and Best Practices for Instream Works* (BC Ministry of Environment 2004), unless otherwise specified in the Environmental Requirements.

- Control runoff and manage stormwater (for example rainfall or snow melt) and direct it away from construction areas where excavation, spoil placement, and staging activities occur.

- Prior to construction of the Jackfish Lake Road, or Project access roads, and of the transmission line, develop, with the assistance of a hydrologist, site-specific measures to reduce changes to the existing hydraulic balance and wetland function during construction.

- Isolate in-stream work areas from flowing water to prevent sediment from entering the downstream environment except as permitted by the environmental monitor.

- The nature and location of silt fences, berms, swales, ditches, check dams, settling ponds, and other sediment and erosion control facilities, as required.

- Contingency supplies of sediment and erosion control materials shall be maintained at each construction site and workers shall be sufficiently trained in their appropriate installation and maintenance.

- Sediment and erosion control measures shall be:
  - inspected regularly at a frequency commensurate with the risk, nature, location, and seasonality of the work
  - adapted or revised, as appropriate
  - repaired as necessary in a timely manner, commensurate with the risk, nature, location, and seasonality of the work
o maintained until construction is completed and the affected areas are sufficiently stabilized and revegetated so there is minimal risk of erosion or sedimentation at the site as a result of construction activities

- Storage and disposal of construction wastes, overburden, soil, or other substances in such a manner as to reduce the potential for entry into any streams or watercourses
  o Stockpiles of materials shall be located at least 15 m from the Ordinary High Water Mark of any watercourse or wetland, unless otherwise reviewed by the Environmental Monitor and deemed to pose a low risk of sediment entry into any waterbody.
  o Cover stockpiles of erodible materials such as soil with plastic sheeting or tarps, or establish vegetative cover, to prevent erosion

- Manage equipment production rates if required to reduce the amount of sediment generated

- Use clean rock materials for riprap construction to reduce the amount of sediment that is introduced into the aquatic environment

- When feasible, adjust the timing of construction activities to coincide with periods of high background sediment levels in consideration of the Peace Region aquatic wildlife least-risk windows identified in *Terms and Conditions for Changes In and About a Stream Specified by Ministry of Environmental Habitat Officers, Peace Sub-Region* (BC Ministry of Environment 2010).

### Erosion Control

- Control site runoff by ditching, grading, sedimentation ponds, check dams or effective alternatives

- Stabilize slopes by maintaining ground cover or using materials such as geotextiles/erosion control cloth

- Leave stumps in place to reduce soil disturbance, erosion and sediment transport in the headpond during reservoir clearing to reduce soil disturbance and potential sedimentation issues

- Manage vegetation and soil stripping, taking into consideration slope stability and the proximity to sensitive habitats such as wetlands

- Identify natural drainages that occur within cleared areas and incorporate appropriate sediment and erosion control measures into site planning

- Incorporate perimeter channels, as required, to catch and transport site runoff from new construction sites and equipment staging areas

- Install water bars to direct road surface runoff away from access roads in a safe manner

- Where required, install appropriately sized culverts to reduce road failure through erosion and to manage hydrological balance and wetland function

- Maintain ditches along access roads, as required, to control surface runoff and sediment transport
• Operate machinery on land above the high water mark in a manner that reduces disturbance to the banks of watercourses

• Remove sediment control measures, such as plastic sheeting and silt fencing, when no longer required, as determined by the Environmental Monitors

• Salvage and stockpile clean surface soils for site restoration

• Establish and maintain vegetative cover on the soils stockpiled for six months or longer to prevent erosion

• Restore disturbed areas to a stable vegetated condition as soon as possible in accordance with 4.12 Soil Management, Site Restoration and Revegetation

• Develop construction schedules such that reservoir clearing in the winter is maximized

References


4.5 Fisheries and Aquatic Habitat Management

Construction activities may affect aquatic habitat and riparian areas. Potential effects include alteration of aquatic habitat and reduction of fish health and survival. Clearing of all project construction sites, including but not limited to the reservoir, transmission corridor, Highway 29, dam site and quarries will be conducted in accordance with the vegetation Clearing and Debris Management Plan.

EPPs will address, at a minimum, the following requirements if applicable:

**Protection of Aquatic and Riparian Habitat**

- Description of the areas and types of aquatic and riparian habitat with the potential to be adversely affected from construction activities, and mitigation measures and best management practices proposed to reduce, avoid, or offset potential adverse effects
- Unless otherwise authorized in a permit or approval, construction activities will be conducted in accordance with:
- Except at the Dam Site Area (see Figure 2) during clearing, prohibit construction within 15 m of the Ordinary High Water Mark, unless the activity was described in the EIS
- Avoid construction and installation of transmission structures and associated infrastructure (i.e. anchors, guy wires) below the high water mark of any watercourse
- Use existing roads, trails, or cut lines, wherever possible
- Retain a 15 m machine-free riparian buffer from the Ordinary High Water Mark of watercourses and waterbodies during clearing
- Locate lay-down and material storage areas at least 15 m from the Ordinary High Water Mark
- Clearly flag or otherwise delineate riparian areas throughout all phases of construction
- Prevent debris and deleterious substances from entering watercourses
- Screen the intakes of any pumps in accordance with Fisheries and Oceans *Canada’s Freshwater Intake End-of-Pipe Fish Screen Guidelines* (Fisheries and Oceans Canada 1995)

**Sediment Controls**

Install effective sediment and erosion control measures and conduct construction activities in a manner which reduces the potential for siltation into watercourses in accordance with Section 4.4 of this CEMP

**Work Timing Windows**

Unless otherwise specified in the Environmental Requirements, conduct construction activities within watercourses only during the Peace Region aquatic wildlife least-risk windows identified in *Terms and Conditions for Changes In and About a Stream Specified by Ministry of Environmental Habitat Officers, Peace Sub-Region* (BC Ministry of Environment 2010).
The least-risk window does not apply if:

- The stream channel is naturally dry (no flow) or frozen to the bottom at the worksite and the instream activity will not adversely impact fish habitat (e.g., result in the introduction of sediment into fish habitat), or
- Construction of a winter crossing is proposed and such work does not adversely impact the stream channel (including stream banks), fish habitat or fish passage.
Fish Salvage and Relocation

Unless otherwise specified in the Environmental Requirements, fish salvage shall be conducted prior to the start of construction activities to capture and relocate any fish present within the work area. Fish salvage and relocation plans will be developed that take into account the following considerations:

- Fish salvage activities will be conducted in accordance with fish collection permits issued by MFLNRO and/or DFO
- Where feasible, prior to instream construction work, exclude fish from a section of the watercourse using stop-nets or other suitable measures
- Stop-nets should remain in place for the duration of the instream work, and should be monitored to ensure that they remain free of debris and continue to prevent fish access to the work area
- Fish should be captured by electrofishing, seining, trapping or a combination of these methods
- Alternative fish salvage approaches will be implemented in advance of those works where work area isolation or fish exclusion is not expected to be technically feasible or effective, such as certain instream work components in the mainstem of the Peace River. The intent is to capture those species and life stages that are expected to remain in the work area given the nature of the works being undertaken (i.e., less mobile fish such as species with small adult body size, and juvenile life stages of large fish species). Fish will be captured in advance of the works using methods suited to the habitat where work is planned. Backpack and/or boat electrofishing are potential capture techniques that are suited to these habitats, though other techniques may also be suited. Fish will be relocated well downstream of the work area.
- Transport and release salvaged fish into suitable habitat (e.g., habitat in which they are likely to survive), and within the same reach either above or below the construction area, and in a location that would not require re-salvaging. Planning for release locations should also take into account the number of fish expected to be released and the capacity of the habitat. Multiple release locations may be required when large numbers of fish are released.
- Fish holding times should be as short as feasible to reduce stress on salvaged fish. Maximum holding times should be specified for each fish species requiring salvaging
- Fish salvage plans in the construction headpond or in the Peace River downstream of Site C should be developed in coordination with the effectiveness monitoring program titled: Fish and Fish Habitat Productivity - Stranding monitoring program
Water Crossings and Instream Works

- Avoid instream construction activities on fish-bearing watercourses during construction of access road crossings where feasible,
- Unless otherwise authorized in a permit or approval, design and construct water crossings in accordance with:
  - Standards and Best Practices for Instream Works (Ministry of Water, Land and Air Protection 2004)
  - Measures to Avoid Causing Harm to Fish and Fish Habitat (Fisheries and Oceans Canada 2013)
  - Fish-stream Crossing Guidebook (Ministry of Forests, Lands and Natural Resource Operations et al, 2012)
- Design and construct clear-span structures to avoid placement of materials such as abutments and rip rap below the high water mark of any watercourse where feasible.
- Isolate instream construction areas in accordance with Section 6 of Standards and Best Practices for Instream Works (BC Ministry of Environment, 2004)
- Design and construct approaches so that they are perpendicular to watercourses to reduce disturbance to or loss of riparian vegetation where feasible
- Design and construct bridges so that stormwater runoff from bridge decks, side slopes, and approaches is directed into a retention pond or vegetated area to remove suspended solids, dissipate velocity and prevent sediment and other deleterious substances from entering watercourses
- If replacement rock reinforcement/ armouring is required to stabilize eroding inlets and outlets of a culvert, the following measures shall be incorporated:
  - Place appropriately-sized, clean rocks into the eroding areas associated directly with the inlet or outlet
  - Obtain rocks from above the high water mark of any watercourse
  - Avoid the use of rock that is acid-generating
  - Install rock at a similar slope to maintain a uniform stream bank and natural stream alignment
  - Do not place rock where it interferes with fish passage or constricts the channel width

Water Isolation and Diversion

If it is necessary to complete work within the stream channel, dewatering the site will proceed after effective fish salvage has been completed. The following guidelines shall be implemented during isolation and dewatering:

- The isolation of the work area must not cut off flow to downstream portions of the stream (below the isolation area) at any time during construction. The point of discharge to the stream should be located immediately downstream of the work area and upstream of the fish stop fence.
• If surface flow is present, water from upstream should be diverted with a suitable method, such as through a diversion channel, gravity bypass pipe, or by pumping around the site. The point of discharge to the stream should not result in sedimentation, scour, or erosion.

• If flow is redirected through a temporary diversion channel, the channel should be lined with an appropriate material (e.g., filter cloth, clean gravel) to prevent erosion of the exposed channel bed.

• Following isolation of the work area, sediment laden water that accumulates within the site due to groundwater flow or seepage should be pumped to a suitable sedimentation pond or vegetated area, far enough from the watercourse to prevent direct re-entry into the channel. Excavation of a small sump upstream and downstream of the work area will assist in collecting seepage, which can then be pumped away from the watercourse.

• The isolation and diversion structures and equipment shall be monitored and regularly maintained until the works are sufficiently completed and until the Environmental Monitor determines that there is no longer a risk of adverse effects to aquatic resources or water quality as a result of flowing water through the work areas.

**Decommissioning and Site Restoration**

• Decommission and remove temporary structures used during construction within the construction season that they are deemed to be no longer required.

• Upon completion of construction activities, remove surplus materials and wastes from the work sites, and dispose at appropriate facilities.

• Install and maintain appropriate sediment control measures until such time that natural vegetation becomes established.

• To the extent possible, restore surface soil adjacent to the stream channel using low impact equipment under dry soil conditions.

• Restore riparian management areas disturbed during work to a stable vegetated condition as soon as possible in accordance with 4.12 Soil Management, Site Restoration and Revegetation.

• Where possible, re-establish ground cover to allow adequate vegetative growth prior to the onset of rainfall and snowfall events. If this is not possible, alternate erosion measures must be provided.

• Upon completion of restoration activities, remove all remaining sediment and erosion control measures, unless necessary to protect areas where vegetation is naturally establishing.

• Remove all equipment, supplies and materials associated with the work.

**Aquatic Invasive Species**

Equipment arriving at the Project area could contain aquatic invasive species. To avoid the introduction aquatic invasive species, EPPs must address, at a minimum, the following:

• Demonstrate compliance with the BC Wildlife Act’s Controlled Alien Species Regulations.
• Measures to avoid the introduction of aquatic invasive species into the Project area, including procedures for equipment inspection, cleaning and treatment of wash water.

References


4.6 Fuel Handling and Storage Management

During construction, fuels will be delivered to and stored on the site for refuelling of service vehicles, equipment and machinery. Mishandling of fuels could affect groundwater and surface water quality, and fish and wildlife habitat. Spilled fuels would create a fire hazard.

EPPs will address, at a minimum, the following requirements if applicable:

- Plan, design, and construct fuel storage and handling facilities in accordance with *Standards and Best Practices for Instream Works* (BC Ministry of Environment 2004)
- Locate storage, handling and vehicle maintenance and repair sites on flat, stable ground, at least 30 m from the Ordinary High Water Mark of watercourses and wetlands
- Store all tanks, barrels, and containers greater than 23 litres containing hydrocarbon products within impermeable containment designed to contain 110% of the volume of the largest container. Containers must be transported upright and secured to prevent shifting and toppling. Impermeable containment is required for stationary fuel storage as well as mobile fuel storage (i.e., fuel trucks) when remaining on site overnight
- Store and transport containers that are 23 litres or less in an equipment box of a vehicle that is capable of containing the total quantity of fuel in the container(s) should it leak or spill
- Operate storage area(s) so that containment systems remain effective during wet weather, and provide protection against theft and vandalism
- Sites shall have a written Spill Contingency Plan with required actions specified and will include the names of those to be contacted
- Plastic containers used to carry petroleum products shall be designed for that purpose
- Verify that containers do not leak and are sealed with a proper fitting cap or lid
- Label containers according to the *Transportation of Dangerous Goods Act Regulations*
- Transport hydrocarbons to and within construction areas, in conformance with the requirements of the *Transportation of Dangerous Goods Act*
- Refuel equipment at least 30 m from the Ordinary High Water Mark of watercourses and wetlands. In locations where this is not practical, describe and implement protective measures to ensure that all spilled fuel is contained and recovered. This includes measures to prevent spills during fuelling of boats
- Ensure all sites where fuel handling and storage is happening are equipped with appropriate spill kits
- Inspect vehicles and equipment, including their hydraulic fittings, daily to verify that they are in good condition and free of leaks
- Compressors/generators required at helicopter fly-in sites shall be placed in an impermeable containment area designed and constructed to contain 110% of the volume of any potential fuel spill. Absorbent pads shall be included in the “fly box” tool kits for sites requiring fuel containing equipment
• Store fuels separately from corrosive materials
• Prohibit smoking in the vicinity of fuel storage and dispensing facilities in accordance with the *Occupational Health and Safety Regulations*
• An inspection program for fuel storage (i.e., tanks and transfer systems) and dispensing locations and equipment shall be developed by a qualified professional, and implemented by the contractor. This program shall be submitted to and accepted by BC Hydro prior to construction of fuel storage and dispensing facilities

**Reference**

4.7 Groundwater Protection

Project construction activities that have the potential to affect groundwater quality include, but are not limited to:

- Storage, use, and potential spills of fuels, chemicals and hazardous materials;
- Reservoir filling;
- Excavation, drilling, and construction around springs and groundwater seeps as well as other activities that can expose groundwater to surface contamination;
- Activities that produce waste fluid and water which could infiltrate into the ground (e.g., washing of cement and concrete, camp septic systems, equipment maintenance).

EPPs will address, at a minimum, the following requirements if applicable:

Managing Infrastructure Prior to Inundation

- Inspect all properties with infrastructure within the proposed reservoir footprint for potential sources of groundwater contamination prior to reservoir inundation. Potential sources of contamination include:
  - Building infrastructure
  - Septic tanks and fields
  - Underground storage tanks
  - Debris and waste, within buildings and on the property
- Decommission identified potential sources of contamination associated with properties and infrastructure within the reservoir footprint, prior to reservoir inundation
- Decommission water wells that will potentially be directly inundated by reservoir filling prior to reservoir filling
- Identify, characterize and remediate contaminated sites in accordance with the Contaminated Sites Management Plan

Groundwater Protection Measures

- Drilling will be conducted in accordance with the Groundwater Protection Regulation
- Waste liquid shall only be discharged to ground:
  - If it has been sampled and meets applicable standards
  - In accordance with a permit or other provincial authorization, or an applicable regulation or code of practice
4.8 Hazardous Waste Management

Hazardous wastes include, but are not limited to, asbestos, fuels, used fuels, oils, oil filters, greases, bitumen’s, lubricants, solvents, cement, paints, solvents, batteries, cleaners, dust suppressants, PCBs, paints, and used spill cleanup materials. Hazardous waste that is spilled could affect surface water quality, air quality, fish habitat, or wildlife habitat.

EPPs will be developed in accordance with *Hazardous Waste Legislation Guide* (BCMOE 2005). EPPs will address, at a minimum, the following requirements if applicable:

- Store, handle and transport hazardous materials to avoid loss and to allow containment and recovery in the event of a spill in accordance with all applicable legislation, including, but not limited to, the BC Fire Code, the National Fire Code of Canada, and the *Transportation of Dangerous Goods Act*.

- Designate onsite areas for the transfer and limited temporary storage of hazardous materials and wastes. The area(s) shall be located at least 30 m from the Ordinary High Water Mark of any waterbody, clearly labelled and appropriately controlled. BC Hydro may inspect designated area(s) at any time and may require the prompt removal of any hazardous materials which are not in active use.

- Adequately train site personnel in the handling and transportation of hazardous materials.

- Dispose of hazardous wastes generated during construction in compliance with the BC *Hazardous Waste Regulation* under the *Environmental Management Act*.

- Where construction activities involve the handling, storage, and removal of hazardous wastes, contractors shall maintain the following records:
  - Inventories of types and quantities of wastes generated, stored, or removed
  - Manifests identifying licensed waste haulers and disposal destinations
  - Disposal certification documents

**Reference**


[http://www2.gov.bc.ca/gov/DownloadAsset?assetId=51C5BF7BBC8140FA93CE2C9AEABBC042](http://www2.gov.bc.ca/gov/DownloadAsset?assetId=51C5BF7BBC8140FA93CE2C9AEABBC042)
4.9 Heritage Resources Management

Heritage resources include archaeological, historical, and palaeontological sites, objects and features. Construction activities that disturb land could affect heritage resources. In addition to heritage sites, there may be locations of cultural importance (e.g., areas of current traditional use) identified by Aboriginal Groups in the area.

All construction sites require completion of a heritage assessment, in the snow-free season, prior to the start of construction activities. These assessments were completed during the environmental assessment phase prior to construction in most areas. Any areas still requiring a heritage assessment prior to commencement of Work shall be identified in an EPP as indicated below.

BC Hydro will:

- Retain a Heritage Specialist to coordinate BC Hydro’s heritage obligations with the Contractors working on the Project.
- With the assistance of the heritage specialist, develop a Project-wide construction Heritage Resource Management plan (HRMP) that describes the measures that will be used to mitigate the adverse effects of the Project on heritage resources.
- Through its Heritage Specialist obtain permits under the BC Heritage Conservation Act that are required for the construction of the Project, which are anticipated to include requirements with respect to the assessment, mitigation and management of heritage resources and requirements to undertake construction activities within protected heritage sites.
- Invite Aboriginal Groups to identify to BC Hydro any locations of cultural importance within planned construction areas; lead discussion with Aboriginal Groups, the Heritage Specialist and applicable contractors to identify feasible avoidance or mitigation measures for locations of cultural importance made known to BC Hydro; direct its contractors with respect to avoidance or mitigation measures for such locations.

Contractors will be responsible to include heritage requirements as part of an EPP as applicable to the scope of work covered by the EPP. Contractors will be required to cooperate with BC Hydro’s Heritage Specialist to develop the heritage requirements of an EPP, and to provide the Heritage Specialist with information in a timely manner about the scheduling of planned work. The Heritage Specialist will support the Contractor in developing the EPP by providing the following as applicable:

- Maps and digital data identifying:
  - areas within planned construction locations where heritage assessments are not completed and still required;
  - recorded heritage sites;
  - required heritage mitigation and protection measures.
- Review of maps of contractors planned construction locations and activities prior to construction commencing to identify heritage management requirements.
- Completion of required heritage assessments in accordance with applicable legislation and conditions of permits issued under the BC Heritage Conservation Act, where heritage assessments have not been completed in any construction locations.
• Confirmation of the status and timing of planned mitigation for known heritage resources in accordance with permit conditions issued under the BC Heritage Conservation Act.

• Confirmation of the status of Heritage Conservation Act permits prior to disturbance of known heritage resources.

• Implementation of required heritage surface inspections or monitoring after initial ground disturbance associated with stripping, grubbing or excavating within known archaeological sites, in accordance with the conditions of permits issued under the BC Heritage Conservation Act.

• Qualified Environmental Professionals as required if the contractor discovers a chance find of any previously unrecorded heritage resources and any human remains found during construction activities in accordance with the HRMP, applicable legislation and conditions of permits issued under the BC Heritage Conservation Act.

EPPs will address, at a minimum, the following heritage requirements if applicable, in accordance with the HRMP:

• Heritage site management requirements, including conditions of permits issued under the BC Heritage Conservation Act;

• Procedures for the delineation, on maps and on the ground, of known heritage sites within Work Areas to support implementation of site specific heritage site management requirements.

• Prohibitions on workers, during the course of their work, from destroying, excavating, altering or collecting any heritage resource without authorisation under a BC Heritage Conservation Act permit

• Prohibitions on workers from disturbing, destroying or collecting heritage resources for personal purposes

• Implementation of monitoring procedures as specified in the HRMP and as specified in permits issued under the BC Heritage Conservation Act.

• Chance find procedures with respect to heritage resources, including definition of heritage resources subject to chance find reporting, initial response procedures, and guidelines for determining further action and management of newly found heritage resources.

References

http://www.for.gov.bc.ca/archaeology/docs/impact_assessment_guidelines/index.htm

http://www.for.gov.bc.ca/archaeology/docs/resource_management_handbook/index.htm
4.10 Ice Management

BC Hydro operates its existing Peace River facilities under a joint agreement between the provinces of BC and Alberta (Alberta - British Columbia Joint Task Force on Peace River Ice). The Project will be operated in accordance with the agreement. One of the management objectives of the joint agreement is to control flows from BC Hydro’s facilities in a way that avoids downstream flooding during ice formation and breakup. Existing ice management practices will continue during the construction phase of the Project.

Construction of the Site C dam will occur in two stages. Stage 1 (channelization) consists of restricting the channel and is expected to last through two or three winters. Stage 2 (diversion) consists of diverting the flow through tunnels in order to isolate the area where the earthfill dam will be constructed across the Peace River and is expected to last through three winters.

BC Hydro will retain a qualified professional to develop and implement a Head Pond Ice Monitoring Plan for the Stage 2 diversion phase of construction. The objectives of the Head Pond Ice Monitoring Plan are to:

- Ensure that ice hazards such as ice jams, and ice accumulation on the construction headpond and downstream of the Project are managed during construction in consideration of worker and public safety
- Establish protocols for managing ice on the construction headpond so that water levels are maintained at a safe level below the top of the temporary cofferdams

Results of this Plan will be reported to BC Hydro and upstream operations will be adjusted accordingly to maintain free flow of water through the diversion tunnels, and sufficient freeboard at the temporary cofferdams.

Monitoring of the downstream ice front will continue as per the operating procedures of the Joint Task Force on Peace River Ice.
4.11 Noise and Vibration Management

The potential to affect noise sensitive receptors (e.g., residences, campgrounds, schools, hospitals, sensitive wildlife) depends on the type of activity and the proximity of that activity to the receptor. The following activities will take place close to residences or campgrounds and therefore the control of noise and vibration is particularly important at the following locations:

- 85th Avenue Industrial Lands: excavating, loading, conveyor operation
- Reservoir clearing
- Construction of Hudson’s Hope berm
- Relocation of Highway 29 segments

BC Hydro will notify residents in the vicinity of the project of construction activities in accordance with the Construction Communications Plan (Appendix C) and the Aboriginal Group Communication Plan (Appendix D).

BC Hydro will implement a noise monitoring program to measure noise levels at sensitive locations near the 85th Avenue Industrial Lands, Highway 29 re-alignment and Hudson’s Hope berm. Where measured noise exceeds the *British Columbia Noise Control Best Practices Guidelines* (BC Oil and Gas Commission, 2009) BC Hydro will require additional mitigation measures such as changes in construction schedule, changes in construction methods or engineered controls to address the issue. If necessary, BC Hydro will temporarily relocate residents, as deemed appropriate in consultation with affected homeowners.

EPPs must include a noise management program that describes:

- any construction activities that create noise that could reasonably be expected to disturb residents in close proximity to the Site; and
- the mitigation measures the Contractor will undertake to lessen the impact of the noise created by such construction activities.

EPPs will address, at a minimum, the following requirements if applicable:

- Retain or erect acoustic barriers, fencing, and vegetative screens as appropriate
- Maintain equipment in good working order
- Outfit equipment with the appropriate silencers and mufflers, as designed
- Use electric motors, pumps and auxiliary equipment that meet current acoustic industrial and regulatory standards
- Locate stationary equipment away from noise receptors
- Restrict helicopter use to defined flight paths to and from construction sites in order to reduce noise effects on local residents
- Schedule construction activity near homes to reduce the period of disturbance
- Control construction traffic and deliveries on local roads during night-time hours (22:00-07:00)
• Implement drive-through pathways for material drop off or pick-up to reduce use of back-up alarms
• Prohibit free swinging tailgates
• Minimize vehicle idling to the extent feasible
• Minimize the length and duration of helicopter flights to the extent feasible

85th Avenue Industrial Lands

The area surrounding 85th Avenue Industrial Lands includes residences and is sensitive to disturbances. The noise management program for 85th Avenue Industrial Lands shall include:

• Install perimeter fencing around the construction site to restrict access
• Direct site lighting into the site
• Install a 3 m high berm along all boundaries of the site at the start of site development
• Consider the use of secondary berms or portable enclosures or barriers closer to construction activities as a measure to reduce visual or noise impacts
• Retain existing vegetation where feasible to maintain a natural visual and noise buffer, and consider planting vegetation as a measure to reduce visual or noise impacts
• Install portable acoustic barriers near the conveyor belt hopper and an enclosure for the on-site portion of the conveyor belt
• Manage noise associated with the off-site portion of the conveyor belt by enclosing it, or by providing an alternative that is as effective in managing noise associated with operation of the conveyor
• If feasible, use silent back-up alarms during night-time operations
• Design a work and noise management schedule that allows an uninterrupted eight hour sleep schedule for Project workers

Reference

4.12 Soil Management, Site Restoration and Revegetation

Excavation and site preparation may disturb natural vegetation and contouring, and may affect agricultural capability of the land. Unvegetated areas may be prone to erosion and invasive plant infestation.

Site restoration is a planned series of activities designed to recreate the conditions that support the re-establishment of a natural ecosystem state on disturbed sites, or the re-establishment of agricultural landscapes. Soil management is planned soil removal activities that support site restoration objectives. Revegetation is part of planned restoration activities that support the natural re-establishment of suitable plant cover on disturbed sites through the promotion of native vegetation.

BC Hydro has developed a framework for soil management, site restoration and revegetation. Each contractor shall prepare a site-specific Soil Management, Site Restoration and Revegetation Plan in accordance with the framework. The objectives of this Plan are to effectively manage disturbed soils through proper soil storage and salvage and to restore and revegetate disturbed construction areas to a safe and environmentally acceptable condition. In areas with pre-existing agricultural use, the objective is to reclaim areas to an agricultural capability equivalent to or better than pre-disturbance capability. EPPs will be developed in accordance with the framework.

Temporarily disturbed areas, including access roads, must be treated in a manner to achieve revegetation with native species as soon as practicable following construction, but no more than one year after the completion of construction activities at the particular site, to reduce the potential for invasive species to establish. Restoration activities will start as soon as practicable after use stops. Some restoration activities may be delayed if needed to wait for the next growing season or to avoid wet or dry conditions that may limit the success of restoration.

Soil Management, Site Restoration and Revegetation Framework

BC Hydro's proposed restoration activities will be guided by a restoration framework. The objectives of the framework are to describe:

- natural processes that can be used to achieve long-term restoration of disturbed areas
- processes that will be used to achieve short term erosion control during the construction period.

Site Features

This section will outline the site features that will be considered when developing site specific restoration plans:

- Topography of
  - the surrounding area
  - the site during construction
  - the site post construction
- Surface structure
- Shoreline areas
- Hydrology, including groundwater and surface water movement.
Successional Dynamics
This section will outline the successional dynamics associated with the different ecosystems that occur in the Project area:

- grassland slopes
- aspen parkland
- Balsam poplar riparian forests
- White spruce forests

Successional dynamics associated with each site that will guide the restoration plans.

Area Specific Recommendations
The framework will outline recommended treatments for the:

- relocated surplus excavated material sites
- north bank excavations at the dam site
- south bank excavations at the dam site
- Highway 29
- material source sites and quarries
- proposed 15m riparian plantings along the reservoir shoreline

Detailed site specific restoration plans within each area will be developed incorporating the recommended treatments in conjunction with Project design. Detailed plans will describe site preparation, erosion protection, planting plans (species composition, planting densities) and planting timelines.

Monitoring
The framework will describe how reclaimed areas will be monitored including:

- inspection methods
- effectiveness evaluations
- measures for determining restoration success
- short-term maintenance (as required)
- monitoring timelines.

EPPs will address, at a minimum, the following requirements if applicable:

Soil Management

- Upon completion of soil movement activities, restore site drainage patterns to natural flow conditions, where feasible
- Design and construct stockpile slopes to reduce soil erosion
- Identify and store appropriately soil, overburden material and coarse woody debris that could be used to create habitat features during site restoration
• Restore soils within agricultural areas, including replacement of topsoil to maintain agricultural productivity in consultation with a Professional Agrologist
• Minimize compaction of undisturbed soils to the extent feasible

Site Restoration
• A schedule of site restoration activities that outlines the progressive closure and reclamation of any temporary disturbance
• Contour disturbed slopes to landforms which are safe and stable and compatible with adjacent landforms and proposed future use/restoration objectives
• Remove all surplus materials, waste materials, debris and temporary structures from site following construction, and subsequent disposal in appropriately authorized facilities
• Borrow and quarry areas (defined under the BC Mines Act) specifically developed for the Project shall be restored as detailed in part 10 of the Health, Safety and Reclamation Code for Mines in British Columbia (BC Ministry of Energy, Mines and Petroleum Resources, 2008), relevant permit conditions, and in accordance with the site development plan before the end of the construction season that construction ceases at the site

Revegetation
• A schedule of site revegetation activities
• Prior to planting, de-compact soils that have been compacted
• Seed and/or re-plant disturbed areas with regionally appropriate native and/or non-invasive plants
• Seed mixes will be native plants, certified weed free and not contain any species listed in invasive categories A, B or C of the Northeast Invasive Plant Committee 2011 Plan and Profile (Northeast Invasive Plant Committee, 2011)
• Revegetate during a period when the soil contains enough moisture to germinate and sustain the application
• Restore riparian areas with native vegetation and fish habitat features

BC Hydro’s support for the local sourcing of indigenous plants for project reclamation activities is described in Section 4.2.2 of the Aboriginal Plant Use Mitigation Plan.

References

Northeast Invasive Plant Committee, 2015
4.13 Spill Prevention and Response

Spills of chemical or fuels spills may cause environmental damage and pose a risk to human health.

Activities that involve potentially harmful or toxic substances such as oil, fuel, antifreeze, and concrete will follow approved practices and consider *Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia* (BC MOE 2014). Equipment will be maintained according to manufacturers’ specifications to reduce the likelihood of spills.

EPPs will adhere to requirements of the *Spill Reporting Regulation, BC Transportation of Dangerous Goods Act, Environmental Emergency Regulations* and the *Canada Transportation of Dangerous Goods Act*. Each Plan shall also meet current BC Ministry of Environment Guidelines for Industry Emergency Response Plans or equivalent.

EPPs will address, at a minimum, the following requirements if applicable:

**Spill Prevention**

- Specific instructions on how to reduce the risk of spills
- Storage, handling and labelling of fuels and other hazardous materials. Fuel storage and handling procedures shall be consistent with *A Field Guide to Fuel Handling, Transportation and Storage* (BC MWLAP 2002)
- Implementation of a risk assessment process for recognizing potential hazards and minimizing fuel spills consistent with Section 7 of *A Field Guide to Fuel Handling, Transportation and Storage* (BC MWLAP 2002)
- Equipment refueling and servicing procedures. Machinery shall only be serviced, refuelled and washed in designated areas, located at least 30 metres from the Ordinary High Water Mark of any watercourse or wetland
- Incorporation of drip containment measures for fuel dispensing equipment to maximize fuel containment
- Monitoring of vehicles and equipment for leaks on a daily basis. If the operation of construction vehicles is necessary within riparian areas, vehicles and equipment shall arrive on site in a clean condition and be maintained free of fluid leaks

**Spill Response Equipment**

- The minimum required content of vehicle spill kits is:
  1. For all pickup trucks, transport vehicles and equipment with on-board fuel capacity of 500L or less:
     - Goggles, PVC gloves, 10 absorbent pads, 2 absorbent booms (3m), 1 container of emergency sealant, 3 heavy duty plastic bags
2. For all pickup trucks, transport vehicles and equipment with a portable fuel tank with capacity of 500L or less:
   Goggles, PVC gloves, 10 absorbent pads, 2 absorbent booms (3m), 1 container of emergency sealant, 3 heavy duty plastic bags

3. For all pickup trucks, transport vehicles and equipment with on-board fuel capacity of greater than 500L:
   Goggles, PVC gloves, 20 absorbent pads, 6 absorbent booms (each 3m), 1 container of emergency sealant, 5 heavy duty plastic bags

4. For all pickup trucks, transport vehicles and equipment with a portable fuel tank with capacity of greater than 500L:
   Goggles, PVC gloves, 20 absorbent pads, 6 absorbent booms (each 3m), 1 container of emergency sealant, 5 heavy duty plastic bags

The required contents are to be carried in each vehicle inside a container marked “Spill Kit”.

- Spill kit contents for fuel dispensing stations shall be consistent with requirements outlined in Table 9.3 (a) of *A Field Guide to Fuel Handling, Transportation and Storage* (MWLAP 2002). Equipment containing ethylene glycol (antifreeze) or other water soluble chemical shall carry an appropriate number of water soluble chemical absorbent pads in addition to absorbent pads used for petroleum products
- Inspections to compare current contents of spill kits with required contents at Project start-up and whenever a new piece of equipment comes onto site
- Locations and nature of clean-up materials and equipment
- Appropriate training of workers in the use of spill response equipment

**Spill Response Procedures**

- Spill reporting and notification procedures, in accordance with Section 2.5
- Containment, recovery and clean-up procedures and training
- Contact information for persons and organizations to be notified in the event of spills or other environmental emergencies (including contact information for the Provincial Emergency Program [PEP] and Environment Canada Emergencies)

If a spill of fuels, oils, lubricants or other harmful substances occurs, the following procedures shall be implemented:

1) Make the area safe
2) Stop the flow (when possible)
3) Secure the area
4) Contain the spill  
5) Report  
6) Clean-up  

References  

4.14 Surface Water Quality Management

Project construction activities in or near streams and water bodies, including clearing, blasting, dam construction, and road construction, have the potential to alter water quality.

EPPs will address, at a minimum, the following requirements if applicable:

**Water Quality Monitoring**

EPPs will include a water quality monitoring program that will specify water sampling locations, parameters and frequencies. Water quality will be monitored both upstream and downstream of construction areas. Unless otherwise specified in the Environmental Requirements, water quality shall be maintained within the limits shown in Table 2. Water Quality Guidelines.

Contractor Environmental Monitor(s) shall conduct water quality monitoring for turbidity plumes (visual and with a turbidity meter), hydrocarbon sheens from oil and grease (visual), and iron bacteria/ochre (visual) during all construction activities in the vicinity of any watercourse or wetland and monitor pH during concrete works within 30 m of the Ordinary High Water Mark of any watercourse or wetland.

**Concrete and Concrete Products**

Concrete works undertaken in and about a water body must be done in accordance with Section 5 of *Standards and Best Practices for Instream Works* (BC Ministry of Environment 2004).

**Water Diversions**

Temporary water diversions must be done in accordance with Section 11 of *Standards and Best Practices for Instream Works* (BC Ministry of Environment 2004).

**Acid Rock Drainage and Metal Leachate**

Measures that will be undertaken to mitigate potential adverse effects resulting from potential sources of acid rock drainage or metal leaching material associated with construction of the Project are described in the Acid Rock Drainage and Metal Leachate Management Plan (Appendix E).

**Application of Roadsalt**

If roadsalt is used for de-icing roads, it shall be applied in accordance with Table 3 of BC Ministry of Environment’s Roadsalt and Winter Maintenance for British Columbia Municipalities Best Management Practices to Protect Water Quality (BC Ministry of Environment. 1998).
Table 2  Water Quality Guidelines

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Maximum Allowable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended Solids¹</td>
<td>• Change from background of 25 mg/L at any one time for a duration of 24 hours in all waters during clear flows or in clear waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 5 mg/L at any one time for a duration of 30 days in all waters during clear flows or in clear waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 10 mg/L at any time when background is 25 – 100 mg/L during high flows or in turbid waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 10% when background is &gt;100 mg/L at any time during high flows or in turbid waters</td>
</tr>
<tr>
<td>Turbidity¹</td>
<td>• Change from background of 8 NTU at any one time for a duration of 24 hours in all waters during clear flows or in clear waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 2 NTU at any one time for a duration of 30 days in all waters during clear flows or in clear waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 5 NTU at any time when background is 8 – 50 NTU during high flows or in turbid waters</td>
</tr>
<tr>
<td></td>
<td>• Change from background of 10% when background is &gt;50 NTU at any time during high flows or in turbid waters</td>
</tr>
<tr>
<td>Streambed Substrate Composition¹</td>
<td>• % fines not to exceed: 10% &lt;2 mm, 19% &lt;3 mm, 28% &lt;6.35 mm at salmonid spawning sites</td>
</tr>
<tr>
<td></td>
<td>• Geometric mean diameter not less than 12 mm (minimum 30-day intragravel dissolved oxygen of 6 mg/L)</td>
</tr>
<tr>
<td></td>
<td>• Fredle number not less than 5 mm (minimum 30-day intragravel dissolved oxygen of 8 mg/L)</td>
</tr>
<tr>
<td>pH²</td>
<td>• 6.5 – 9.0</td>
</tr>
<tr>
<td>Oil and Grease³</td>
<td>• the surface water should be virtually free of petroleum, animal or vegetable oils</td>
</tr>
</tbody>
</table>

¹ From Ambient Water Quality Guidelines (Criteria) for Turbidity, Suspended and Benthic Sediments (BC MOE, 2001)
² From Water Quality Guidelines for the Protection of Aquatic Life (CCME 2012)
Table 3. Roadsalt Application Rates

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
<th>Application Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>light application</td>
<td>to prevent black ice when the surface temperature is near freezing with light snow or sleet</td>
<td>60 kilograms per two-lane kilometre (about 1/20 cubic metre)</td>
</tr>
<tr>
<td>average application</td>
<td>early in the day when the surface temperature is -4° Celsius and rising under snow, sleet or freezing rain conditions</td>
<td>85 kilograms per two-lane kilometre (about 1/14 cubic metre)</td>
</tr>
<tr>
<td>heavy application</td>
<td>early in the day when the surface temperature is -4° Celsius and stable or when the surface temperature is -6° Celsius and rising or late in the day when the surface temperature is -4° Celsius and rising, under conditions of packed snow or ice on the highway surfaces</td>
<td>130 kilograms per two-lane kilometre (about 1/9 cubic metre)</td>
</tr>
</tbody>
</table>

From (BC Ministry of Environment. 1998)

References


4.15 Vegetation and Invasive Plant Management

Construction activities may affect the dispersal of invasive plant species which can out-compete native vegetation, and cause damage to natural environments and agricultural production.

BC Hydro will undertake invasive plant control on work sites, in accordance with BC Hydro’s applicable Pest Management Plan, prior to construction, and coordinate control activities, and schedules with Contractors.

EPPs must address, at a minimum, the following requirements if applicable:

- Surveys of existing invasive species populations and mapping provided by BC Hydro
- Limit the stripping of vegetation and soils to the areas required for Project activities
- Ensure that weed material is not brought onto Project work sites from non-Project work sites, and that weed material from Project work sites is not transported to non-Project work sites
- Manage vehicle movement in a manner that reduces seed dispersal both within and beyond construction sites
- Locate vehicle wash areas at least 30 m from the Ordinary High Water Mark of any water body
- Treat used wash water to prevent seed dispersal and release of contaminants
- Keep machinery on designated routes to reduce damage to surrounding vegetation
- Measures to control invasive plants, manage established invasive species populations and prevent invasive species establishment

Reference

4.16 Waste Management

Construction materials and other wastes can cause adverse effects on groundwater and surface water quality, fish and wildlife habitat, and human health and safety.

EPPs will be developed in accordance with *A Best Practices Guide to Solid Waste Reduction* (Canadian Construction Association 2001). EPPs will develop methods for disposal of project-related waste and identify waste management strategies to manage effects on landfills in the region. EPPs will address, at a minimum, the following requirements if applicable:

**General Construction Wastes**

- Contractor(s) shall make every reasonable effort to control the amount of material disposed of, using regionally available facilities
- Each contractor shall develop and implement a waste management program that integrates waste reduction, reuse and recycling considering the Peace River Regional District’s Solid Waste Management Plan
- Contractors may dispose of tires which are not recycled as part of BC’s tire recycling program in the Relocation Areas for Surplus Excavated Material
- If wastes are generated by contractor(s) in the course of construction, the wastes shall be disposed of in compliance with appropriate environmental waste management procedures and legislation such as the *Environmental Management Act* which are intended to reduce waste and potential for creating health risks and problems for wildlife
- Each contractor shall arrange for disposal of construction-related wastes in a manner acceptable to local governments having jurisdiction, including verification that local landfills have capacity to meet the contractor’s disposal requirements
- Establish regular clean up and disposal programs to prevent the unnecessary accumulation of construction wastes
- Provide sanitary facilities for the use of workers. Sanitary facilities shall be secured so they do not fall over, and shall be located at least 30 m from the Ordinary High Water Mark of any waterbody. Sanitary facilities shall be secured and emptied at a frequency sufficient to prevent potential overflow and spills
- The contractor shall keep records of the types and quantities of waste generated, their handling, transport, disposal date and disposal facility. The contractor shall make the records available to BC Hydro for inspection whenever required

**Food Waste**

- Collect and store food waste and domestic garbage in animal-proof containers and remove regularly for proper disposal
Waste Forecasting

Each contractor shall provide to BC Hydro an annual forecast of its expected waste types and quantities by January 31 of each year of construction.

BC Hydro will compile the annual contractor waste forecasts and provide the compilation to the Peace River Regional District by March 31 of each year of construction. BC Hydro will consult with the Peace River Regional District annually to identify waste management options and establish resources and funding arrangements to address any potential shortfall in existing landfill capacity caused by construction of the Project.

References


4.17 Wildlife Management

Construction activities may affect wildlife and wildlife habitat through:

- Disturbance and displacement;
- Permanent or temporary habitat loss, alteration or fragmentation;
- Direct and indirect mortality; and,
- Increased wildlife-human contact.

EPPs will address, at a minimum, the following requirements if applicable:

**Wildlife Protection Measures**

- Least-risk timing windows:
  - Where feasible, vegetation clearing will take place during the Peace Region terrestrial wildlife least-risk windows as shown in Table 3.
  - If clearing is to take place outside of the least-risk windows or inside the General Nesting Period, the contractor shall inform BC Hydro and retain a Qualified Environmental Professional to develop a nest and lek search protocol. The protocol will be developed in consultation with the Canadian Wildlife Service (Environment Canada), and the BC Ministry of Forests, Lands and Natural Resource Operations. The protocol will outline survey procedures that will be used to determine the presence of active nests and buffers required around active nest sites. Trees would be removed once nests are confirmed unoccupied.

- Raptor nests:
  - Bald Eagle Nests
    - Obtain a BC *Wildlife Act* permit prior to removal of any Bald Eagle nest. Nests will be removed in compliance with permit conditions.
    - Bald Eagle nests will be removed from construction sites prior to construction activities.
    - Bald Eagle nests within the reservoir area and outside construction sites will be removed prior to reservoir filling, under the direction of BC Hydro. For active nests retained in the reservoir area through construction, a no-clearing buffer centered on each active nest will be implemented and maintained until reservoir filling is initiated.
    - Nests within the diversion headpond area, that could be lost during seasonal headponding, will be removed to reduce the risk of displacement or possible mortality during active nesting.
    - No buffer will be implemented around Bald Eagle nests newly occupied or newly constructed during Project construction within the Project Activity Zone or within 300 m of the Project Activity Zone.
- Other raptor nests
  - For existing active raptor nest within construction zones implement and maintain a 100 m buffer centered on each active nest
  - No buffer will be implemented around other active raptor nests newly occupied or newly constructed during Project construction within the Project Activity Zone or within 600 m of the Project Activity Zone
  - No buffer will be implemented around raptor nests adjacent to a road being used for site access

- Sharp-tailed grouse leks
  - If construction is required adjacent to any leks, implement appropriate barriers around the lek sites in accordance with management of Important Wildlife Areas protection measures described below

- Amphibian breeding and migration areas:
  - 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 management of Important Wildlife Areas protection measures described below
  - Implement amphibian salvage and relocation procedures as required

- Active bear, wolf, fox or coyote dens sites
  - Maintain a 200 m buffer centered on the den site until the young are no longer reliant on the den

- If a calf or fawn is observed hiding, leave the site. Return once a QEP has determined the calf or fawn has been away from the area for at least 24 hours.
### Table 3  Peace Region Terrestrial Wildlife Least-Risk Windows

<table>
<thead>
<tr>
<th>Wildlife</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Jan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Songbirds</td>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>1</td>
<td>31</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raptors &amp; Owls</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trumpeter Swans</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moose &amp; Elk</td>
<td>15</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Low Risk**
Restrictions would not normally apply. Where ground conditions permit, plan development activities within these timeframes.

**Caution**
Operators should avoid development activities during these timeframes. [http://www.env.gov.bc.ca/esd/distdata/Peace_Region_Wildlife_Values/Industrial_Sectors/Best_Management_Practices/AircraftBMPJul%2015'08.pdf](http://www.env.gov.bc.ca/esd/distdata/Peace_Region_Wildlife_Values/Industrial_Sectors/Best_Management_Practices/AircraftBMPJul%2015'08.pdf)

**Critical**
Development activities are not appropriate during this timeframe. Aerial activities should adhere to guidelines. In the event that working within a critical window is unavoidable, proponent should contact an appropriate qualified professional (e.g. Registered Professional Biologist with BC accreditation) to discuss alternatives, and potential mitigation and monitoring plans.

---


### General Wildlife Habitat Protection Measures

- Control permanent habitat loss by carefully flagging and restricting clearing to those areas required for construction and the safe and reliable operation of the Project.
- Outside the reservoir area, control riparian vegetation clearing including clearing around wetlands, and retain wildlife trees when possible, and safe to do so.
- Where live or dead large trees must be removed within the transmission line fall zone, leave tall stumps where feasible and safe to do so.
• Focus lighting on work sites and away from surrounding areas to minimize light pollution and disturbance to wildlife

• Take measures to mitigate against harming migratory birds, nests and eggs as described in Incidental Take of Migratory Birds in Canada (Environment Canada 2014b).

Protection of Important Wildlife Areas

The Environmental Features Map will show Important Wildlife Areas. Contractors will use this data when planning construction activities to identify potential interactions with Important Wildlife Areas and guide avoidance and mitigation planning associated with these areas. Contractors will provide updated data to BC Hydro. BC Hydro will provide the Environmental Features Map to applicable regulatory agencies prior to the start of construction and as it is updated.

• In temporary construction areas, plan construction methods that take into account the location of known rare plant occurrences. Where complete avoidance is not feasible, employ measures to reduce adverse effects such as timing construction activities to winter months, placing ramps or mats over occurrences to reduce soil compaction, use of rubber-tired equipment, implementing designated travel routes to and from work sites

• Except within the dam site area, on designated access roads and during clearing, construction activities shall be prohibited within 15 m of the Ordinary High Water Mark of streams or wetland, unless the activity was described in the EIS and is accepted by BC Hydro

• Avoid construction activity within Important Wildlife Areas, including designated set-back buffers, where feasible

• Designation of set-back buffers:
  o If construction activities must be undertaken within a setback buffer, develop and implement an appropriate mitigation and monitoring program in consultation with BC Hydro, Ministry of Forests Lands and Natural Resources and Canadian Wildlife Service
  o If a bird builds or occupies a nest in an active construction zone a minimum 5 m buffer will be established around the nest to protect the nest and allow construction activities to proceed. The appropriate buffer should be determined by a QEP.

Human-Wildlife Conflict Management Plan:

• Food scraps and garbage from construction sites and camps (except the north and south bank worker camps, which will have their own food disposal program) shall be stored in bear-proof containers and removed regularly for proper disposal

• Project workers shall be prohibited from:
  o Feeding wildlife at construction sites
  o Hunting while on construction sites, Project built roads or worker housing sites
o Cleaning game at construction sites, Project built roads or worker housing sites

- Reduce risk of wildlife-vehicle collisions:
  o Encourage personnel to use as few vehicles as necessary, with multiple people per vehicle
  o Instruct workers that wildlife has the right of way unless it is unsafe (for example if a collision is imminent)
  o Adhere to safe speed limits
  o Maintain a log of large wildlife sightings and road kill
  o Promptly notify appropriate authorities of road kill
  o Post warning signs at locations with frequent wildlife crossings
  o Provide and maintain wildlife escape routes through snow banks on each side of ploughed roads. Escape routes will be about 500 m apart and one blade width wide and extend to the edge of the surrounding vegetation to enable individual animals to exit the roadway
  o Report dangerous human-wildlife incidents to appropriate authorities
  o Include wildlife vehicle collisions in tailboard meetings

EPPs will address, at a minimum, the following:

- Bear Interaction Management Considerations
- Relative Human Risk from Bears
- General Bear Interaction Management
- Waste Management
  o Solid Waste Management
  o Sewage and Grey Water
  o Petroleum-Based Products
- Bear Awareness & Safety Training
- Bear Detection
  o Reporting and Recording Bear Activity
- Bear Interaction Response
- Bear-Related Emergency

**Wildlife Deterrents**

Wildlife deterrent activities and devices may be employed within the Project Activity Zone, and in areas adjacent to the Project Activity Zone where there is a risk of dangerous wildlife or nest occupation by breeding birds.
Deterrent systems may include a combination of animal detection systems, physical barriers, auditory deterrents, and visual deterrents (e.g. airborne devices, kites, balloons, lights, laser deterrents, trained animals (dogs or birds of prey such as hawks or falcons), and models (injured birds or predators). Deterrent type will vary depending on target species, habituation, site conditions and effectiveness of deterrent activities.

Materials shall be placed, stored and stockpiled in a manner that limits their potential to attract wildlife.

References


4.18 Restricted Activity and Work Avoidance Zones

Within the Dam Site Area (see Figure 2), restricted activity zones will be established to reduce or avoid potential construction effects in those areas. Only specified construction activities will be conducted within the restricted activity zones.

Environmental, heritage and cultural features and environmentally sensitive areas may also be identified as work avoidance zones. No construction activities will be allowed in work avoidance zones. Examples are:

- except within the Dam Site Area, work avoidance zones will be established around known tufa seeps, wetlands and rare plant occurrences that are adjacent to construction areas;
- sensitive heritage sites as identified in Heritage EPPs.

These sites must be addressed, as applicable, in EPPs. Appropriate buffers and barriers will be established around these sites in consultation with BC Hydro.
5.0 Pre- and Post- Construction Surveys and Monitoring

5.1 Vegetation and Wildlife Surveys

BC Hydro will conduct the following surveys:

- Rare plant surveys (including vascular plants, mosses, and lichens) along the transmission line and temporary access roads
- Invasive plant inventories at work sites
- Bald Eagle nests along the Peace River between Hudson's Hope and the Alberta border, up major tributaries to the Peace River, around select large lakes on the plateau near the transmission line and along the proposed expanded transmission line Right of Way
- Beaver lodges along the Peace River and major tributaries between Hudson's Hope and the Alberta border

BC Hydro will provide the results of these surveys to contractors, including updates, as appropriate.

Where available RISC standards will be used to conduct pre-construction surveys. There are currently no formal BC RISC standards for conducting rare plant surveys other than for the collection of voucher specimens. Methodologies for these surveys will be developed using guidelines in the following documents: Guidelines for Rare Plant Surveys (Bizecki-Robson, 1998); Survey Protocols For Survey & Manage Strategy 2 Vascular Plants (Whiteaker et al., 1998); ANPC Guidelines for Rare Plant Surveys in Alberta (Alberta Native Plant Council, 2012); CNPS Botanical Survey Guidelines (California Native Plant Society, 2001); Occupancy Survey Guidelines for Prairie Plant Species at Risk (Henderson 2009) and Protocols for Rare Plant Surveys (Penny and Klinkenberg, 2012).

5.2 Post- Construction Monitoring

BC Hydro will undertake a post-construction site restoration monitoring program at each site, including evaluation of the effectiveness of site reclamation activities by a Qualified Environmental Professional to confirm that the required commitments have been met.
References


http://www.geoq.ubc.ca/biodiversity/eflora/ProtocolsforRarePlantSurveys.html

6.0 Qualified Environmental Professionals

The CEMP was prepared by the following Qualified Environmental Professional:

Al Strang, P. Eng., BC Hydro
7.0 Appendices
Smoke Management Plan

Site C Clean Energy Project

Revision 1 June 5, 2015
ABBREVIATIONS AND ACRONYMS

BMP ................................................................. Best Management practices
BRN ................................................................. Burn Registration Number
CVF ................................................................. Custom Venting Forecast
MoE ................................................................. Ministry of Environment
OBSCR ............................................................ Open Burning Smoke Control Regulation
PM 2.5 .............................................................. extreme-value frequency distribution
PSSZ ................................................................. Primary Smoke Sensitivity Zone
SMP ................................................................. Smoke management Plan
SSSZ .............................................................. Secondary Smoke Sensitivity Zone
EAC ................................................................. Environmental Assessment Certificate
VCDMP .......................................................... Vegetation Clearing and Debris Management Plan
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Appendix B  Venting
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1.0 Introduction

As part of the planning associated with the Site C Clean Energy Project, and the environmental assessment process, a vegetation clearing and debris management plan, and a smoke management plan were developed and submitted with the Environmental Impact Statement (BC Hydro 2013) as Volume 1, Appendix A, Vegetation Clearing and Debris Management Plan (VCDMP).

The Vegetation Clearing and Debris Management Plan and the Smoke Management Plan that were submitted with the EIS have been updated to reflect project implementation.

The VCDMP describes the approach to vegetation clearing during construction of the Site C Project. The VCDMP describes the break down of the timber to be cleared into merchantable and non-merchantable components as well as a strategy for its sale or disposal.

One method that could be applied for disposal of residual vegetation (e.g. fibre not used by industry) will include incineration. Any burning will be conducted according to the British Columbia Ministry of Environment Open Burning Smoke Control Regulation (OBSCR), and in accordance with the Site C Clean Energy Project Construction Environmental Management Plan (CEMP), section 5.1 Air Quality Management, which states:

- Manage smoke from the burning of clearing debris in accordance with the Smoke Management Plan (Appendix B).

2.0 Regulatory Context and Plan Scope

2.1 Regulatory Context

Under the authority of the Environmental Management Act, the BC Ministry of Environment (MOE) has the mandate to regulate smoke emissions from open burning activities through the application of the Open Burning Smoke Control Regulation (OBSCR). As of October 2014, the OBSCR continues to be under review by the MOE. In anticipation of changes that may occur as a result of the OBSCR review BC Hydro proposed in its CEMP to develop a Smoke Management Plan (SMP) for use during construction of the Site C Project.

Consistent with the May 2011 update to the OBSCR Intentions Paper and Consultation, this SMP will apply to all Category 3 debris burn piles and will supersede the default requirements of the current OBSCR. The May 2011 update indicated that area based Smoke Management Plans will be allowed to cover parts of the Primary Smoke Sensitivity Zone.
2.2 Smoke Management Plan Scope

The smoke management plan will outline the practices that will be employed in the course of vegetation clearing and debris management, that are factors in smoke emissions and the management of the effects of smoke emissions on sensitive human receptors, as follows:

- Describe vegetation clearing activities
  - estimated areas and volumes to be cleared
  - Identify additional methods for the potential reduction of vegetation waste

- Describe Smoke Management Practices
  - Identification of Smoke Sensitivity Zones including places of high use by Aboriginal peoples
  - Identify measures to manage smoke emissions, and control smoke, by following the current BC MOE Open Burning Smoke Control Regulation and proposed changes to the regulation

3.0 Vegetation Clearing Activities by Project Area

3.1 Estimated Clearing Areas and Volumes

Six discrete Site C construction activity areas, each requiring some level of vegetation clearing, have been identified. These areas are presented in Table 3.1 with corresponding volumes presented in Table 3.2.

Table 1 Site C Vegetation Area Cleared

<table>
<thead>
<tr>
<th>Site C Project Area Description</th>
<th>Area (hectares)</th>
<th></th>
<th></th>
<th></th>
<th>Total Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dam Site</td>
<td>Highway 29 Re-location</td>
<td>Construction materials</td>
<td>Access roads</td>
<td>Transmission ROW</td>
</tr>
<tr>
<td>Gross Area</td>
<td>3,907.4</td>
<td>418.0</td>
<td>690.7</td>
<td>193.5</td>
<td>8,921.2</td>
</tr>
<tr>
<td>Forest Area</td>
<td>2,893.3</td>
<td>194.0</td>
<td>444.0</td>
<td>169.4</td>
<td>3,947.6</td>
</tr>
<tr>
<td>Area Cleared and stumps are removed</td>
<td>1,500.6</td>
<td>194.0</td>
<td>444.0</td>
<td>169.4</td>
<td>0.0</td>
</tr>
<tr>
<td>Site C Project Area Description</td>
<td>Volume (‘000 cubic metres)</td>
<td>Total volume (‘000 cubic metres)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-----------------------------</td>
<td>----------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dam Site</td>
<td>Highway 29</td>
<td>Realignment</td>
<td>Construction materials</td>
<td>Access roads</td>
</tr>
<tr>
<td>Gross volume</td>
<td>1,045.8</td>
<td>51.7</td>
<td>211.4</td>
<td>86.7</td>
<td>286.9</td>
</tr>
<tr>
<td>Merchantable volume</td>
<td>464.0</td>
<td>24.0</td>
<td>103.6</td>
<td>41.1</td>
<td>129.1</td>
</tr>
<tr>
<td>Total merchantable volume cleared</td>
<td>319.4</td>
<td>24.0</td>
<td>103.6</td>
<td>41.1</td>
<td>127.8</td>
</tr>
<tr>
<td>Total merchantable volume retained</td>
<td>144.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Total non-merchantable volume cleared</td>
<td>375.2</td>
<td>27.8</td>
<td>107.8</td>
<td>45.6</td>
<td>136.7</td>
</tr>
<tr>
<td>Total non-merchantable volume retained</td>
<td>206.6</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>21.1</td>
</tr>
</tbody>
</table>

### 3.2 Reduction of Vegetation Waste

In the estimates in section 3.1, measures to reduce the overall volume of vegetation to be cleared are already applied. Through the finalization of construction plans and contracts additional measures may be identified that would further reduce the volume of waste for incineration, including:

- Reduce the overall volume of cleared vegetation.

The Vegetation Clearing and Debris Management Plan describes planned clearing strategies, including areas where some retention of vegetation is planned, for example retention of forested and scrub areas, where feasible and where retention of vegetation supports environmental and safety factors.
• Commercial utilization of wood and wood fibre. There are several forestry operations in the Peace region and in nearby regions that are suitable to receive merchantable fibre. Industry engagement identifies opportunities to optimise onsite processing, and the subsequent sale and transportation of merchantable wood fibre to existing industrial consumers (sawmills, pulp mills, bioenergy producers).

• Seek innovate utilisation of wood and wood fibre. BC Hydro has undertaken a procurement process to seek innovative or leading approaches to utilization of wood fibre not suitable for existing industrial consumer markets. If successful, further wood waste would be diverted from burning.

4.0 Smoke Management Practices

All burning activities will be conducted as part of the Site C VCDMP and will adhere to the BC Open Burning Smoke Control Regulation, and proposed revisions to the OBSCR. The following measures have been developed in accordance with these existing, and potential new, regulations:

Smoke management measures - program planning:

1. Identification of Smoke Sensitivity Zones
2. Annual burn program planning
3. Sensitive Time Periods
4. Set-Back Distances

Smoke management measures - burn procedures:

5. Debris pile construction and seasoning
6. Pre-burn protocols
7. Light-up procedures including venting forecasts
8. Ignition criteria and smoke release periods
9. Burn operator training
10. Post-burn protocols

Refer to Section 5.0 for further information on Ignition criteria and smoke release periods, and Appendix A for further descriptions of the other smoke management burn procedures.
4.1 Identify Smoke Sensitivity Zones

The proposed revisions to the OBSCR describe smoke sensitivity zones as follows:

- **Primary Smoke Sensitivity Zone** – Areas of the province with a population density of 200 people per square kilometre or more (as provided by the most recent census data), plus a 10 km radius buffer around the PSS zones intended to limit the impacts from open burning under poor venting conditions on populated areas.

- **Secondary Smoke Sensitivity Zone** – all areas of the Province not categorized as Primary Smoke Sensitivity Zones

In addition to these provincial definitions, through ground-truthing exercises with Aboriginal groups, locations of high Aboriginal use may be identified, and would be treated as Primary Smoke Sensitivity Zones during planned burning activities. Areas identified during ground-truthing exercises by Aboriginal groups that meet the definition of “seasonal residence” (see Section 4.4 Setback distances) will have appropriate fire setback distances applied.

4.2 Annual Burn Program Planning

The progression through the annual burn program will be planned to ensure that piles located in the primary smoke sensitivity zone are burned under optimum burning conditions. Typically the late summer / early fall offers better burning conditions in terms of fire weather indices and longer daily average of appropriate venting (i.e. longer days). The annual scheduling of burning will prioritise activities within the Primary Smoke Sensitivity Zone into optimal periods, and will plan activity within secondary smoke sensitivity zones as the season progresses.

4.3 Sensitive Time Periods

Within the annual program, scheduling of burning activities will consider regionally important time periods, for example periods with high recreational activity or periods with known Aboriginal use based on the results of ground-truthing exercises.

During, and two days prior to, sensitive time periods no debris piles will be ignited. Based on regional recreation activity, the following period has been identified:

- long weekends in May, July, August and September
- Aboriginal use periods – to be determined based on ground-truthing exercises

4.4 Setback Distances

The fire setback distances that will be maintained for burning operations carried out under the Site C SMP are described in Table 4.1. These setbacks are consistent with proposed changes to OBSCR (BC MOE 2010, 2011).
Table 3  
Setback Distances

<table>
<thead>
<tr>
<th>Category</th>
<th>Setback Distance (m) With Air Curtain Technology</th>
<th>Setback Distance (m) Without Air Curtain Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>residences, businesses (including seasonal residences(^1))</td>
<td>150</td>
<td>500</td>
</tr>
<tr>
<td>hospitals and community care facilities</td>
<td>500</td>
<td>1000</td>
</tr>
</tbody>
</table>

5.0  
Ignition Criteria and Smoke Release Periods

Four components combine to define the timing of debris pile ignition, specifically, smoke sensitivity zone, venting forecasts, daily ignition period and smoke release period.

Table 4  
Burn Criteria

<table>
<thead>
<tr>
<th>Smoke Sensitivity Zone</th>
<th>Venting Forecast (Day of Ignition)</th>
<th>Venting Forecast (Day After Ignition)</th>
<th>Daily Ignition Period</th>
<th>Smoke Release Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>Good</td>
<td>Fair or Better</td>
<td>1-hr after sunrise to 5-hr before sunset</td>
<td>to 4:00 pm the 1(^{st}) day after ignition</td>
</tr>
<tr>
<td>Secondary</td>
<td>Good</td>
<td>Fair or Better</td>
<td>1-hr after sunrise to 3-hr before sunset</td>
<td>to 4:00 pm the 2(^{nd}) day after ignition</td>
</tr>
</tbody>
</table>

5.1  
Venting Forecast

The persistence of smoke from open burning is tied directly to atmospheric venting conditions. To encourage the best dissipation of smoke, this SMP will utilize custom venting forecasts prepared by Ministry of Environment approved forecasters. Custom venting forecasts are thought to be a more accurate choice than Environment Canada venting indices because they have a much greater geographic tie to burning operations. For more information on venting refer to Appendix B – Venting.

\(^1\) A seasonal residence is a fixed residence that, while not being occupied on a full-time basis, is occupied on a regular basis. A regular basis does not imply a scheduled occupancy but implies use of six weeks per year or more. The residence must not be mobile and should have some sort of foundation or features of permanence (e.g., electrical power, domestic water supply, septic system) associated with it. Summer cottages or mobile homes are examples of seasonally occupied dwellings, while a holiday trailer simply pulled onto a site is not. (Alberta Energy Regulator 2007)
5.2 Daily Ignition Period

The daily ignition period has been designed to coincide with the time of day where venting conditions are typically best and to ensure that there is sufficient time remaining after ignition for the burn to consume most of the pile. If piles are ignited late in the day there would not be sufficient burn time before late evening and overnight when venting typically worsens.

5.3 Smoke Release Period

The smoke release period is effectively a results based component of the Smoke Management Plan. Smoke release period monitoring is the monitoring of burning activities in accordance with smoke release commitments.

Smoke release is defined as the condition where more than 10% of the burnt surface area is emitting visible smoke by the end of the smoke release period specified in Table 5.1.

6.0 Monitoring

6.1 Smoke Release Monitoring

Monitoring for compliance with smoke release periods provides critical feedback in improving reduced smoke management. The daily burn program should include a sampling of piles by the end of the smoke release period. Smoke release should be characterized relative threshold value for the amount of surface area of the pile that is still emitting smoke. Where threshold values have been exceeded, BC Hydro and the Contractor will review the contributing factors and make changes to subsequent daily burn plans. Potential adjustments to daily burn plans could include;

1. Imposition of earlier end time for ignition period to allow for more daytime burning.
2. Using accelerants to promote more rapid pile ignition
3. Re-piling slash to improve pile construction

6.2 Air Quality Monitoring, Advisories and Burn Bans

The BC Ministry of Environment operates an air quality monitoring station at the North Peace Cultural Centre in Fort St. John. BC Hydro will install and maintain fine particulate monitoring stations at 85th Avenue Industrial Lands, Old Fort and the Site C worker accommodation complex.

The Ministry of Environment (MOE) may issue air quality advisories or burn bans should particulate matter concentrations approach or exceed provincial objectives (based on
provincial policy). If an advisory and/or burn ban is issued, burn operators are required to adhere to the terms of the advisory and/or burn ban.

6.3 Post Season Custom Venting Forecasting Analysis

After the burn season ends an analysis of the custom venting forecasts will be conducted to;

- Determine consistency of forecasts
- Compare CVFs with Environment Canada’s venting indices
- Examine opportunities created or reduced by the CVF service
- Provide an overall assessment of the performance and Value of the CVF service

The analysis will be used to inform the next phase (season) of smoke management planning and changes to future iterations of the Plan may be made based on the results of this analysis.

7.0 Notification and Reporting

7.1 Burn Registration

Prior to the ignition of any piles, Burn Coordinators will obtain Burn Registration Numbers (BRN) for the annual burn plan.

7.2 Burn Notification

Prior to 8:00 am on the day of a burn, an email will be send to everyone on the notification list (Appendix D). The email will indicate in which geographical unit that the planned burns are located as well as the custom venting forecast.

7.3 Daily Burn Reporting

Reporting will be facilitated by completing and submitting a Burn Reporting Form (Appendix C). The burn tracking form is intended to serve as an update to Ministry of Environment personnel regarding the status of burning relative to the burn plan. The update also aids the custom venting forecaster through the provision of feedback.

- Complete and submit the Burn Reporting Form by 2:00 pm daily to the Ministry of Environment. The report form provides details on the progress of the burning plan and provides information related to burning criteria.
• Record observations and photos related to achievement of smoke release period criteria and document any changes and in ongoing burn plans that result from the monitoring feedback.

• Provide a summary of any complaints received since the filing of the previous burn report.

• Provide a summary of the results of the burn.

7.4 Annual Burn Reporting

After the completion of each annual burn program, BC Hydro will submit an Annual Burn Report to the MOE. The annual report will provide:

• a summary of the daily burn reports

• volume of debris burned

• summary of smoke release monitoring as described in Section 6.1

• summary of particulate levels from applicable MOE and BC Hydro air quality monitoring stations

• summary of complaints received

• summary of the assessment of the performance and Value of the custom venting service and any recommendations

8.0 Qualified Professionals

This plan was prepared in accordance with the BC Open Burning Smoke Control Regulation (BC MOE 2012) and proposed updates to the regulation (BC MOE 2010), by the following qualified professionals:

William Golding Registered Professional Forester, Silvicon Services Inc.

Paul Veltmeyer Registered Professional Forester, BC Hydro.
9.0 References


Bulkley Valley Smoke Management Plan Pilot, August 31, 2012


Industrial Forestry Service Ltd. (IFS) 2012 *Site C Clean Energy Project, Vegetation Clearing and Debris Management Plan, Preliminary Draft*. Prepared for BC Hydro. Vancouver, BC.
APPENDIX A

Smoke Management Burn Procedures
These Best Management Practices (BMPs) will provide guidance to vegetation clearing and debris management contractors for opening burn activities and smoke management.

A1. Debris Pile Construction and Seasoning

Proper pile construction techniques will aid in the achievement of a high intensity burn that is capable of consuming itself in the shortest time possible.

Pile Size and Shape

To maximize the chimney effect, debris should be piled in roughly conical in shape and have a width to height ratio of less than 2 to 1. Large piles typically burn hotter and cleaner than smaller piles so efforts should be made to minimize pile less than 4 metres high. Piles should be of a size that ensures that smoke release period criteria can be met.

Pile Constituents

Pile construction should consider the following;

1. Coniferous slash often burns better than aspen/cottonwood slash so efforts should be made to mix species where practicable,

2. To ensure the continuity of the burn, piles should contain a mixture of debris sizes with as few voids as possible,

3. Avoid introducing soils and other non-combustibles into the pile,

4. Break root wads up to remove any soils/rocks and place pieces higher on the pile.

5. Seasoning

To promote optimum seasoning, avoid constructing piles in low, water receiving sites and allow curing for at least one summer.

A2. Pre-Burn Protocols

Collate Burn Plan Information

Prior to the burning season collate information related to the Smoke Sensitivity Zone, number and location (latitude and longitude) of the piles slated for burning. This information will also be required in obtaining Burn Registration Numbers (BRNs) as required in the Wildfire Regulation.

Communicate Burn Plan to Custom Venting Forecasters
Provide custom venting forecasters with the burn plan data. To maximize the effectiveness of the custom venting forecast, work with the forecaster in identifying any additional information that may be required. This information may include specific pile elevation, and timing related to the issuance of forecasts.

A3. Light-Up Procedures

It is critical to ensure that all the logistics relative to the burning plan have been addressed prior to light-up. For example, appropriate actions should already have been implemented to ensure that open burning requirements have been minimized and that burn piles have been constructed according to best management practices. They also assume that adequate fire suppression resources are available and that a crew safety has been addressed.

1. Email notifications should be sent to all stakeholders prior to 8:00 am on the day of ignition.

2. Re-confirm information and burn criteria relative to the key ‘burn criteria’, namely;
   i. Venting forecast is at or above ignition threshold
   ii. Crews are informed of applicable ignition period
   iii. Pile location - relative to Smoke Sensitivity Zones
       ▪ For piles within the Primary Smoke Sensitivity Zone, if smoke release conditions cannot be met then employ alternate technologies such as air curtain incinerators or halt operations.
   iv. Fire weather indices, pile size and moisture content are appropriate to ensure that smoke release period parameters can be met (consider SSZ).

3. Consider Limitations of Custom Venting Forecasts
   i. Consider the impact of changing weather, such as changing wind patterns and rain/snow events that may result in undesirable burning conditions or evening and overnight venting conditions.
   ii. Consider PSSZ burns when forecaster confidence in continued good venting is high.
   iii. Consider moving to remote piles when forecaster confidence in continued good venting is low. Despite appropriate venting forecast (e.g. good and fair) advancing weather conditions can result in a rapid decline in venting leading to unacceptable levels of smoke.
iv. Consider the wind direction and mixing heights. Lower mixing heights will not have the capacity for large volumes of smoke, suggesting that the ignition of a large number of piles should be avoided.

4. Adhering to appropriate daily ignition periods light a test pile to validate venting forecast. Monitor the performance of the test pile burn (for 15-30 minutes) relative to;

v. Fire intensity

vi. Smoke release (direction, quantity and relation to important infrastructure such as highways, airports and population centres). If winds or other conditions are not favourable, move to remote piles or to areas where winds work in favour of the burn.

vii. Potential for escape to adjacent piles or slash

5. With confirmation that the test pile is burning as planned, continue with the daily burn plan and monitor pile burning performance throughout the day. Where significant reductions in burn performance are noted, burning should be halted or the burn plan revised.

6. Pile ignition should conform to the following;

viii. Ignite the pile on the upwind side

ix. Ignition should be low on the pile

x. To support rapid ignition, select a portion of the pile with an appropriate mixture of piece sizes and distribution

xi. When fine fuels are damp or when slash pile lack the appropriate distribution piece sizes, consider using propane torches or fuel gel to encourage a better/hotter ignition. Alternately burn operators can wait until fuel moisture conditions are such that a good burn can be achieved.

A4. Ignition Criteria and Smoke Release Periods

See Section 5.3 and 6.1 above.

A5. Burn Operator Training

Desired opening burning outcomes are much more likely to be achieved if burning crews have the appropriate level of experience and training. In addition to appropriate training in safety, fire suppression and fuel handling, burn contractors should also receive training in the following;

1. Site C Smoke Management Plan and the application of burning criteria
A6. Post Burn Protocols

Monitoring of pile burning will be undertaken at three levels; smoke release, debris reduction and hazard abatement.

1. Smoke Release

Following the burn period, piles will be inspected for compliance with the burning plan smoke release periods. If the pile is found to have a smoke levels that exceeds the specified threshold value then the pile will be extinguished or repiled to facilitate cleaner burning.

2. Debris Reduction

At the same time the remnants of the burn piles with be assessed that the appropriate reduction in debris mass has been achieved. If it is deemed that the burn was not complete, the remaining debris can be re-piled for another ignition in keeping with the protocols outlined in this plan.

3. Hazard Abatement

For the purposes of hazard abatement, piles will be monitored to ensure that the piles are completely extinguished. This monitoring will be achieved by cold trailing by hand or scanning by helicopter using infrared scanning cameras.
APPENDIX B

Venting
BACKGROUND

BC Air Quality Defines venting index as; “a numerical value related to the potential of the atmosphere to disperse airborne pollutants, such as smoke from a prescribed fire. It is based on both the current wind speed in the mixed layer and the mixing height. The mixed layer is the surface layer of air that is turbulent and well mixed.”

The greater the wind speed and mixing heights the greater the venting index will be. It should be noted, however, when wind speeds are too high ground level mixing may be reduced.

The three categories of venting index are shown in the following table.

<table>
<thead>
<tr>
<th>Venting Index Numerical Rating</th>
<th>Ventilation Category</th>
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<tbody>
<tr>
<td>0-33</td>
<td>Poor</td>
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<tr>
<td>34-54</td>
<td>Fair</td>
</tr>
<tr>
<td>55-100</td>
<td>Good</td>
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</tbody>
</table>

The persistence of smoke from open burning is tied directly to atmospheric venting conditions.

Custom Venting

To encourage the best dissipation of smoke, this SMP will utilize custom venting forecasts. Custom venting forecasts, produced daily through the burning season by provincial government meteorologists, are tied more closely to specific geographic locations. Because of closer ties to specific areas, custom venting forecast are thought to be a more accurate choice than Environment Canada venting indices.
APPENDIX C

Burn Plan Reporting
BURN TRACKING FORM

The burn tracking form is intended to serve as an update to Ministry of Environment personnel regarding the status of burning relative to the burn plan. The update also aids the custom venting forecaster through the provision of feedback.

1. Complete and submit the Burn Reporting Form by 2:00 pm daily. The report form provides details on the progress of the burning plan and provides information related to burning criteria.

2. Record observations and photos related to achievement of smoke release period criteria and document any changes and in ongoing burn plans that result from the monitoring feedback.

Table 5 Burning Report Form

<table>
<thead>
<tr>
<th>Name of Column</th>
<th>Location</th>
<th>Custom Venting Forecast</th>
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<tbody>
<tr>
<td># of Pile</td>
<td>Date of Burn</td>
<td>Piles Burned</td>
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<tr>
<td></td>
<td>Pile Remaining</td>
<td>Geographic Unit</td>
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<td></td>
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<td>Smoke Sensitivity</td>
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Air Quality Monitoring Program

Site C Clean Energy Project

Revision 1: June 5, 2015
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1.0 Background

Potential changes in air quality due to construction of the project are described in the Site C Environmental Impact Statement (EIS) Section 11.11 Air Quality (BC Hydro, 2013a) and in EIS Volume 2, Appendix L Air Quality Technical Data Report (BC Hydro, 2013b). Dispersion modelling results indicate that provincial ambient air quality objectives for particulate matter may be exceeded in the absence of mitigation. However, mitigation measures have been proposed and are described Section 33.4.4 of the Project Environmental Impact Statement (EIS) (BC Hydro, 2013c) that are expected to control emissions of fine particulate and dust so that ambient air quality objectives are not exceeded due to project construction. Maximum concentrations of nitrogen oxides, sulphur dioxide and carbon monoxide are predicted to be below relevant ambient air quality objectives due to Project construction, and no mitigation is required. The assessment of potential project effects on human health due to changes in ambient air quality are described in EIS Section 33 Human Health (BC Hydro, 2013c), which concluded that with implementation of proposed mitigation measures, no residual effects on human health are anticipated.

Measures to control emissions of fine particulate matter and dust, and to reduce potential effects on human health are included in the Construction Environmental Management Plan, Section 5.1 Air Quality Management (BC Hydro, 2014a). An air quality Environmental Protection Plan will be prepared for elements of construction that emit fine particulate and dust. Mitigation measures to be implemented will be described in those Environmental Protection Plans.

2.0 Objectives

The objectives of the Air Quality Monitoring Program are to:

- monitor ambient fine particulate concentrations, CO, NO₂ and SO₂; and
- develop a process for notification of sensitive populations and Aboriginal groups in the event of an exceedance of provincial ambient air quality objectives.

3.0 Scope

The scope of the Air Quality Monitoring Program includes continuous monitoring of ambient fine particulate matter during Project construction and the first two years of operations at locations that may be affected by construction activities as described in Section 4.

4.0 Monitoring Plan

4.1 Locations

Air quality monitoring stations operated by BC Hydro have been installed at the following locations (see Figure 1):

- 85th Avenue Industrial Lands
In addition, BC Hydro will install air quality monitoring stations at the following locations (see Figure 1):

- Site C worker accommodation complex
- Hudson’s Hope berm site

BC Ministry of Environment operates an air quality monitoring station at the North Peace Cultural Centre in Fort St. John.

### 4.2 Parameters

Two fractions of fine particulate matter will be measured at all of the BC Hydro operated stations – less than 10 microns (PM$_{10}$) and less than 2.5 microns (PM$_{2.5}$).

NO$_2$ and SO$_2$ will be measured at the Site C worker accommodation complex and at Hudson’s Hope berm site.

PM$_{10}$ is measured at the North Peace Cultural Centre station.

### 4.3 Duration

Monitoring at the following locations began in 2014 or earlier and will continue throughout construction and for the first two years of operations:

- 85th Avenue Industrial Lands
- Old Fort
- Attachie Flat upper terrace

Monitoring at the Site C worker accommodation complex will begin in 2015 and continue until the end of the first two years of operations. Monitoring at the Hudson’s Hope berm site will begin prior to the start of berm construction and continue until the end of the first two years of operations.

### 4.4 Frequency

Monitoring at all locations will be continuous.
5.0 Reporting

BC Hydro will develop a procedure for notifying Northern Health and the BC Ministry of Environment in case of exceedance of provincial ambient air quality objectives. Northern Health and the BC Ministry of Environment will be responsible for notifying sensitive populations and Aboriginal groups of any exceedance.

BC Hydro will assess the monitoring data during Project construction and determine if any exceedances of provincial ambient air quality objectives occurred due to Project activities.

An annual summary report will be submitted to BCEAO, BCMOE, BCMFLNRO, CEAA, City of Fort St. John, District of Hudson’s Hope, District of Taylor and PRRD. First Nations will be notified in accordance with the Project’s First Nations Communications Plan.

6.0 Sensitive Receptor Groups and Places of High Aboriginal Group Use

Sensitive receptors were identified in EIS Volume 2, Appendix L, Air Quality Technical Data Report. This list was updated in Undertaking 81 during the Joint Review Panel hearing for the Project (BC Hydro, 2014b).

The identified sensitive receptors are:

SCHOOLS

- Aboriginal Education Center
- Alwin Holland
- Baldonnel Elementary
- Bert Ambrose Elementary
- Bert Bowes Middle School
- Board Office
- Charlie Lake Elementary
- Christian Life School
- CM Finch Elementary
- Dr. Kearney Middle School
- Duncan Cran Elementary
- École Central Elementary
- Facilities & Transportation
- Key Learning Centre
- North Peace Secondary
- Energetic Learning Campus
- Northern BC Distance Education
- Open Learning
- Robert Ogilvie Elementary
- Student Support Services
- Taylor Elementary
- Technology Services

HEALTH CARE FACILITIES

- Fort St. John Health Unit
- Fort St. John Hospital
- Fort St. John Medical Clinic
- Fort St. John Pharmacy and Wellness Centre
- The Taylor Medical Clinic
- ABC Medical Clinic
- North Peace Medical Clinic
SENIOR CARE FACILITIES

- Heritage Manor
- Peace Lutheran Apt. #1
- Peace Lutheran Apt. #2
- The Sunset Home
- North Peace Care Centre
- Abbeyfield Houses of Fort St. John
- New Senior Housing
- Peace Villa

PLACES OF HIGH ABORIGINAL GROUP USE

Aboriginal groups that have informed BC Hydro of their use of places of high Aboriginal group use will be notified in the event of an exceedance of provincial ambient air quality objectives in accordance with the procedure developed pursuant to Section 5 Reporting of this Air Quality Monitoring Program.

In order to identify and confirm important sites (e.g. burial, cultural, ceremonial, habitation, medicinal and food plants), BC Hydro started a ground-truthing initiative in 2014.

The purpose of the ground-truthing initiative is to engage with Aboriginal land users, including registered trapline holders, to verify and accurately site land use information, and to identify concerns related to specific features and or sites that may be affected by the proposed Project. In particular, BC Hydro is seeking to verify features such as plant sites (specifically medicinal and food plants), the location of burial sites, and the location of habitation sites, including when and how they are used by Aboriginal groups.

During ground truthing, the locations of features and sites are recorded by digital video, photography, notes and GPS. Following completion of field work associated with ground truthing, BC Hydro will prepare a report, which will be shared with land users for their review and comment. BC Hydro will seek to avoid or mitigate the potential health effects from exceedances of provincial ambient air quality objectives on Aboriginal groups who use the specific sites which have been identified in the ground-truthing exercise.

BC Hydro has initiated ground-truthing with six registered trapline owners from the Saulteau First Nations. An invitation to other Aboriginal groups to engage in ground-truthing was sent in September 2014, with an initial focus on the dam site area. BC Hydro anticipates that most ground truthing work will be completed during the first year of construction but may continue as construction progresses.
7.0 Qualified Environmental Professionals

The Air Quality Monitoring Program was prepared by the following Qualified Environmental Professional:

Al Strang, P. Eng., BC Hydro

8.0 References

BC Hydro, 2013a. Site C Clean Energy Project Environmental Impact Statement, Volume 2, Section 11.11 Environmental Background - Air Quality


BC Hydro, 2013c. Site C Clean Energy Project Environmental Impact Statement Section 33 Human Health


BC Hydro, 2014b. Site C Clean Energy Project Joint Review Panel Hearing, Undertaking No. 81
Figure 1 Air Quality Monitoring Stations Operating During Project Construction
Air Quality Monitoring Stations Operating During Project Construction

DATE: September 18, 2014

Air Quality Monitoring Station
- Protected Areas, Provincial Parks, Regional Parks, and Ecological Reserves
- Indian Reserve

Legend

City/District Municipality
- Existing Road
- Existing Highway
- Existing Railway

Map Notes:
1. Datum: NAD83
2. Projection: UTM Zone 10N
3. Base Data: Province of B.C.
Construction Communication Plan

Site C Clean Energy Project

Revision 1: June 5, 2015
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1.0 Background

1.1 The Site C Clean Energy Project

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River in northeast B.C. The Project will provide 1,100 megawatts of capacity and about 5,100 gigawatt hours of energy each year to the province’s integrated electricity system. The Project will be a source of clean, reliable and cost-effective electricity for BC Hydro’s customers for more than 100 years.

The key components of the Project are:

• an earthfill dam, approximately 1,050 metres long and 60 metres high above the riverbed;
• an 83 kilometre long reservoir that will be, on average, two to three times the width of the current river;
• a generating station with six 183 MW generating units;
• two new 500 kilovolt AC transmission lines that will connect the Project facilities to the Peace Canyon Substation, along an existing right-of-way;
• realignment of six segments of Highway 29 over a total distance of approximately 30 kilometers; and
• construction of a berm at Hudson’s Hope.

The Project will also include the construction of temporary access roads, a temporary bridge across the Peace River, and worker accommodation at the dam site.

1.2 Project Benefits

The Project will provide important benefits to British Columbia and Canada. It will serve the public interest by delivering long term, reliable electricity to meet growing demand; contribute to employment, economic development, ratepayer, taxpayer and community benefits; meet the need for electricity with lower GHG impact than other resource options; contribute to sustainability by optimizing the use of existing hydroelectric facilities, delivering approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area; and include an honourable process of engagement with First Nations and the potential for accommodation of their interests.

1.3 Environmental Assessment Process

The environmental assessment of the Project has been carried out in accordance with the Canadian Environmental Assessment Act, 2012 (CEAA 2012), the BC Environmental Assessment Act (BCEAA), and the Federal-Provincial Agreement to Conduct a Cooperative Environmental Assessment, Including the Establishment of a Joint Review Panel of the Site C Clean Energy Project. The assessment considered the environmental, economic, social, heritage and health effects and benefits of the Project, and included the engagement of Aboriginal groups, the public, all levels of government, and other stakeholders in the assessment process.
Detailed findings of the environmental assessment are documented in the Site C Clean Energy Project Environmental Impact Statement (EIS), which was completed in accordance with the Environmental Impact Statement Guidelines (EIS Guidelines) issued by the Minister of Environment of Canada and the Executive Director of the Environmental Assessment Office of British Columbia. The EIS was submitted to regulatory agencies in January 2013, and amended in August 2013 following a 60 day public comment period on the assessment, including open house sessions in Fort St. John, Hudson’s Hope, Dawson Creek, Chetwynd, town of Peace River (Alberta) and Prince George.

In August 2013, an independent Joint Review Panel (JRP) commenced its evaluation of the EIS, and in December 2013 and January 2014 undertook five weeks of public hearings on the Project in 11 communities in the Peace region, including six Aboriginal communities. In May 2014, the JRP provided the provincial and federal governments with a report summarizing the Panel’s rationale, conclusions and recommendations relating to the environmental assessment of the Project. On completion of the JRP stage of the environmental assessment, the CEA Agency and BCEAO consulted with Aboriginal groups on the JRP report, and finalized key documents of the environmental assessment for inclusion in a Referral Package for the Provincial Ministers of Environment and Forests, Lands and Natural Resource Operations.

Construction of the Project is also subject to regulatory permits and authorizations, and other approvals. In addition, the Crown has a duty to consult and, where appropriate, accommodate Aboriginal groups.

1.4 Environmental Assessment Findings

The environmental assessment of the Project focused on 22 valued components (VCs), or aspects of the biophysical and human setting that are considered important by Aboriginal groups, the public, the scientific community, and government agencies. In the EIS, valued components were categorized under five pillars: environmental, economic, social, heritage and health. For each VC, the assessment of the potential effects of the Project components and activities during construction and operations was based on a comparison of the biophysical and human environments between the predicted future conditions with the Project, and the predicted future conditions without the Project.

Potential adverse effects on each VC are described in the EIS along with technically and economically feasible mitigation measures, their potential effectiveness, as well as specific follow-up and related commitments for implementation. If a residual effect was found on a VC, the effect was evaluated for significance. Residual effects were categorized using criteria related to direction, magnitude, geographic extent, context, level of confidence and probability, in accordance with the EIS Guidelines.

The assessment found that the effects of the Project will largely be mitigated through careful, comprehensive mitigation programs and ongoing monitoring during construction and operations. The EIS indicates that the Project is unlikely to result in a significant adverse effect for most of the valued components. However, a determination of a significant effect of the Project was found on four VCs: Fish and Fish Habitat, Wildlife Resources, Vegetation and Ecological Communities, and Current Use of Lands and Resources for Traditional Purposes.

1.5 Environmental Assessment Conclusion

On October 14, 2014, the Provincial Ministers of Environment and of Forests, Lands and Natural Resource Operation decided that the Project is in the public interest and that the
benefits provided by the Project outweigh the risks of significant adverse environmental, social and heritage effects (http://www.newsroom.gov.bc.ca/2014/10/site-c-project-granted-environmental-assessment-approval.html). The Ministers have issued an Environmental Assessment Certificate (EAC) setting conditions under which the Project can proceed.

Further, on November 25, 2014, The Minister of Environment of Canada issued a Decision Statement confirming that, while the Project has the potential to result in some significant adverse effects, the Federal Cabinet has concluded that those effects are justified in the circumstances. The Decision Statement sets out the conditions under which the Project can proceed.

1.6 Development of Mitigation, Management and Monitoring Plans

Mitigation, management and monitoring plans for the Project have been developed taking into account the measures proposed in the EIS, information received during the Joint Review Panel hearing process, and the Report of the Joint Review Panel on the Project. Those plans are consistent with, and meet requirements set out in, the conditions of the Environmental Assessment Certificate and of the Decision Statement issued on October 14, 2014 and November 25, 2014 respectively.

In addition, in accordance with environmental best practices (Condition 3.1), these plans were informed by the best available information and knowledge, based on validated methods and models, undertaken by qualified individuals and apply the best available economically and technologically feasible mitigation strategies. These plans contain provisions for review and update as new information on the effects of the Project and on the efficacy of the mitigation measures become available.

2.0 Construction Communications Plan

2.1 Objective and Scope

This Plan has been developed in accordance with the following Conditions 39, 43 and 72 of the Environmental Assessment Certificate (EAC).

EAC 39, 43, 72

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<tr>
<th>Condition Number</th>
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<tr>
<td>EAC Condition 39</td>
<td>The EAC Holder must provide information to the Province of Alberta, during construction and operations, to assist in their communications with anglers in Alberta regarding changes in downstream fishing opportunities due to construction activities and longer-term changes in fish community composition.</td>
<td>Section 3.0 Statement of Objectives</td>
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<td>EAC Condition 43</td>
<td>The EAC Holder must develop an Emergency Services Plan that includes at least the following to describe how the EAC Holder will implement measures to: Communicate Project emergency management plans to all emergency service providers, and</td>
<td>Section 4.0 Audiences</td>
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</table>

sitecproject.com
The EAC Holder must manage effective communications for the Project by implementing measures in communication plans and a business participation plan.

The following communication and participation plans are to be developed and implemented:

- Business Participation Plan;
- Construction Communication Plan; and
- First Nations Communication Plan.

Each plan in addition to plan specific conditions identified in this document will include:

- Clear Statement of Objectives; Section 3.0 Statement of Objectives
- Audiences; Section 3.1 Audiences and Stakeholders; 4.0 Audiences
- Key activities and tools; and Annual summary reporting. Section 3.2 Information and Notification Tools; Section 5.0 Key Activities and Tools

### 2.2 Consultation

Many of the conditions require BC Hydro to consult or collaborate with certain government agencies and Aboriginal groups in respect of measures and plans required by the conditions.

BC Hydro began consultation on the Project in late 2007, before any decision to advance the Project to an environmental assessment. BC Hydro’s consultation with the public, stakeholders, regional and local governments, regulatory agencies, and Aboriginal groups is described in EIS Section 9, Information Distribution and Consultation.

Additional information on the consultation process and a summary of issues and concerns raised during consultation are provided in:

- Volume 1 Appendix G, Public Information Distribution and Consulting Supporting Documentation
- Volume 1 Appendix H, Aboriginal Information Distribution and Consultation Supporting Documentation
- Volume 1 Appendix I, Government Agency Information Distribution and Consultation Supporting Documentation
- Volume 5, Appendix A01 to A29, Parts 2 and 2A, Aboriginal Consultation Summaries
- Technical Memo: Aboriginal Consultation
Draft versions of a number of the mitigation, management and monitoring plans required by the conditions were submitted to applicable government agencies and Aboriginal groups for comment on October 17, 2014.

Comments on these draft plans were received from various government agencies and Aboriginal groups during November and December 2014, and were considered in the revisions to these plans. BC Hydro’s consideration of these comments is provided in the consideration tracking tables that accompany each plan.

On December 15, 2014, Treaty 8 Tribal Association (T8TA), on behalf of West Moberly, Saulteau and Prophet River First Nations, submitted to BC Hydro a letter in response to BC Hydro’s request for comment on the Plans sent on October 17, 2014. The letter included several appendices, including the Joint Review Panel (JRP) Report and transcripts from the JRP hearings in December 2013 and January 2014. BC Hydro responded to the three First Nations on January 21, 2015 noting that the October 17 2014 request for comments on the plans was to provide an opportunity to the First Nations to submit to BC Hydro any information they wanted to provide in relation to the Plans. BC Hydro advised that it was aware of the information referred to in T8TA’s letter when the plans were prepared, and advised that it was preparing a table setting out where any mitigation measures identified by representatives of the three First Nations during the hearings are considered in the draft plans and would provide that to the First Nations once complete. Accordingly BC Hydro’s responses to those mitigation measures identified by the representatives of the three First Nations during the JRP hearings were provided to the EAO in a separate table by letter dated May 19, 2015. Aside from the December 15, 2014 letter, BC Hydro has not received further comments from these First Nations. A letter of understanding dated April 30, 2015 respecting provision of capacity funding to support review of the plans was entered into by BC Hydro and Saulteau First Nations (on behalf of Saulteau, West Moberly and Prophet River First Nations).

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Comments on the revised plans were requested by May 11, 2015 to allow for review, consideration of comments and finalization of the plans 30 days prior to the commencement of construction.

Comments were received by this requested date from:

- Fort Nelson First Nation
- Ministry of Forests, Lands and Natural Resource Operations (FLNRO), and
- Métis Nation British Columbia.

The Peace River Regional District submitted their comments on the plan on May 14, 2015. FLNRO submitted additional comments on May 15, 2015, including comments from the BC Ministry of Environment.
BC Hydro considered the comments provided and prepared final plans. On May 19, 2015, BC Hydro submitted the following mitigation, management and monitoring plans to the BC Environmental Assessment Office (BC EAO) for review:

- Construction Environmental Management Plan
- Construction Safety Management Plan
- Fisheries and Aquatic Habitat Management Plan
- Vegetation and Wildlife Mitigation and Monitoring Plan
- Vegetation Clearing and Debris Management Plan
- Aboriginal Plant Use Mitigation Plan
- Aboriginal Training and Inclusion Plan
- Business Participation Plan
- Emergency Services Plan
- Healthcare Services Plan
- Labour and Training Plan
- Cultural Resources Mitigation Plan
- Heritage Resources Management Plan
- Housing Plan and Housing Monitoring and Follow-Up Program
- Wuthrich Quarry Development Plan
- West Pine Quarry Development Plan; and
- Del Rio Pit Development Plan.

The CEA Agency and Environment Canada submitted comments on the revised plan on May 22, 2015. These comments were considered and the final plans were revised accordingly and submitted on June 5, 2015 to the entities identified in the EAC conditions.

3.0 Statement of Objectives

BC Hydro will provide regular updates to the public about construction activities, mitigation program activities, and about business and job opportunities, and will provide means for the public to ask questions, and to provide comments and feedback during construction as per Condition 72 of the EAC. Communications will be initiated prior to the start of construction activities.

BC Hydro will provide information about construction activities, schedules and mitigation and monitoring programs.

As described in Section 9.1.4 of the Environmental Impact Statement (EIS), objectives of this plan are to:

- Continue to facilitate regular community and stakeholder communications regarding the Project
- Maintain cooperative relationships with regional and local government and work with them to manage construction information and issues
- Maintain strong relationships with the business community through the Business Liaison Program

The scope of the construction phase communication program includes:
• Regular, two-way community and stakeholder communications regarding the Project, including engagement through the Community Liaison Committees
• Timely construction information including but not limited to air quality monitoring results, burning plans, burning summaries, and blasting schedules.
• Engagement with regional and local governments to manage construction issues
• Media updates on construction and traffic information and key project milestones
• Continuation of the Project’s Business Liaison Program

BC Hydro will provide regular updates to the public about construction activities, and about business and job opportunities, and will provide means for the public to ask questions, and to provide comments and feedback during construction.

In addition, as per EAC condition 39, BC Hydro provide ongoing information to the Province of Alberta during construction and operations to assist in their communications with anglers in Alberta regarding changes in downstream fishing opportunities due to construction activities and longer-term changes in fish community composition.

Prior to the start of construction, BC Hydro will initiate construction communications to raise awareness and understanding of Site C construction activities, and how to find out information about construction activities.

Each year, BC Hydro will provide an annual summary report about the construction communications program related to meeting program objectives. This report will be posted on the project website.

3.1 Audiences and Stakeholders

A preliminary list is included below.

• Aboriginal Groups
• Public
• Property owners/leaseholders
• Local and regional governments
• Business and industry potentially affected by construction
• Potential workers
• Potential contractors
• Regional and local stakeholder groups
• News media

3.2 Information and Notification Tools

A variety of construction information and notification tools will be used, including Communications Activities:

• Project Website (sitecproject.com)
• Advertising
• Construction Information Telephone Line
4.0 Audiences

BC Hydro’s construction information and notification program is intended to reach the public, Aboriginal groups (see also the Aboriginal Communications Plan), residents, local governments and other stakeholder groups in the Peace region. A preliminary list is included below.

- Aboriginal Groups
  - Blueberry River First Nations
  - Dene Tha’ First Nation
  - Doig River First Nation
  - Duncans First Nation
  - Fort Nelson First Nation
  - Halfway River First Nation
  - Horse Lake First Nation
  - Kelly Lake Métis Settlement Society
  - McLeod Lake Indian Band
  - Métis Nation British Columbia
  - Prophet River First Nation
  - Saulteau First Nations
  - West Moberly First Nations
- General Public
• Residents of properties in the vicinity of the Project Activity Zone
• Local and regional governments
  o City of Fort St. John
  o City of Dawson Creek
  o District of Chetwynd
  o District of Hudson’s Hope
  o District of Taylor
  o Peace River Regional District
  o Town of Peace River, Alberta
• Province of BC
• Province of Alberta
• Government of Canada
• Business and industry in the vicinity of the Project Activity Zone
• Potential workers
• Potential contractors
• Regional and local stakeholder groups
• Emergency Service Providers
• News media

5.0 Key Activities and Tools
A variety of construction information and notification tools will be used, including advertising, email alerts, mailings, website information and extensive media and community outreach to ensure a broad distribution of construction-related information. In addition, information and notification will be provided through ongoing community relations, as well as Aboriginal engagement and consultation.

5.1 Communications Activities
• **Project Website (sitecproject.com):** The project website will be updated to include regular information about site preparation, early works and construction activities, as well as all construction-related information. This information is expected to include an eight-year construction schedule summary, a 1-month look-ahead schedule for construction, and background information on construction. In addition, the website will include relevant project maps, a construction photo gallery, and information for businesses and workers.

• **Advertising:** BC Hydro will advertise in local and regional media outlets to inform and notify key audiences about construction-related activities, prior to the start of work, as appropriate.

• **Construction Information Telephone Line:** A phone line will be set up, which the public can call to receive the most up-to-date information about construction activities, or to provide feedback or comments about the project.

• **Construction Bulletins:** Site C construction bulletins will be developed, posted on the project website, delivered to key news outlets and emailed to web subscribers. The
construction bulletins will provide advance notification of construction activities, its potential impacts and duration.

- **Mailings**: BC Hydro will send notices by mail prior to the commencement of any work in close proximity of homes and/or businesses, as appropriate.

- **Information Materials**: BC Hydro will develop public information materials on the construction phase, including an updated brochure, fact sheets and backgrounders.

- **Media Relations**: BC Hydro will inform local media outlets of key construction activities as part of its information and notification program.

- **Social Media**: BC Hydro will use social media networks, such as Twitter, to inform and notify key audiences about construction activities.

- **Signage**: Appropriate signage will be placed at construction sites for the project, as well as on public roads and highways where construction activities are taking place.

### 5.2 Community Relations

- **Community Consultation Offices**: The Project’s community consultation offices are located in Fort St. John and Hudson’s Hope. The offices will continue to be staffed throughout the construction phase to provide a location where the public can get information about the Project, ask questions and submit feedback.

- **Neighbourhood Meetings**: As appropriate, BC Hydro will meet with property owners in the vicinity of construction activity, prior to the work commencing, to provide information about schedule, work hours and activities. The meetings will also provide an opportunity to answer questions and hear feedback or concerns.

- **Open Houses**: BC Hydro will hold public information meetings to provide information about Site C construction activities, including schedule, impacts and duration of work. The meetings will also provide an opportunity for BC Hydro to answer questions, gather feedback and hear about concerns.

- **Council Presentations**: Project team representatives will continue to provide updates to local and regional government councils on major Project milestones and construction-related activities.

- **Community Liaison Committees**: During the construction phase, BC Hydro will establish Community Liaison Committees. The Committees will provide an opportunity to BC Hydro to keep communities informed of project activities, as well as to answer questions and hear about concerns.
Aboriginal Group Communication Plan

Site C Clean Energy Project

Revision 1: June 5, 2015
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Revision 1: June 5, 2015
1.0 Background

1.1 The Site C Clean Energy Project

The Site C Clean Energy Project (the Project) will be the third dam and generating station on the Peace River in northeast B.C. The Project will provide 1,100 megawatts of capacity and about 5,100 gigawatt hours of energy each year to the province’s integrated electricity system. The Project will be a source of clean, reliable and cost-effective electricity for BC Hydro’s customers for more than 100 years.

The key components of the Project are:

- an earthfill dam, approximately 1,050 metres long and 60 metres high above the riverbed;
- an 83 kilometre long reservoir that will be, on average, two to three times the width of the current river;
- a generating station with six 183 MW generating units;
- two new 500 kilovolt AC transmission lines that will connect the Project facilities to the Peace Canyon Substation, along an existing right-of-way;
- realignment of six segments of Highway 29 over a total distance of approximately 30 kilometers; and
- construction of a berm at Hudson’s Hope.

The Project will also include the construction of temporary access roads, a temporary bridge across the Peace River, and worker accommodation at the dam site.

1.2 Project Benefits

The Project will provide important benefits to British Columbia and Canada. It will serve the public interest by delivering long term, reliable electricity to meet growing demand; contribute to employment, economic development, ratepayer, taxpayer and community benefits; meet the need for electricity with lower GHG impact than other resource options; contribute to sustainability by optimizing the use of existing hydroelectric facilities, delivering approximately 35 per cent of the energy produced at the W.A.C. Bennett Dam, with only five per cent of the reservoir area; and include an honourable process of engagement with First Nations and the potential for accommodation of their interests.

1.3 Environmental Assessment Process

The environmental assessment of the Project has been carried out in accordance with the Canadian Environmental Assessment Act, 2012 (CEAA 2012), the BC Environmental Assessment Act (BCEAA), and the Federal-Provincial Agreement to Conduct a Cooperative Environmental Assessment, Including the Establishment of a Joint Review Panel of the Site C Clean Energy Project. The assessment considered the environmental, economic, social, heritage and health effects and benefits of the Project, and included the engagement of Aboriginal groups, the public, all levels of government, and other stakeholders in the assessment process.
Detailed findings of the environmental assessment are documented in the Site C Clean Energy Project Environmental Impact Statement (EIS), which was completed in accordance with the Environmental Impact Statement Guidelines (EIS Guidelines) issued by the Minister of Environment of Canada and the Executive Director of the Environmental Assessment Office of British Columbia. The EIS was submitted to regulatory agencies in January 2013, and amended in August 2013 following a 60 day public comment period on the assessment, including open house sessions in Fort St. John, Hudson’s Hope, Dawson Creek, Chetwynd, town of Peace River (Alberta) and Prince George.

In August 2013, an independent Joint Review Panel (JRP) commenced its evaluation of the EIS, and in December 2013 and January 2014 undertook five weeks of public hearings on the Project in 11 communities in the Peace region, including six Aboriginal communities. In May 2014, the JRP provided the provincial and federal governments with a report summarizing the Panel’s rationale, conclusions and recommendations relating to the environmental assessment of the Project. On completion of the JRP stage of the environmental assessment, the CEA Agency and BCEAO consulted with Aboriginal groups on the JRP report, and finalized key documents of the environmental assessment for inclusion in a Referral Package for the Provincial Ministers of Environment and Forests, Lands and Natural Resource Operations.

Construction of the Project is also subject to regulatory permits and authorizations, and other approvals. In addition, the Crown has a duty to consult and, where appropriate, accommodate Aboriginal groups.

1.4 Environmental Assessment Findings

The environmental assessment of the Project focused on 22 valued components (VCs), or aspects of the biophysical and human setting that are considered important by Aboriginal groups, the public, the scientific community, and government agencies. In the EIS, valued components were categorized under five pillars: environmental, economic, social, heritage and health. For each VC, the assessment of the potential effects of the Project components and activities during construction and operations was based on a comparison of the biophysical and human environments between the predicted future conditions with the Project, and the predicted future conditions without the Project.

Potential adverse effects on each VC are described in the EIS along with technically and economically feasible mitigation measures, their potential effectiveness, as well as specific follow-up and related commitments for implementation. If a residual effect was found on a VC, the effect was evaluated for significance. Residual effects were categorized using criteria related to direction, magnitude, geographic extent, context, level of confidence and probability, in accordance with the EIS Guidelines.

The assessment found that the effects of the Project will largely be mitigated through careful, comprehensive mitigation programs and ongoing monitoring during construction and operations. The EIS indicates that the Project is unlikely to result in a significant adverse effect for most of the valued components. However, a determination of a significant effect of the Project was found on four VCs: Fish and Fish Habitat, Wildlife Resources, Vegetation and Ecological Communities, and Current Use of Lands and Resources for Traditional Purposes.
1.5 Environmental Assessment Conclusion

On October 14, 2014, the Provincial Ministers of Environment and of Forests, Lands and Natural Resource Operation decided that the Project is in the public interest and that the benefits provided by the Project outweigh the risks of significant adverse environmental, social and heritage effects (http://www.newsroom.gov.bc.ca/2014/10/site-c-project-granted-environmental-assessment-approval.html). The Ministers have issued an Environmental Assessment Certificate (EAC) setting conditions under which the Project can proceed.

Further, on November 25, 2014, The Minister of Environment of Canada issued a Decision Statement confirming that, while the Project has the potential to result in some significant adverse effects, the Federal Cabinet has concluded that those effects are justified in the circumstances. The Decision Statement sets out the conditions under which the Project can proceed.

1.6 Development of Mitigation, Management and Monitoring Plans

Mitigation, management and monitoring plans for the Project have been developed taking into account the measures proposed in the EIS, information received during the Joint Review Panel hearing process, and the Report of the Joint Review Panel on the Project. Those plans are consistent with, and meet requirements set out in, the conditions of the Environmental Assessment Certificate and of the Decision Statement issued on October 14, 2014 and November 25, 2014 respectively.

In addition, in accordance with environmental best practices (Condition 3.1), these plans were informed by the best available information and knowledge, based on validated methods and models, undertaken by qualified individuals and apply the best available economically and technologically feasible mitigation strategies. These plans contain provisions for review and update as new information on the effects of the Project and on the efficacy of the mitigation measures become available.

2.0 Aboriginal Group Communication Plan

2.1 Objective and Scope

The objective of the Aboriginal Group Communication Plan (the “Plan”) is to establish a communications program for informing Aboriginal harvesters about construction activities related to the Site C Project (the “Project”) that may affect their harvesting opportunities for plants, fish and game, as well as access to those opportunities. This Plan is aligned with the Construction Communication Plan.

This Plan has been developed in accordance with the following Conditions 27 and 72 of the Environmental Assessment Certificate (EAC) and Condition 14.2 of the federal Decision Statement (FDS), as indicated in the table below.

<table>
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<tr>
<th>Condition Number</th>
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<td><strong>EAC Condition 27</strong></td>
<td>In order to manage adverse effects on Aboriginal plant, fish and game harvesters during both the construction and operations phases of the Project, the EAC Holder must develop, as part of the Construction Communication Plan, a communications program (Program) for informing Aboriginal harvesters about construction activities that may affect their harvesting opportunities for plants, fish, and game, as well as access to those opportunities.</td>
<td>Section 5.0 Key Activities and Tools</td>
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<td>The Program must also include information regarding how fish monitoring programs will be used to inform Aboriginal harvesters about changes in fish community composition during operations.</td>
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<td>The EAC Holder must make all reasonable efforts to develop the draft Program in collaboration with FLNR and Aboriginal Groups, at least 90 days prior to Project activities that may affect Aboriginal harvesting opportunities.</td>
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<td>The EAC Holder must file the final Program with EAO, FLNR and Aboriginal Groups at least 30 days prior to any activities that may affect Aboriginal harvesting opportunities.</td>
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<td>The EAC Holder must develop, implement and adhere to the final Program, and any amendments, to the satisfaction of EAO.</td>
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<tr>
<td><strong>EAC Condition 72</strong></td>
<td>The EAC Holder must manage effective communications for the Project by implementing measures in communication plans and a business participation plan. The following communication and participation plans are to be developed and implemented: • Business Participation Plan; • Construction Communication Plan; and • First Nations Communication Plan.</td>
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<td>Each plan in addition to plan specific conditions identified in this document will include: • Clear Statement of Objectives; • Audiences; • Key activities and tools; and</td>
<td>Section 3.0 Scope of Plan Section 4.0 Audiences Section 5.0 Key Activities and Tools</td>
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2.2 Consultation

Many of the conditions require BC Hydro to consult or collaborate with certain government agencies and Aboriginal groups in respect of measures and plans required by the conditions.

BC Hydro began consultation on the Project in late 2007, before any decision to advance the Project to an environmental assessment. BC Hydro’s consultation with the public, stakeholders, regional and local governments, regulatory agencies, and Aboriginal groups is described in EIS Section 9, Information Distribution and Consultation.

Additional information on the consultation process and a summary of issues and concerns raised during consultation are provided in:

- Volume 1 Appendix G, Public Information Distribution and Consulting Supporting Documentation
- Volume 1 Appendix H, Aboriginal Information Distribution and Consultation Supporting Documentation
- Volume 1 Appendix I, Government Agency Information Distribution and Consultation Supporting Documentation
- Volume 5, Appendix A01 to A29, Parts 2 and 2A, Aboriginal Consultation Summaries
- Technical Memo: Aboriginal Consultation

Draft versions of a number of the mitigation, management and monitoring plans required by the conditions were submitted to applicable government agencies and Aboriginal groups for comment on October 17, 2014.

Comments on these draft plans were received from various government agencies and Aboriginal groups during November and December 2014, and were considered in the revisions to these plans. BC Hydro’s consideration of these comments is provided in the consideration tracking tables that accompany each plan.

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Comments on the revised plans were requested by May 11, 2015 to allow for review, consideration of comments and finalization of the plans 30 days prior to the commencement of construction.

Comments were received by this requested date from:

- Fort Nelson First Nation
- Ministry of Forests, Lands and Natural Resource Operations (FLNRO), and
- Métis Nation British Columbia.

The Peace River Regional District submitted their comments on the plan on May 14, 2015. FLNRO submitted additional comments on May 15, 2015, including comments from the BC Ministry of Environment.

BC Hydro considered the comments provided and prepared final plans. On May 19, 2015, BC Hydro submitted the following mitigation, management and monitoring plans to the BC Environmental Assessment Office (BC EAO) for review:

- Construction Environmental Management Plan
- Construction Safety Management Plan
- Fisheries and Aquatic Habitat Management Plan
- Vegetation and Wildlife Mitigation and Monitoring Plan
- Vegetation Clearing and Debris Management Plan
- Aboriginal Plant Use Mitigation Plan
- Aboriginal Training and Inclusion Plan
- Business Participation Plan
- Emergency Services Plan
• Healthcare Services Plan  
• Labour and Training Plan  
• Cultural Resources Mitigation Plan  
• Heritage Resources Management Plan  
• Housing Plan and Housing Monitoring and Follow-Up Program  
• Wuthrich Quarry Development Plan  
• West Pine Quarry Development Plan; and  
• Del Rio Pit Development Plan.

The CEA Agency and Environment Canada submitted comments on the revised plan on May 22, 2015. These comments were considered and the final plans were revised accordingly and submitted on June 5, 2015 to the entities identified in the EAC conditions.

3.0 Scope of Plan

This Plan covers communications activities during construction of the Project and has been prepared in fulfillment of BC Hydro’s mitigation commitments described in section 19 of the EIS:

- Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect fishing opportunities or access.
- Develop a communications program to inform harvesters of planned or unplanned events related to construction activities that may affect hunting opportunities or access.
- Develop a communications program to inform harvesters of planned or unplanned events that may affect opportunities to harvest plants, berries, and other resources.

BC Hydro understands that the Project Activity Zone, as defined in the EIS, overlaps with areas identified as important by Aboriginal groups, including:

- the Peace Moberly Tract;
- Areas adjacent to Saulteau and West Moberly First Nations communities; and,
- Areas used for fishing in the Moberly, Halfway and Peace Rivers.

4.0 Audiences

The following Aboriginal groups have been identified as the audience for this Plan:

- Blueberry River First Nations  
- Dene Tha’ First Nation  
- Doig River First Nation  
- Duncan’s First Nation  
- Fort Nelson First Nation  
- Halfway River First Nation  
- Horse Lake First Nation
5.0 **Key Activities and Tools**

This Plan comprises the general activities and tools that will, at minimum, form part of the construction communications program. In addition to what is reflected in this plan and as part of the consultation process, BC Hydro and individual Aboriginal groups may develop communication tools that work best for the specific community.

The following communications activities, described in section 3 of the Construction Communication Plan, will also be used to communicate with Aboriginal groups about construction activities:

- Project website;
- Advertising;
- Construction Information Telephone Line;
- Construction Notices;
- Email updates;
- Mailings;
- Information Materials;
- Social Media;
- Signage;
- Community Consultation Offices;
- Open Houses; and,
- Community Liaison Committees.

In addition, BC Hydro will conduct the following activities to engage with Aboriginal groups to inform Aboriginal harvesters about construction activities that may affect their harvesting opportunities for plants, fish and game, as well as access to those opportunities:

- **Aboriginal Harvesters Information Sheet**: an information sheet containing regular updates on construction activities.

- **Saulteau Trappers Protocol**: BC Hydro has developed, in collaboration with Saulteau First Nation Trapline holders, a protocol for notification of work taking place in their respective traplines related to the Project. This protocol was initiated in 2013 and will continue through the construction phase of the Project.

- **Consultation meetings**: BC Hydro will continue to consult Aboriginal groups through the construction phase of the Project. From time to time and as appropriate, consultation
meetings can be used to provide updates to communities about construction activities that may affect their land users.

- **Fish Monitoring Program**: BC Hydro will communicate results of the Fisheries and Aquatic Habitat Monitoring and Follow-up Program which includes as part of the Site C Reservoir Fish Community monitoring program to assess the effects of river to reservoir transformation on the fish community in the Site C Reservoir and associated tributaries. Aboriginal groups will be provided with monitoring reports annually. Community-based meetings with Aboriginal groups could be held to share these results and inform the communities on changes to the fish community composition.

## 6.0 Plan Reporting Requirements

On an annual basis, BC Hydro will provide to the Environmental Assessment Office and the Canadian Environmental Assessment Agency a summary report of its activities carried out under this Plan.
SITE C CLEAN ENERGY PROJECT

Appendix E

ACID ROCK DRAINAGE AND METAL LEACHATE MANAGEMENT PLAN

REVISION 4
Prepared by

Klohn Crippen Berger Ltd. and SNC-Lavalin Inc.

For

BC Hydro

February 26, 2015
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<td>Acid Rock Drainage</td>
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<tr>
<td>EIS</td>
<td>Environmental Impact Statement</td>
</tr>
<tr>
<td>EPP</td>
<td>Environmental Protection Plan</td>
</tr>
<tr>
<td>ML</td>
<td>Metal Leaching</td>
</tr>
<tr>
<td>PAG</td>
<td>Potentially Acid Generating</td>
</tr>
<tr>
<td>RSEM</td>
<td>Relocated Surplus Excavated Materials</td>
</tr>
<tr>
<td>WQM</td>
<td>Water Quality Model</td>
</tr>
</tbody>
</table>
1.0 Objective

The objective of this Acid Rock Drainage and Metal Leachate Management Plan (the Plan) is to describe the measures that will be undertaken to mitigate potential adverse effects on the receiving environment resulting from known or potential sources of acid rock drainage (ARD) and/or metal leaching (ML) material.

This Plan describes the measures that will be adopted to effectively dispose of materials that will be excavated, exposed or disturbed during the construction of the Site C Clean Energy Project (the Project) so that there is an insignificant change in pH, total metals and dissolved metals upstream and downstream of the dam site as a result of Project construction.

The Plan:
- Describes the procedures for managing and storing surplus excavated materials during construction of the Project; and
- Recommends a monitoring program during construction of the Project to assess the performance of material management and storage strategies.

This version of the plan is based on the latest results from geochemical characterization program presented in KCB and SLI (2014a, 2014b, and 2014c).

Although the geochemical characterization program is at an advanced stage, it will continue to be developed and this Plan will be revised in parallel, as knowledge of the geochemistry of the materials is refined. Subsequent versions of this plan will incorporate:
- Additional information on the geochemical characterization of the materials; and
- Results of additional studies and water quality modeling to evaluate the requirements for the management and storage of excavated materials.

To ensure this Plan remains current, it will be updated at a minimum of once per year or as required based on Project and geochemical characterization program advancements.
2.0 Background

The Plan includes risk-based planning and design approaches to quantify the long-term impacts of mitigation option(s) and select the most appropriate mitigation option(s). Mitigation measures include on-going geochemical testing and analysis of materials that will define handling and storing plans to reduce source loading discharges and minimize long-term monitoring and maintenance requirements.

2.1 ARD and ML

ARD and ML occur when sulphide minerals react with oxygen, ferric iron and water to produce sulphuric acid. Sulphuric acid could then leach metals thereby further increasing the acidity and producing sulphates, and metals. ARD resulting from the Project may result in ML release, but leaching under neutral conditions may also occur.

Furthermore, ARD can be neutralized with the addition or presence of carbonate minerals.

2.2 Mitigation Approaches

The primary approaches to preventing and mitigating ARD and ML are to minimize the supply of the primary reactants for sulphide oxidation and / or maximize the availability of acid neutralizing minerals. Examples of these approaches include one or a combination of the following:

- Minimize oxygen
- Minimize water and moisture
- Minimize, remove or isolate sulphide minerals
- Adjusting pore water seepage pH
- Maximize acid neutralizing minerals and pore water alkalinity
- Control bacteria and biogeochemical processes

3.0 Geochemical Characterization Program

The purpose of the geochemical characterization program is to determine the risk of ARD and ML at the Project components.

The geochemical characterization program is at an advanced stage. It uses a phased approach to characterize the risk of ARD and ML and has included a range of both static and kinetic tests.

- Static testing includes:
  - Elemental analysis
o Mineralogy
o Acid base accounting
o Leachate extraction

- Kinetic testing includes:
  o Humidity cells
  o Field leach barrels
  o Field leach pads
  o Wall wash stations

In addition to these tests, modeling to predict the water quality has been completed.

### 3.1 Status

EIS Volume 2 Section 11.2.4 Geochemistry summarizes the geochemical characterization program completed to the end of 2012. The latest results from the geochemical characterization program are presented in geochemical reports by Klohn Crippen Berger and SNC Lavalin (KCB and SLI 2014a, 2014b, and 2014c), which summarize the program to the end of 2013.

The 2014 testing has included:

- Shake flask extraction tests to assess the potential for ML at Wuthrich Quarry, Howe Pit, Area A, 85th Avenue Industrial Lands, and dam site bedrock;

- Humidity cells to assess the rate of ARD and ML at the dam site and West Pine Quarry;

- Wall wash station to assess the water quality of surface runoff from West Pine Quarry;

- Water quality samples from a wall wash station and field runoff pad to assess surface runoff of the dam site bedrock;

- Ongoing field leach barrels to assess any changes in water quality overtime of dam site materials;

- Ongoing field leach pad operation and monitoring to assess any changes to water quality overtime of the dam site bedrock;

- Acid base accounting to further characterize the ARD potential of the dam site bedrock; and
Water quality samples from seeps from right bank of the dam site area to assess background water quality.

3.2 ARD and ML Results

A summary of the ARD and ML potential at each Project component is presented in Table 1.

These results are based on the latest results of the geochemical characterization program (KCB & SLI 2014a, 2014b, and 2014c), which indicate that the only material characterized as acid generating (AG) is the bedrock at the dam site. The remaining materials are characterized as either not potentially acid generating (PAG) or as having a very low potential of being AG.

Characterization and management plans of material have been focused on the dam site bedrock since it is the only material characterized as AG and it will be disturbed earliest to construct the Project. Characterization and management plans of materials at other Project components will advance as their construction schedules approach.
# Table 1 Project Components ARD and ML Potential

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Location</th>
<th>Material</th>
<th>Potential for ARD</th>
<th>Potential for ML</th>
<th>Management Plan Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Site Area</td>
<td>Dam Site</td>
<td>Bedrock</td>
<td>High</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Dam Site</td>
<td>Overburden</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>Farrell Creek</td>
<td>Overburden</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Lynx Creek, Dry Creek, Halfway River, Cache Creek</td>
<td>Overburden</td>
<td>No,</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td>Highway 29 Realignment</td>
<td>Bedrock</td>
<td>Low</td>
<td>Very Low</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Hudson’s Hope Shoreline Protection</td>
<td>Hudson’s Hope</td>
<td>Overburden</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Hudson’s Hope</td>
<td>Bedrock</td>
<td>Low to Moderate</td>
<td>Very Low</td>
<td>Yes</td>
</tr>
<tr>
<td>Quarried and Excavated Construction Materials</td>
<td>Riske Pit, Peaceview Pit, Thompkins Pit, Beryl Pit, Southwick Reserve, Ardill Pit, Halfmoon Lake Quarry, Del Rio Pit</td>
<td>Granular road base material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Portage Mountain Quarry</td>
<td>Rip-rap source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Wuthrich Quarry</td>
<td>Rip-rap source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>West Pine Quarry</td>
<td>Rip-rap source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>85th Avenue Industrial Lands</td>
<td>Aggregate source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Area A</td>
<td>Aggregate</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
</tr>
</tbody>
</table>
3.3 Water Quality Predictions and Reference Concept Design

To further evaluate AG bedrock with an ARD and/or ML potential from the dam site, a runoff water quality model (WQM) was developed for the Relocated Surplus Excavated Material (RSEM) areas. This WQM was based on a reference concept design for the material handling schedule for the Relocated Surplus Excavated Material (RSEM). The reference design includes the layout of water management structures for diversion, collection and storage including sediment ponds, and discharges.

The objectives of the WQM were to predict:

- Water quality of runoff from the RSEM areas and exposed excavated surfaces;
- Water quality at construction discharge points to the receiving environment.

In addition, quality and quantity of seepage through the RSEM column was assessed. The results of the WQM, based on a reference concept design, indicate that water quality at the dam construction site discharge points using sediment ponds are sufficient and no additional water treatment is required. The results of the seepage analysis concluded no treatment is required.

<table>
<thead>
<tr>
<th>Project Component</th>
<th>Location</th>
<th>Material</th>
<th>Potential for ARD</th>
<th>Potential for ML</th>
<th>Management Plan Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Howe Pit</td>
<td>Aggregate source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Riverbed Sand and Gravel</td>
<td>Aggregate source material</td>
<td>No</td>
<td>Very Low</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
3.4 Future Work

Future work will depend on the results of the geochemical characterization program, including the results of the testing listed in Section 3.1.

Additional information from these reports will be incorporated into future versions of the Plan as results become available.

Future work will also include additional characterization and, if required, management procedures for excavated, exposed, and disturbed materials at the other Project components.

BC Hydro has engaged qualified professionals to assist with the development of the Plan. BC Hydro will continue to work with regulators in the development of the Plan.
4.0 Regulations and Guidelines

4.1 Statutory Requirements

The legislation that contains provisions relevant to prevention and management of ARD and ML include the federal Fisheries Act, and the provincial Environmental Management Act and the Fish Protection Act. If the drainage or leachate of the material has the potential to affect surface water or groundwater, then the Water Act and Groundwater Protection Act will also apply.

4.2 BC Hydro Policies

The applicable corporate policy is the Environmental Responsibility Policy (BC Hydro 2010 – see CEMP Section 1.3).

4.3 Voluntary Commitments

The ARD and ML Management Plan is consistent with relevant management practice guidelines, which includes:

- DRAFT Guidelines and Recommended Methods for the Prediction of Metal Leaching and Acid Rock Drainage at Minesites in British Columbia, Ministry of Employment and Investment, April 1997
- List of Potential Information Requirements in Metal Leaching/Acid Rock Drainage Assessment and Mitigation, Mine Environment Neutral Drainage Report 5.10E, January 2005
- British Columbia Ministry of Environment Approved and Working Water Quality Guidelines
5.0 Mitigation and Environmental Protection Measures

5.1 General Approach

The primary approaches to mitigate ARD and ML for the Project, consistent with Section 2.2 Mitigation Approaches, are to minimize the sulphide mineral exposure to air and water by:

- Reducing the time of exposure of excavated surfaces and fill areas that contain AG and PAG material;
- Encapsulating AG and PAG material in natural material with a low permeability to minimize infiltration and leachate; and
- Storing AG and PAG material within the reservoir footprint to significantly reduce reaction rates by minimizing oxygen.

In addition, any surface runoff from exposed or excavated surfaces that contain AG and PAG material will be captured and, if required, treated prior to discharge. Proposed mitigation and treatment for different Project components are described in Section 5.2.

Implementation of the mitigation measures in the Plan will be a contractual requirement to the contractor. The details of how the contractor will sequence the construction work and meet the requirements of this Plan will be provided in the contractor’s Environmental Protection Plan (EPP).

During construction runoff from disturbed areas will be collected and directed towards sedimentation ponds. Discharges shall meet the concentration limits specified in Table 2. Details regarding the locations and frequency of monitoring of sedimentation pond discharges will be provided in the contractor’s EPP.
Table 2. Discharge Limits for Construction Sedimentation Ponds

<table>
<thead>
<tr>
<th></th>
<th>Maximum Mean Monthly Concentration (mg/L)</th>
<th>Maximum Concentration in a Composite Sample (mg/L)</th>
<th>Maximum Concentration in a Grab Sample (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>0.50</td>
<td>0.75</td>
<td>1.00</td>
</tr>
<tr>
<td>Copper</td>
<td>0.30</td>
<td>0.45</td>
<td>0.60</td>
</tr>
<tr>
<td>Cyanide</td>
<td>1.00</td>
<td>1.50</td>
<td>2.00</td>
</tr>
<tr>
<td>Lead</td>
<td>0.20</td>
<td>0.30</td>
<td>0.40</td>
</tr>
<tr>
<td>Nickel</td>
<td>0.50</td>
<td>0.75</td>
<td>1.00</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.50</td>
<td>0.75</td>
<td>1.00</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>6.0 – 9.5</td>
<td></td>
</tr>
</tbody>
</table>

1 From Schedule 4 of the Metal Mining Effluent Regulations (Minister of Justice, 2012)

5.2 Proposed Mitigation

The proposed mitigation measures for the respective Project sites are described below.

5.2.1 Dam Site Area

The dam site general arrangement including excavations and RSEM areas are shown in Figure 1. The intent at the dam site is to excavate materials and manage RSEM areas and exposed excavated surfaces in a manner that controls the discharge of surface water into the Peace River to maintain Acceptable Water Quality, as described in Section 7.3.2.
Figure 1 RSEM Area General Arrangement
5.2.1.1 Dam Site Excavations

A large bedrock excavation is required to construct the dam, generating station, and spillways. These excavated surfaces will be isolated from the river by the Stage 1 and Stage 2 cofferdams, described in EIS Volume 1 Section 4.4.3. The cofferdams will have cut-offs that penetrate through the river bed alluvium and into the underlying bedrock so that precipitation, runoff from excavated slopes or seepage will be contained within the cofferdams.

Where practical, upslope runoff will be diverted away from the excavation areas to minimize the amount of water that has to be collected. Water will be collected between the cofferdams, and, if required, treated prior to discharge into the Peace River.

During construction the excavated slopes will be monitored and, if required, temporary covers will be placed on the excavation slopes to mitigate ARD and ML. The majority of the excavated bedrock surfaces will be permanently covered by earth fill and concrete structures that will minimize future sulphide oxidation. Areas that are not covered will be monitored and treated, if required, to maintain Acceptable Water Quality, as described in Section 7.3.2.

Runoff WQM predictions based on the reference concept design (see Section 3.3), indicate that physical treatment via sediment pond will likely be sufficient to maintain Acceptable Water Quality, as described in Section 7.3.2, for most of the dam site excavations. However WQM predictions indicate that mitigation, with the use of temporary covers, may be required for excavation of the approach channel on the south bank.

5.2.1.2 RSEMs

Unsuitable construction material, including dam site bedrock will be relocated to the RSEM areas. Where applicable, RSEM areas will be isolated from the river with perimeter dykes designed to withstand erosion by wave action and river currents.

To limit infiltration and leachate, the AG and PAG materials placed in the RSEM areas will be encapsulated with low permeability natural materials or covered with neutral natural materials available on site. Furthermore, the majority of the AG and PAG materials will be relocated upstream of the dam and permanently submerged in the reservoir. This will inhibit ARD and ML production.

The contractor will be required to:

- Divert upslope runoff away from the RSEM areas to minimize the amount of contact water, where practical.
- Treat water within the RSEM areas prior to discharge, if required.
North Bank RSEM Area L3 Management Measures

Overburden from the north bank excavations will be relocated to RSEM Area L3. This RSEM area is located in a gully on the north bank and is not adjacent to the Peace River.

A reference concept design to mitigate the risk of ARD and ML generation and to manage runoff includes the following:

- Temporary management of Unnamed Creek 3 during construction to minimize surface water contact with the RSEM area;
- Construct the RSEM area in horizontal lifts and compact the surface of each lift to reduce water infiltration and air ingress;
- Install a compacted granular cover on the downstream face to minimize erosion;
- Compact the final surface to minimize infiltration; and
- Landscape the final surface to minimize erosion.

North Bank RSEM Area L5 Management Measures

Overburden and bedrock from the north bank and earthfill dam excavations will be relocated to RSEM Area L5. RSEM Area L5 is located on the north bank, upstream of the dam, and will be permanently submerged during operations. A starter dyke will be constructed around the area.

A reference concept design to mitigate the risk of ARD and ML generation and manage runoff includes the following:

- Temporary management of Garbage Creek to minimize contact with the RSEM area;
- Construct the area in horizontal lifts to reduce water infiltration and air ingress;
- Encapsulate the bedrock within compacted overburden materials;
- Construct a granular cover on the final surfaces; and
- Contain and treat, if required, runoff from the RSEM area.

Containment and treatment of runoff from this RSEM area will continue, if required, until reservoir filling when permanent submergence will inhibit ARD and ML generation.

WQM predictions based on the reference concept design (see Section 3.3), indicate that physical treatment via sediment pond will likely be sufficient to maintain Acceptable Water Quality, as described in Section 7.3.2.
North Bank RSEM Area L6 Management Measures

Overburden and bedrock from the north bank excavations, including material from the
diversion tunnels, will be relocated to RSEM Area L6, which is located on the north bank,
downstream of the dam. A starter dyke will be constructed around the area.

A reference concept design to mitigate the risk of ARD and ML generation and manage
runoff includes the following:

- Construct the area in horizontal lifts to reduce water infiltration and air ingress;
- Place bedrock below the final elevation of the Peace River;
- Encapsulate the bedrock within compacted overburden materials; and
- Contain and treat, if required, runoff from the RSEM area.

Containment and treatment of runoff from this RSEM area will continue, if required, until
the RSEM area is capped with a compacted granular cover.

WQM predictions based on the reference concept design (see Section 3.3), indicate that
physical treatment via sediment pond will likely be sufficient to maintain Acceptable
Water Quality, as described in Section 7.3.2.

The RSEM area will not be inundated and at the end of construction, it will be graded
and vegetated.

South Bank RSEM Areas R5a and R5b Management Measures

Overburden and bedrock from the south bank excavations will be relocated to RSEM
Area R5a. Overburden will be relocated to RSEM Area R5b. These RSEM areas are
located on the south bank, upstream of the dam, and will be permanently submerged
during operations. These areas will be constructed and managed as described for
RSEM Area L5 except that the AG and PAG materials will be covered with neutral
natural materials available on site or with bedrock that has a long lag time before it
becomes AG.

Runoff WQM predictions based on the reference concept design (see Section 3.3),
indicate that mitigation, with the use of temporary covers, may be required for RSEM
Areas R5a.

South Bank RSEM Areas R6 Management Measures

In addition to RSEM Areas R5a and R5b, overburden from the south bank excavations
could also be relocated to RSEM Area R6, which will be located downstream of the dam.
This area will be constructed and filled as described for RSEM Area L3 since it will not
contain any bedrock and it will be located downstream of the dam. The area will not be
inundated at the end of the construction; therefore it will be graded, covered with a
compacted granular cover and vegetated.
WQM predictions based on the reference concept design (see Section 3.3), indicate that treatment via sediment pond will likely be sufficient to maintain Acceptable Water Quality, as described in Section 7.3.2, for RSEM Area R6.

5.2.1.3 Dam Site Road Cuts

Two access roads that will cut through the bedrock at the dam site are required for Project construction. These roads are on either side of the Peace River and the sections where bedrock will be exposed are as follows:

- On the north bank, between Howe Pit and the Peace River along River Road; and
- On the south bank, between RSEM Area R6 and Area A.

Surface water on the north bank will be collected and diverted to a side channel of the Peace River. Surface water on the south bank will be collected and diverted to the main stem of the Peace River. The runoff WQM results indicate that treatment may not be required. Should treatment be required, a mitigation plan will be implemented to mitigate the effects of ARD and/or ML.

It is preferable that the bedrock be disposed of subaqueously, but since these roads will be constructed prior to the construction of RSEM areas, the material will need to be stored temporarily. Suggested storage features to mitigate ARD and ML generation include:

- Locating stockpiles on compacted low permeability pads to minimize infiltration into underlying soils;
- Diverting surface water runoff from adjacent areas away from stockpiles;
- Covering stockpiles with an impermeable membrane; and
- Monitoring any contact water and if required, implement water treatment.

5.2.2 Highway 29 Realignment Segments and Hudson’s Hope Shoreline Protection

The overburden samples collected from the Highway 29 Realignment Segments and at the Hudson’s Hope Shoreline Protection are classified as not PAG but are potentially ML.

The bedrock samples collected from the Highway 29 Realignment Segments and at the Hudson’s Hope Shoreline Protection are classified as PAG and potentially ML.

Estimates of areas that will be exposed and volumes to be relocated to construct the Highway 29 Realignment Segments are required to assess whether further geochemical characterization of these materials are required and to determine appropriate management option(s). These management option(s) will be updated in future revisions to the Plan, once the engineering designs are advanced.
The current design of the Hudson’s Hope Shoreline Protection does not include excavating or disturbing this rock, hence it is not anticipated that mitigation will be required.

5.2.3 Borrow Materials

Borrow material will be derived from various sources as summarized in Table 1. The borrow materials are not PAG and have a very low potential for neutral metal leaching. If shale rocks are encountered in the base of the borrow pits, they will be mitigated by maintaining a cover of non-PAG material over the surface.

6.0 Training and Human Resource Planning

Field monitoring protocols will be developed by a qualified professional for use by field staff. The qualified professional will provide training to field staff and oversee all monitoring activities. These will include rock sampling for additional ARD and ML characterization, as well as sampling of surface water at various locations.
7.0 ARD and ML Monitoring and Reporting

In order to measure the effectiveness of the mitigation measures implemented, a monitoring program will be undertaken to monitor ARD and ML from construction activities and reservoir creation.

As the geochemical characterization of the other Project components advances, this water quality monitoring program will be updated to reflect those advances.

7.1 Objectives

The objectives of the water quality monitoring program are to:

- Compare the quality of the Peace River downstream of construction activities to the quality of the Peace River upstream of the construction activities;
- Evaluate the effectiveness of implemented ARD–ML mitigation measures; and
- Make necessary adjustments to the Plan, if required.

7.2 Scope

The scope of the ARD and ML monitoring program includes the monitoring of the Peace River during construction.

A monitoring plan for the operations phase of the Project will be developed prior to reservoir filling.

7.3 Construction Phase

7.3.1 Locations

A minimum of six discrete samples collected on the same day will constitute a sampling event. The six samples will be obtained from two traverses of the river. Each traverse will obtain at least three samples: one near the left bank; one near the centre; and one near the right bank. Upstream and downstream sampling events must also be conducted on the same day for comparison.

a) Upstream Sample Locations

Results of upstream samples will be used to determine the existing water quality in the Peace River at the time of the sampling event.

For each sampling event, the arithmetic average of the upstream test results (the upstream test result) will be compared to the British Columbia Water Quality Guidelines (BC MoE 2011) for each parameter.

b) Downstream Sample Locations
Results of downstream samples will be used to determine the changes in water quality in the Peace River at the time of the sampling event.

For an individual sampling event, the arithmetic average of the downstream test results (the downstream test result) will be compared to the British Columbia Water Quality Guidelines (BC MoE 2011) or to the upstream test results for each parameter as follows:

Refer to Figure 2 for the location of the surface water sampling sites.

7.3.2 Evaluation

In all cases, the upstream test results will be the used as the control against which the downstream test results will be compared:

• If the upstream test result is less than or equal to the British Columbia Water Quality Guideline for a particular parameter, the downstream test result for that parameter will be compared to the British Columbia Water Quality Guideline.

• If the upstream test result exceeds the British Columbia Water Quality Guideline for a particular parameter, the downstream test result for that parameter will be compared to the upstream test result.

• If the downstream test result is less than or equal to the value to which it was compared then mitigation will be deemed to be sufficient for that parameter at that time and no adjustments to the plan will be required. For the purposes of this plan, this will be considered as Acceptable Water Quality.

• If the downstream test result is greater than the value to which it was compared (taking statistical significance into consideration), then an investigation must be carried out to determine if the increase is due to the project. If the investigation determines that the project is the cause, then the need for additional mitigation and adjustments to the Plan must be evaluated.

7.3.3 Duration and Frequency

Sampling will be conducted monthly for the duration of construction. Sampling will not be completed when the Peace River is frozen.
Figure 2 Locations of Proposed Surface Water Sampling Sites
7.3.4 Parameters

The following parameters will be monitored:

- Total suspended solids (TSS)
- Turbidity
- Sulphate
- pH
- Temperature
- Dissolved oxygen
- Conductivity
- Acidity and alkalinity
- Total dissolved solids
- Total and Dissolved Metals:
  - Aluminum
  - Antimony
  - Arsenic
  - Barium
  - Beryllium
  - Boron
  - Cadmium
  - Chromium
  - Cobalt
  - Copper
  - Iron
  - Lead
  - Lithium
  - Manganese
  - Mercury
  - Molybdenum
  - Nickel
  - Selenium
  - Silver
  - Thallium
  - Tin
Acid Rock Drainage and Metal Leachate Management Plan
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- Titanium
- Uranium
- Vanadium
- Zinc

7.3.5 Reporting

During construction annual summary reports will be submitted by June 1st and will summarize the results of the testing conducted during the previous year. These reports will be submitted to:

- BC Environmental Assessment Office
- BC Ministry of Environment
- BC Ministry of Forests, Lands, Natural Resources Operations
- Canadian Environmental Assessment Agency
- Natural Resources Canada
- Environment Canada
- City of Fort St John
- District of Hudson’s Hope
- District of Taylor
- Peace River Regional District
- Aboriginal Groups
8.0 Qualified Environmental Professionals

The Acid Rock Drainage and Metal Leachate Management Plan was prepared by the following Qualified Environmental Professionals:

Sarah Simon, E.I.T., Klohn Crippen Berger Ltd.
Harvey McLeod, P. Eng., Klohn Crippen Berger Ltd.
Keith Mountjoy, P. Geo., Klohn Crippen Berger Ltd.
Vivian Ferrera, M. Sc., Klohn Crippen Berger Ltd.
9.0 References


