

SITE C CLEAN ENERGY PROJECT

DRAFT ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

APRIL 10, 2012

Pursuant to the British Columbia Environmental Assessment Act and the Canadian Environmental Assessment Act



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1 PREFACE TO THE ENVIRONMENTAL IMPACT STATEMENT GUIDELINES

2 British Columbia Hydro and Power Authority (the Proponent), proposes to construct and
3 operate the Site C Clean Energy Project (the Project¹) as described in the Project
4 Description Report (BC Hydro 2011 a). The Project will involve the construction and
5 operation of a dam and hydroelectric generating station on the Peace River, in north east
6 British Columbia, downstream of the existing Williston Reservoir and Dinosaur Reservoir,
7 and the respective Proponent generating facilities at G.M. Shrum and Peace Canyon.

8 The Project will have an installed energy generating capacity of up to 1,100 megawatts, will
9 require two new 500-kilovolt transmission lines adjacent to two existing 138-kilovolt
10 transmission lines along approximately 77 kilometres of existing and widened right-of-way;
11 will require a realignment of portions of Highway 29; and will involve the creation of new
12 and the expansion of existing sand, gravel, and stone quarries. Each of these project
13 aspects are reviewable under the *Environmental Assessment Act*, S.B.C. 2002, c. 43
14 (BCEAA), and the *Reviewable Projects Regulation*. Federal agencies have concluded that
15 the Project will require approvals under the *Navigable Waters Protection Act* and the
16 *Explosives Act* and authorizations under the federal *Fisheries Act*, triggering an
17 environmental assessment under the *Canadian Environmental Assessment Act*, S.C. 1992,
18 c. 37 (CEAA) (Agency 2007a). Responsible Authorities identified by the federal government
19 are Transport Canada, Natural Resources Canada, and Fisheries and Oceans Canada,
20 with input from Federal Authorities (e.g., Environment Canada, Health Canada, Parks
21 Canada, and Aboriginal Affairs and Northern Development Canada).

22 In accordance with Section 15 of the CEAA, the Minister of Environment of Canada has
23 determined that the scope of the Project in relation to which an environmental assessment
24 will be conducted is the Project as proposed by the Proponent in the Project Description
25 Report and as it may be modified from time to time.

26 The Minister of Environment of Canada and the Minister of Environment of British Columbia
27 have agreed to a cooperative environmental assessment of the Project, including the
28 establishment of a joint review panel.

29 The Joint Review Panel, after holding public hearings and evaluating the information
30 included in the Environmental Impact Statement (EIS) and public hearings, will provide the
31 Minister of Environment of Canada and the Executive Director of the Environmental
32 Assessment Office of British Columbia with the Joint Review Panel Report which will
33 summarize the Panel's rationale, conclusions and recommendations relating to the
34 environmental assessment of the Project. The provincial Minister of Environment and the
35 provincial Minister of Forests, Lands and Natural Resource Operations will determine
36 whether an Environmental Assessment Certificate should be issued. The Responsible

¹ The Project and the proposed Project are used interchangeably for the sake of brevity.

- 1 Authorities will take a course of action in accordance with their response to the Panel
2 Report, as approved by the Governor in Council.
- 3 These EIS Guidelines are issued by Executive Director of the Environmental Assessment
4 Office of British Columbia and, in accordance with Section 16 of CEAA, by the Minister of
5 Environment of Canada, in order to set out the scope of the factors to be taken into
6 consideration in the environmental assessment of the Project.
- 7 For the purposes of the environmental assessment under CEAA and to serve as the
8 Environmental Assessment Certificate (EAC) Application² for the Project, the Proponent
9 must provide an EIS. In this document, the information which must be included in the EIS
10 is identified.
- 11 The concerns of Aboriginal groups will be presented in the EIS in accordance with Section
12 15 and Section 20 of these EIS Guidelines. The Proponent will incorporate additional
13 baseline information as made available based on concerns identified by Aboriginal groups.

² The co-operative Environmental Impact Statement (EIS) and Environmental Assessment Certificate (EAC) Application will be collectively referred to as the Environmental Impact Statement or EIS.

1 **ACKNOWLEDGEMENTS**

- 2 This section of the EIS will acknowledge the regulatory agencies and authorities, Aboriginal
3 groups, and key stakeholders that contributed to the development of the baseline study
4 reports and the EIS.

1 **AUTHORSHIP**

- 2 This section of the EIS will provide a list of the project team members and their
3 qualifications.

1 **TABLE OF CONCORDANCE**

2 A Table of Concordance will be provided in the EIS. The table will identify, through cross-
3 referencing, where information identified in these EIS Guidelines that is required in the EIS
4 can be found in the EIS, including volume, section and page references. An example of
5 how the Table of Concordance will be constructed is illustrated in Table 1.

6 **Table 1 Table of concordance between the Environmental Impact Statement**
7 **Guidelines and the Environmental Impact Statement**

EIS Guidelines Section	Title	Summary	EIS Volume	EIS Section	Page Reference

1 EXECUTIVE SUMMARY

2 The EIS will include an Executive Summary that summarizes:

- 3 • The Proponent
- 4 • the key project components and activities
- 5 • the harmonized federal and provincial environmental assessment process
- 6 • consultations undertaken by the Proponent, key issues raised, responses provided
- 7 and how input was considered in project planning
- 8 • potential effects of the Project on environment, social, economic, heritage and
- 9 human health resources
- 10 • Aboriginal groups and the potential effects of the Project on their interests
- 11 • mitigation measures
- 12 • significance of potential residual effects
- 13 • significance of potential cumulative effects
- 14 • conclusions

1 ABBREVIATIONS AND ACRONYMS

2 A list of acronyms and abbreviations referred to in the text of the EIS will be provided and
3 defined in this section.

4 The list below provides abbreviations and acronyms used in these EIS Guidelines.

5

6 Agency Canadian Environmental Assessment Agency

7 BCEAA British Columbia *Environmental Assessment Act*

8 BCEAO British Columbia Environmental Assessment Office

9 BC Hydro BC Hydro Power and Authority

10 BCMOE British Columbia Ministry of Environment

11 CEAA *Canadian Environmental Assessment Act*

12 EIS Environmental Impact Statement

13 EMP Environmental Management Plan

14 GHG greenhouse gas

15 LAA Local Assessment Area

16 LiDAR Light Detection and Ranging

17 km kilometre

18 kV kilovolt

19 m metre

20 MW megawatt

21 RAA Regional Assessment Area

22 SARA *Species at Risk Act*

23 VC Valued Component

24 VLI Visual Landscape Inventory

1 DEFINITIONS

2 Definitions of technical terms referred to in the text of the EIS will be provided in this
3 section. Many terms that will be relevant to the EIS have been previously defined in the
4 Project Description Report accepted by the provincial and federal authorities in August
5 2011.

6 A list of the terms used in this EIS Guidelines is included below.

average energy	The estimate of energy that could be generated by a project over a long period of time (expressed conventionally in gigawatt hour/year).
BC Energy Plan	Energy policy documents released by the B.C. government in 2007 and 2010 that guide energy planning in the province.
dependable capacity	The amount of megawatts a plant can reliably produce when required, assuming all units are in service. Factors external to the plant affect its dependable capacity. Planned and forced outage rates are not included.
clean or renewable resources (under B.C.'s Clean Energy Act)	Biomass, biogas, geothermal heat, hydro, solar, ocean, wind or any other prescribed resources, such as biogenic waste used for electricity generation.
cofferdam	A temporary dam or barrier used to divert a river or to enclose an area during construction to enable work to be done in the dry.
Composite Ecosystem Mapping	In the context of the project, composite ecosystem mapping refers to combining 1:20,000 vegetation resource inventory mapping layers with 1:50,000 terrestrial ecosystem mapping to increase the details and spatial extent of the project terrestrial maps.
discipline	Subject matter or area of knowledge or learning (e.g., wildlife).
firm energy	The energy that is available (i.e., equalled or exceeded) 100 per cent of the time, either for a given period such as 25 years, or for an analysis period such as a period covered by flow records.
generating station	The component of a hydroelectric power plant where the generators and turbines are housed and where power is produced by the action of the water acting on the turbines.
fluvial geomorphology	The scientific study of landforms and how the landforms have been shaped by fluvial processes, including the physical configuration of the river channel in relation to surrounding topography and geology.

head	Hydroelectric power comes from the potential energy of dammed water driving a water turbine and generator. The power extracted from the water depends on the volume and on the difference in height between the water source and the water's outflow. This height difference is called the head. The greater the head (i.e., the height difference), the greater the amount of energy that can be generated.
hydrology	The science of the properties, distribution and effects of water on a planet's surface, in the soil and underlying rocks, and in the atmosphere.
impact lines	Lines located to delineate the potential spatial extent of physical processes, including flood, erosion, landslides and landslide-generated waves, that could be affected by the reservoir and that could impact safety or land use.
laydown areas	Designated locations at a construction site where the components or equipment needed during the construction of a facility are offloaded and stored temporarily until required. These locations are usually large flat areas that are easily accessible by both transportation and construction equipment. Pre-assembly of some components prior to their installation or use may also be carried out at these locations.
LiDAR	LiDAR, Light Detection and Ranging, is an optical remote sensing technology that can measure the distance to, or other properties of a target, by illuminating the target with light, often using pulses from a laser.
Local Assessment Area	The area within which the potential adverse effects of the Project will be assessed.
megawatt (MW)	A unit of power, equal to one million watts or 1,000 kilowatts.
Methyl mercury	An organic form of mercury, created from metallic or elemental mercury by bacteria in sediments.
penstock	A closed conduit or pipe used to convey water under pressure from the power intakes to the turbines of a hydroelectric power plant.
Regional Assessment Area	The area within which projects and activities, the residual effects of which may be combined with residual effects of the Project, will be identified and taken into account in the cumulative effects will be assessed.
reservoir	An artificial lake used to collect and store water, such as for community water supply, irrigation or electricity generation.
spillway	A structure used to provide an efficient, controlled and safe means of releasing (spilling) surplus water inflows from a dam/reservoir.

technical study area	This is the physical extent of the data collection program, or the physical boundaries for the technical modelling program.
substation	The facility at a power plant (hydroelectric, thermal, wind, etc.) that contains the switching facilities and equipment, including transformers, needed to connect transmission lines at different voltages.
switchyard	The facility at a power plant (hydroelectric, thermal, wind, etc.) that contains the switching facilities and equipment needed to connect the power plant to the transmission system.
tailrace	The area of the river immediately downstream of the generating station into which the water from the turbines is discharged.
taxon or taxa	A taxonomic category or group, such as a kingdom, phylum, class, order, family, genus, species, or subspecies.
Terrestrial Ecosystem Mapping	Stratification of the landscape into map units according to ecological features using a combination of manual airphoto interpretation and ground sampling (definition from: http://www.env.gov.bc.ca/fia/terrecomap.htm).
Valued Component	Valued Components are those components of the environment, social, economic, heritage and health setting on which the Project may have an effect, which must be assessed in accordance with these EIS Guidelines.

1 **VOLUME 1 – INTRODUCTION, PROJECT PLANNING, AND DESCRIPTION**

2 **1 PURPOSE OF THE ENVIRONMENTAL IMPACT**
3 **STATEMENT**

4 This section of the Environment Impact Statement (EIS) will describe why an environmental
5 assessment review pursuant to BCEAA and CEAA is required.

6 The EIS will describe the provincial triggers for the environmental assessment. Pursuant to
7 Part 4 of the *Reviewable Projects Regulation*, an environmental assessment is required
8 because the Proponent is proposing the following:

- 9 • Construction of a new hydroelectric power generating station with a rated
10 nameplate capacity of greater than 50 MW
- 11 • A new 500kV transmission line greater or equal to 40 km in length
- 12 • A new sand and gravel pit that will have a production capacity of greater than or
13 equal to 500,000 tonnes per year, or over a period of less than or equal to a period
14 of 4 years of operation greater than or equal to 1,000,000 tonnes, or a modification
15 of an existing pit if it meets the criteria above or results in an expansion of 35
16 per cent of the existing permitted facility
- 17 • A new construction stone quarry that will have a production capacity of greater than
18 or equal to 250,000 tonnes per year, or a modification of an existing quarry of the
19 above capacity or 750 hectares of land not previously permitted, or an area of land
20 at least 50 per cent of the area previously permitted

21 The EIS is not intended to constitute a Certificate of Public Convenience and Necessity for
22 the Site C Project. The Site C Project is exempt from the requirement for a Certificate of
23 Public Convenience and Necessity as per section 7 of the B.C. Clean Energy Act.

24

25 Pursuant to Section 5 of the CEAA and the *Law List Regulation*, a federal environmental
26 assessment is to be conducted because:

- 27 • Fisheries and Oceans Canada (DFO) has concluded that the Project requires
28 *Fisheries Act* authorizations (section 32 and 35) for works or undertakings
29 associated with the Project
- 30 • Transport Canada has concluded that it must issue approvals under the *Navigable*
31 *Waters Protection Act* (Section 5)
- 32 • Natural Resources Canada may be required to issue a licence under section 7(1)a
33 of the *Explosives Act*

34

35 The Project is also subject to the Major Resource Project Initiative led by the Major
36 Projects Management Office, which works collaboratively with federal departments and

1 Agencies, and acts as a single window into the federal regulatory process.

2

3 On September 30th, 2011 the federal Minister of the Environment and the BC Minister of the
4 Environment announced a cooperative environmental assessment of the Site C Clean
5 Energy project including the establishment of a joint review panel.

6 This section of the EIS will also describe:

- 7 • The purpose of the cooperative EIS
- 8 • The relationship between these EIS Guidelines and the EIS

9 In the interest of brevity, the cooperative EIS and Environmental Assessment Certificate
10 Application (Application) are referred to collectively as the EIS. The joint terms of reference,
11 called the EIS Guidelines-Application Information Requirements (AIR) are collectively
12 referred to as these EIS Guidelines.

13 The EIS will generally be structured in the same way as these EIS Guidelines and will
14 include: Preface; Acknowledgements; Table of Concordance; Executive Summary;
15 Abbreviations and Acronyms; Definitions; Table of Contents; Project Overview and
16 Description; Needs for, Alternatives to, Purpose of, and Alternative Means of Undertaking
17 the Project; Project Benefits; Public, Aboriginal Groups and Agency Information Distribution
18 and Consultation; Assessment of Potential Environmental, Economic, Social, Heritage and
19 Health Effects, Mitigation and Significance of Residual Effects; Assessment of Potential
20 Adverse Impacts to Asserted or Established Aboriginal Rights and Treaty Rights, Aboriginal
21 Interests and Information Requirements; Requirements for the Federal Environmental
22 Assessment; Summary of Potential Residual Effects; Table of Conditions; and Conclusions.

23 The EIS that is made publicly available for comment should not contain:

- 24 • Information that is sensitive or confidential (i.e., financial, commercial, scientific,
25 technical, personal, cultural or other nature), that is treated consistently as
26 confidential, and the person affected has not consented to the disclosure; or,
- 27 • Information that is likely to endanger the life, liberty or security of a person through
28 its disclosure.

29

30 **2 PROPONENT DESCRIPTION**

31 The EIS will describe BC Hydro, and provide contact information for the project
32 management team.

33 BC Hydro is a Crown corporation that is owned by the Province of British Columbia.

34

Name of Corporation:	BC Hydro and Power Authority
Address:	Corporate Office 333 Dunsmuir Street Vancouver, B.C. V6B 5R3

President and
Chief Executive Officer: Charles Reid

Executive Vice-President, Site C: Susan Yurkovich

Principal Contact for the
Environmental Assessment: Danielle Melchior
Director, Site C Environmental Assessment and
Regulatory
Phone: 604 699-7344
Fax: 604 623-4333
Email: sitec@bchydro.com

Company Website: <http://www.bchydro.com>
Project Website: <http://www.bchydro.com/sitec>

3 PROJECT OVERVIEW

In accordance with Section 15 of CEAA, the Minister of Environment of Canada has determined that the scope of the Project in relation to which an environmental assessment will be conducted of the Project as proposed by the Proponent in the Project Description Report (BC Hydro 2011a) and as it may be modified from time to time. Descriptions of the Project and its components are set out in these EIS Guidelines for convenience only.

The EIS will describe the Proponent's project governance process for the Project. It will then describe the project location and project components and activities.

3.1 Project Governance Process

The Proponent will describe the governance and multi-staged decision-making process for the Project.

3.1.1 Scheduling

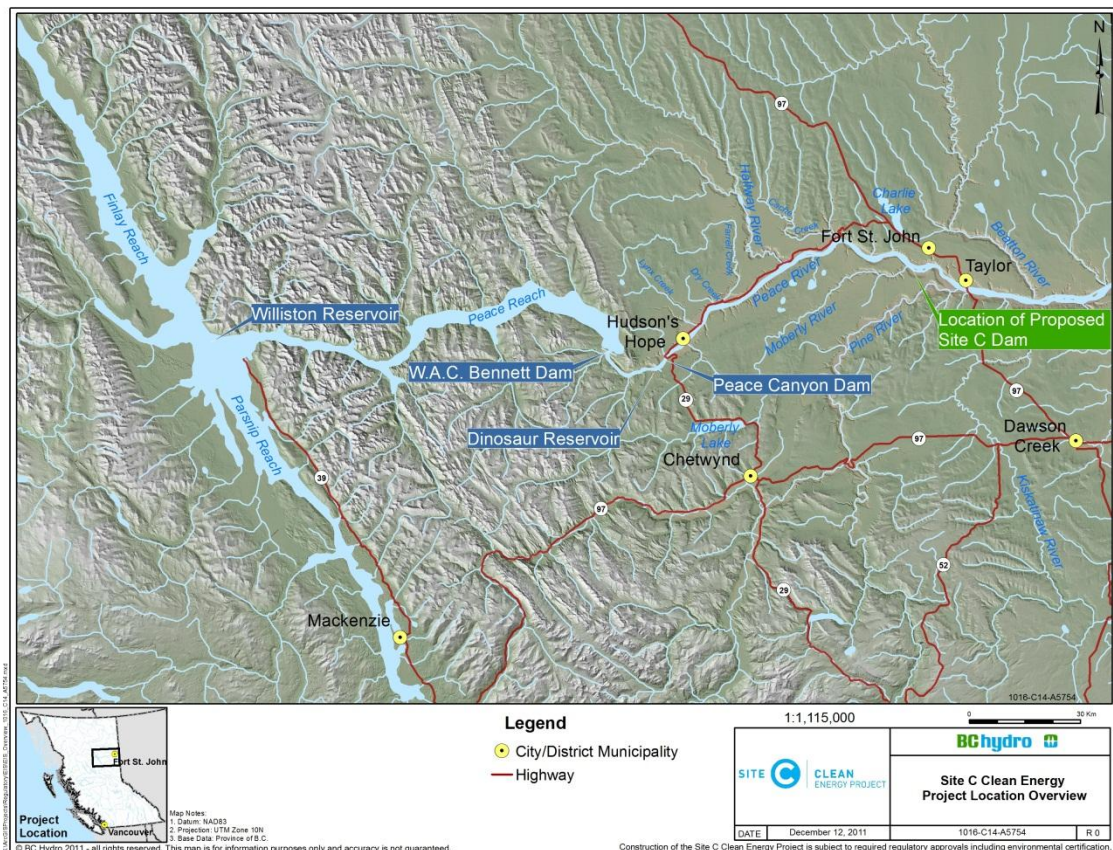
An estimated month by month construction schedule based on project planning at the time of preparation of the EIS will be incorporated into the EIS. The schedule will commence on the anticipated date of certification. The EIS will describe the anticipated scheduled maintenance activities and the potential future capital upgrades.

3.2 Project Location

The EIS will identify the proposed project location. The EIS will indicate that the Project lies within the tract of land described in Treaty 8. The EIS will provide mapping at appropriate scales indicating the location and regional setting of the project components. For example, figures will illustrate:

- Overall site layout including the local and regional setting of the project components and activities

- 1 • Location of nearby communities, including Aboriginal communities
- 2 • Tenure, ownership and land management details for lands within the areas of
- 3 project components
- 4 As appropriate, site plans, photographs and other graphics will be used to describe project
- 5 components and activities.
- 6 The dam and hydroelectric generating station will be located on the Peace River in
- 7 northeast B.C., approximately 7 km southwest of the City of Fort St. John (**Figure 3.1**).



8
 9 **Figure 3.1 Site C project location**

10 **3.3 Project Components and Activities**

11 The EIS will describe the project components and activities.

12 The description of the project components and activities will be supported by:

- 13 • Maps depicting the spatial scope and local context
- 14 • Plan and cross-section drawings
- 15 • Tables containing pertinent data

- 1 The temporal context of the project component and activities will be described, and the
2 Proponent will provide a rationale in instances where all temporal phases are not
3 considered relevant.
- 4 The description of the construction activities will be based on construction planning and
5 assumptions at the time the EIS is submitted. Some activities may be different during
6 implementation depending on procurement, including contractors' preferences for
7 equipment, construction means and methods, and competitive pricing. Therefore, feasible
8 options for some activities may be described if required to define the likely range of
9 potential effects of the construction activities.
- 10 The EIS will describe the expected performance of the structures during and after major
11 earthquakes, including the ability of earth dams and other water retaining and flow control
12 structures to withstand earthquakes. This will include a review of lessons learned from
13 major earthquakes that have occurred elsewhere.

14 **3.3.1 Dam and Generating Station**

15 **3.3.1.1 Earthfill Dam**

16 The EIS will describe:

- 17 • The principal dimensions of the earthfill dam and associated buttress
- 18 • The characteristics and anticipated quantities of material used to construct each
19 zone of the earthfill dam
- 20 • Explosives use, manufacturing, and storage facilities
- 21 • The anticipated quantities of material used to construct the buttress
- 22 • See page control and drainage provisions
- 23 • Freeboard requirements to accommodate potential flood, seiche, and wind and
24 landslide-generated waves
- 25 • The specifications for the design of the earthfill dam and the testing that has been
26 performed to determine the suitability of the materials from which the dam will be
27 constructed

28 The EIS will characterize the geotechnical parameters of the materials that will be quarried
29 and excavated and describe their suitability for use as construction materials.

30 **3.3.1.2 Generating Station**

31 The EIS will describe:

- 32 • The principal dimensions of each structure that is part of the generating station ,
33 including the associated buttress
- 34 • The approach channel that conveys water from the reservoir to the generating
35 station and spillways
- 36 • The type and anticipated quantities of materials used to construct each structure
- 37 • Seepage control and drainage provisions

- 1 • The principal characteristics of the generating equipment
- 2 • The ancillary mechanical and electrical systems
- 3 • The tailrace that conveys water from the powerhouse to the river downstream of the
- 4 dam

5 **3.3.2 Spillways**

6 The EIS will describe:

- 7 • The principal dimensions of each part of the spillway, including the associated
- 8 buttress
- 9 • The type and anticipated quantities of materials used to construct each structure
- 10 • Seepage control and drainage provisions
- 11 • The equipment used to operate the spillway
- 12 • The hydraulic capacity of the spillway at the maximum normal reservoir level and
- 13 the maximum flood level
- 14 • The tailrace that conveys water from the spillways to the river downstream of the
- 15 dam
- 16 • The energy dissipation and erosion protection provisions

17 **3.3.3 Reservoir**

18 The EIS will describe the physical characteristics of the reservoir, including:

- 19 • Its normal operating range
- 20 • Its overlap with the Peace River and its spatial extent into Peace River’s tributaries
- 21 • The surface area at the maximum normal reservoir level, with the area of each
- 22 tributary arm
- 23 • The normal operating water volume, and the volume between the maximum normal
- 24 reservoir level and the minimum normal reservoir level
- 25 • Reservoir bathymetry

26 **3.3.4 Transmission Line to Peace Canyon**

27 The EIS will describe the facilities required to connect to the bulk transmission system,
28 including access roads required for clearing, construction and maintenance of the
29 transmission line.

30 **3.3.5 Access Roads and Rail**

31 The EIS will describe the permanent and temporary access routes required for access to
32 the project site and other project components including a description of the temporal
33 aspects of road use (e.g. traffic management plans, expected traffic patterns and volumes
34 for different phases of project development, deactivation schedules). The EIS will also

1 describe any improvements that would be required to existing roads and rail. Maps showing
2 the access roads and rail will be provided.

3 **3.3.6 Highway 29 Realignment**

4 The EIS will describe alternative highway realignment options and a rationale for selection
5 of the preferred options. The EIS will describe the proposed sections of Highway 29 that
6 would be realigned. The description will include the approximate length of bridges and
7 causeways at watercourse crossings, clearance between bridges and the reservoir and the
8 factors considered in alignment selection. Drawings showing the preliminary design of the
9 bridges and causeways for each section of Highway 29 that has to be realigned will be
10 included in the EIS.

11 The EIS will identify any driveways, properties or existing crown tenures that may need
12 entirely new access routes constructed as a result of the highway realignment.

13 **3.3.7 Quarried and Excavated Construction Materials**

14 The EIS will describe the sources of riprap, aggregates and till that would be required to
15 construct the dam and generating station, for highway realignment, and for the berm at
16 Hudson's Hope. Maps showing the location of the proposed sources will be included with
17 the descriptions.

18 **3.3.8 Worker Accommodation**

19 The EIS will describe plans for temporary worker accommodation for construction, at the
20 dam site and other locations, as well as any plans for provision of worker accommodations
21 in nearby communities. The projected size and use of camp facilities will be described,
22 including any related project employment policies or restrictions.

23 **3.3.9 Construction Phase Activities**

24 The EIS will describe the expected construction sequence and activities for each project
25 component. A description of the information to be provided is listed below.

26 The EIS will describe the following activities for construction of the **dam and generating**
27 **station**:

- 28 • Site clearing and grubbing
- 29 • Construction of temporary and permanent access and haul routes
- 30 • Modifications to rail
- 31 • Construction of a temporary access bridge over the Peace River and one over the
32 mouth of the Moberly River, including a rationale for the choice of installation of
33 temporary rather than permanent crossings over the Peace and Moberly rivers
- 34 • Transportation of equipment and materials to the site
- 35 • Set up and operation of the temporary facilities required for construction
- 36 • Excavations to stabilize slopes and for the foundations of structures
- 37 • Stockpiling of excavated materials for use in construction

- 1 • Relocation of surplus excavated materials that are unsuitable for construction,
2 including estimated quantities, locations and treatment of relocation areas
- 3 • Construction of cofferdams to confine the river to the main channel and isolate the
4 north and south banks of the river so that work can be performed in the dry
- 5 • Construction of the diversion tunnels
- 6 • Diversion of the river through the tunnels
- 7 • Construction of cofferdams across the main river channel to isolate the foundations
8 of the earthfill dam
- 9 • Construction of the earthfill dam
- 10 • Placing roller-compacted concrete in the buttress abutting the earthfill dam and
11 supporting the generating station and spillways
- 12 • Placing reinforced concrete for the generating station and spillways
- 13 • Placing the impervious lining and erosion protection in the approach channel
- 14 • Placing erosion protection in the tailrace and spillway outlet channel
- 15 • Fabricating and erecting the steel penstocks of the generating station
- 16 • Erection of buildings and powerhouse superstructure
- 17 • Installation of mechanical and electrical equipment
- 18 • Testing and commissioning the generating facility and spillways
- 19 • Removal of temporary construction facilities, including roads and bridges
- 20 • Disposal of construction waste
- 21 • Site reclamation
- 22 The EIS will describe the following construction activities for **reservoir preparation**,
23 including:
 - 24 • Estimated volumes of merchantable and non-merchantable wood within the
25 reservoir area
 - 26 • Proposed extent and locations of cleared areas
 - 27 • Clearing strategy and methods
 - 28 • Proposed access routes, including transportation of merchantable timber resources
29 to processing facilities
 - 30 • Construction of temporary access roads
 - 31 • Construction of the shoreline protection berm at Hudson's Hope
 - 32 • Removal or treatment of existing structures or utilities including any other potential
33 hazard to navigation at the minimum normal reservoir level
 - 34 • Reservoir filling

- 1 • Methods for managing wood debris during construction and reservoir filling
- 2 • Methods for managing vessel traffic during construction and reservoir filling
- 3 The EIS will describe the following construction activities for the connection to the
- 4 **transmission system:**
- 5 • Clearing to widen the existing right-of-way
- 6 • Construction of new access roads and upgrading of existing roads
- 7 • Construction laydown areas along the transmission corridor for the storage of
- 8 materials and assembly of components
- 9 • Installation of tower foundations
- 10 • Batching of concrete for tower foundations;
- 11 • Assembly and erection of towers and supporting structures
- 12 • Stringing conductor wires
- 13 • Installation of grounding systems (i.e., counterpoise)
- 14 The EIS will describe the following construction activities for **access roads and rail to the**
- 15 **dam site:**
- 16 • Construction of access roads on the north bank including connections to and, where
- 17 required, upgrades of, existing municipal roads
- 18 • Construction of an access road on the south bank connecting to the existing
- 19 Jackfish Lake road and any upgrades required to the existing road
- 20 • Traffic management during modifications to existing roads
- 21 • Addition of new rail sidings and associated facilities on the existing Canadian
- 22 National railway
- 23 The EIS will describe the following construction activities for each section of **Highway 29**
- 24 that has to be relocated or modified:
- 25 • Clearing and grubbing
- 26 • Removal/decommissioning of existing pavement
- 27 • Excavation and embankment construction
- 28 • Sources of gravel fill, sub-base, base course and asphalt
- 29 • Pavement construction
- 30 • Bridge construction
- 31 • Construction of connections to existing driveways and local roads
- 32 • Construction sequence
- 33 • Traffic management

1 The EIS will describe the following construction activities for each **quarried and excavated**
2 **material source:**

- 3 • Development plan
- 4 • Clearing and grubbing
- 5 • Construction of access roads
- 6 • Excavation and stockpiling of unsuitable material, including topsoil
- 7 • Excavation of suitable material, including drilling, blasting, sorting and screening in
8 rock quarries and moisture conditioning of impervious material
- 9 • Reclamation plan, or plan for ongoing use by others

10 The EIS will describe how the **construction contracts** will include:

- 11 • Commitments to perform all construction activities in accordance with the Project
12 Environmental Management Plan
- 13 • The process to be followed for upgrading any bridges required to meet load capacity

14 **3.3.10 Operations Phase Activities**

15 A description of activities to be conducted during the operations phase will be included in
16 this section of the EIS. Maintenance activities along the transmission line and access road
17 (e.g., vegetation management and dust control) will be described in the EIS.

18 The Proponent proposes to operate the Project to respond to provincial electricity demand
19 in the same manner as the Proponent's other generating facilities on the Peace River. A
20 water management approach will be developed for the Project which will describe reservoir
21 operations and resulting downstream flows and water levels. A draft of a Water
22 Management Plan will be appended to the EIS. The final Water Management Plan will
23 require approval by the BC Comptroller of Water Rights as part of the water licensing
24 process.

25 The EIS will include an estimate of the magnitude, frequency, seasonality, and duration of
26 potential spillway discharges.

27 The EIS will also include a list of operating plans where there would be a potential
28 interaction with the Valued Components and provide outlines of each of those plans.

29

1

2 **3.3.11 Decommissioning Activities**

3 The EIS will describe

- 4 - Offsite components of the Project that are going to be retained and maintained as
- 5 part of the ongoing maintenance of the Project
- 6 - Decommissioning of temporary construction facilities and any associated
- 7 reclamation.

8 Once operational, the Project will be a major addition to the Proponent's hydroelectric
9 generating assets. Such assets are operated and maintained over the long term with no
10 future decommissioning contemplated. Should a proposal be made in the future to
11 decommission the Site C dam and generating station, a plan for decommissioning and
12 restoration would be developed and executed by the Proponent, in accordance with
13 applicable regulations at that time.

14 **3.4 References**

15 This subsection will include a list of supporting references used in this section of the EIS.

16 **4 NEED FOR, PURPOSE OF, ALTERNATIVES TO,** 17 **AND ALTERNATIVE MEANS OF CARRYING OUT,** 18 **THE PROJECT**

19 The operational policy statement issued by the Canadian Environmental Assessment
20 Agency "Addressing "Need for", "Purpose of" "Alternatives to" and "Alternative Means"
21 under the Canadian Environmental Assessment Act (November 2007)" will be used to
22 guide this portion of the assessment.

23 **4.1 Need for and Purpose of the Project**

24 The EIS will describe the "need for" and "purpose of" the Project.

25 **4.1.1 Need for the Project**

26 The EIS will provide the fundamental rationale for proceeding with the development at this
27 time within the relevant legal and policy context. The "need for" the Project is defined as the
28 problem or opportunity that the Project is intending to address, solve or satisfy (Agency
29 2007b). The "need for" establishes the fundamental justification or rationale for the Project.

30 The EIS will provide a description of methodologies, assumptions and conclusions used in
31 the analysis, and will include an evaluation of the following:

- 32 • Current and forecasted electricity demand
- 33 • Current and forecasted Proponent demand-side management measures as defined
- 34 in Section 1 of the B.C. *Clean Energy Act*

- 1 • Existing resources
- 2 • Committed resources – those that have received British Columbia Utilities
- 3 Commission, and if necessary BCEAO, and/or Proponent Board of Directors
- 4 approvals, but are not yet in-service
- 5 • The uncertainties in load growth and resource delivery
- 6 • And any other relevant factors

7 **4.1.2 Purpose of the Project**

8 The EIS will present the “purpose of” the Project. The purpose of the Project is defined as
9 what is to be achieved by carrying out the Project (Agency 2007b). The “purpose of” the
10 Project will be established from the perspective of the Proponent, and will provide context
11 for the consideration of alternatives to the Project in Section 4.2.

12 **4.2 Alternatives to the Project**

13 The EIS will describe the functionally different ways to meet the need for the Project. The
14 EIS will contain an analysis of technically and economically feasible alternatives to the
15 Project..

16 **4.2.1 Rationale for Selection of Resources for Consideration**

17 The EIS will identify the legislative and policy rationales for including and excluding certain
18 resource alternatives from consideration, such as:

- 19 • Policy Action No. 23 of the 2007 Energy Plan provides that nuclear power “is not
20 part of B.C.’s energy future”. The Proponent is a Crown agent of the B.C.
21 Government, and the B.C. Government can direct the Proponent not to acquire
22 nuclear power.
- 23 • Sections 10 and 11 and Schedule 2, of the B.C. *Clean Energy Act* prohibit the
24 following large hydroelectric projects: Murphy Creek, Border, High Site C, Low
25 Site E, Elaho, McGregor Lower Canyon, Homathko River, Liard River, Iskut River,
26 Cutoff Mountain and McGregor Diversion
- 27 • Subsections 3(5), 6(2)(d) and 13 of the B.C. *Clean Energy Act*, and the
28 Authorization for Burrard Thermal Electricity Regulation, restrict the role of Burrard
29 Thermal Generating Station (Burrard) after the following projects are in service:
30 Mica Units 5 and 6, the Interior to Lower Mainland Project, and the third transformer
31 at the Meridian Substation. After this, the Proponent will only be able to operate
32 Burrard in case of “emergency” and for voltage support (not generating electricity
33 but running in synchronous condenser mode).

34 The EIS will also describe constraints that exist with respect to resources that could
35 potentially be alternatives to the Project such as:

- 36 • Policy Action No. 20 of the 2007 Energy Plan stipulates that coal-fired generation
37 must meet a zero greenhouse gas (GHG) emission standard “through a combination
38 of clean coal fired generation technology, carbon sequestration and offsets for any

- 1 residual GHG emissions”. The EIS will provide information concerning the current
2 status of coal-fired generation with carbon capture and sequestration.
- 3 • Policy Action No. 18 of the 2007 Energy Plan requires that new natural gas-fired
4 generation have zero net GHG emissions. Therefore, the analysis of natural gas-
5 fired generation must include a discussion of GHG offset-related costs.

6 **4.2.2 Characterization of Viable Alternatives to the Project**

7 The EIS will describe the major financial, technical, environmental, and economic
8 development attributes of the supply-side and demand-side alternatives.

9 Financial and technical attributes can include:

- 10 • Firm energy and dependable capacity
- 11 • Cost of supply, including a description of project capital costs and operating costs
- 12 • Technology status and potential in-service date
- 13 • Resource quality (i.e. intermittency or flexibility of generation)
- 14 • Uncertainties and risks associated with development of the resource option,
15 including deliverability risk

16 Environmental attributes can include:

- 17 • Land footprint
- 18 • Freshwater footprint
- 19 • Marine footprint
- 20 • Local air emissions
- 21 • GHG emissions

22 Economic development attributes can include:

- 23 • Employment
- 24 • Gross Domestic Product
- 25 • Government Revenues

26 **4.2.3 Evaluation of Alternatives to the Project**

27 The EIS will describe the methodology used to identify whether and how, the Project can be
28 seen as the preferred option based on consideration of the environmental, economic and
29 technical benefits and costs.

30 The comparison of Site C to other options can be through an integrated resource planning
31 methodology as follows:

- 32 • Portfolio analysis - The methodology will evaluate alternative portfolios, each of
33 which can meet the Proponent’s customers’ electricity needs. These portfolios will
34 be composed of discrete identified resources.

- 1 • Scenario-based - The methodology will evaluate alternative portfolios under a range
2 of potential future conditions.
- 3 • Characterization of uncertainties and risks - The methodology should characterize
4 the uncertainties and risks associated with the alternative portfolios under
5 consideration.

6 **4.3 Alternative Means of Carrying Out the Project**

7 The EIS will summarize various studies on developing the hydroelectric potential of the
8 Peace River downstream of Peace Canyon Dam that were undertaken prior to publication
9 in 2007 of the Proponent's report on the feasibility of the Project (the "Stage 1 Report").

10 The EIS will describe results of studies completed since the publication of the Stage 1
11 Report of the following alternative means of developing the hydroelectric potential of the
12 Peace River between Peace Canyon Dam and Site C:

- 13 • A dam located 3 km upstream of Site C, upstream of the Moberly River confluence
- 14 • A dam located 5.5 km upstream of Site C
- 15 • A dam located 11.5 km upstream of Site C
- 16 • A dam located at Site C, 15 m lower than that proposed in the Project, plus a
17 15-metre-high dam located 66 km upstream
- 18 • A lower dam at Site C, with two other low dams located 22 km and 58.5 km
19 upstream
- 20 • A lower dam at Site C, with three other low dams located 18 km, 38.5 km and
21 60.5 km upstream
- 22 • A very low dam located 0.5 km downstream of Site C, with six other very low dams
23 located 10 km, 23 km, 36.5 km, 52.5 km, 65 km and 78.5 km upstream

24 The EIS will describe the following characteristics of each of these alternatives:

- 25 • Engineering parameters
- 26 • The physical footprint during construction, reservoir filling and operation
- 27 • The capital cost
- 28 • Generation of dependable capacity

29 The EIS will provide a parameter-based analysis comparing the relative potential
30 environmental effects of the each of the alternative means identified above to the potential
31 environmental effects of the Site C dam. The assessment of alternate means described in
32 the EIS will include a multi-attribute analysis addressing specific technical, geotechnical,
33 economic and environmental attributes.

34 Fish passage is one of the parameters that will be considered in the assessment of
35 alternative means presented in the EIS.

1 The rationale by which the Proponent identified the Project as the preferred alternative for
2 developing the hydroelectric potential of the Peace River between Peace Canyon Dam and
3 Site C will be described in the EIS.

4 **4.4 References**

5 This subsection will include a list of supporting references used in this section of the EIS.

6 **5 PROJECT BENEFITS**

7 The EIS will present the extent, distribution and duration of benefits of the Project and will
8 describe the following information.

9 Projected financial benefits of the Project, as measured by standard financial indicators
10 proposed by the Proponent, including:

- 11 • The value of the electricity generated by the Project
- 12 • Initial capital construction cost and operating cost estimates (including taxes and
13 grants-in lieu) and a description of the methodology for developing the cost
14 estimates and the dollar basis.
- 15 • Annual federal, BC provincial, municipal, and regional government revenues that will
16 accrue during the construction and operation phases of the Project
- 17 • Annual federal and BC provincial Gross Domestic Product that will accrue during the
18 construction and operations phases of the Project

19 Projected economic development benefits, including:

- 20 • Estimated direct employment, stated in number of person years, to be created by
21 major job category (e.g., labour, management, business services) during
22 construction and operations
- 23 • Estimated indirect employment (i.e., employment in industries that supply goods and
24 services used to produce an industry's output or to be consumed by individuals) and
25 induced employment (i.e., employment due to the spending and re-spending of
26 directly and indirectly generated incomes in the broader economy) during
27 construction and operation predicted by the British Columbia Input-Output Model
28 developed and maintained by BC Stats (BC Stats 2011a)
- 29 • Predicted locality of direct and indirect hires
- 30 • Contractor supply services estimates, including the value of supply of service
31 contracts expected for the Project's construction and operations phases

32 Projected economic development benefits for Aboriginal groups, including:

- 33 • Employment
- 34 • Contracting and business development, including small and medium sized
35 enterprises

- 1 • Capacity-building initiatives
- 2 Projected social benefits, including:
- 3 • Potential for use of local human resources that are currently not in the labour market
- 4 • Potential for use of existing local facilities for construction and operations activities,
- 5 and an indication of their current level of use
- 6 Provided benefits to sustainable development, including:
- 7 • The ability of the Project to integrate intermittent generation resources such as wind
- 8 and small hydro
- 9 • The ability of the Project to generate electricity with a low amount of greenhouse
- 10 gas emissions per unit of energy delivered
- 11 All assumptions and reference sources used to develop the above information will be
- 12 identified.

13 **5.1 References**

14 This subsection will include a list of supporting references used in this section of the EIS.

15 **6 ASSESSMENT PROCESS**

16 **6.1 Provincial Agencies, Departments and Organizations**

17 The EIS will list the provincial agencies, departments and organizations that will be involved

18 in the Project's environmental assessment process.

19 A summary of the issues and concerns identified by provincial, local and regional

20 government agencies will be provided in the EIS. Detailed agency comments and the

21 Proponent responses will be provided in an issues tracking table to be prepared by the

22 Proponent and posted on the Agency's and BCEAO's website.

23 **6.2 Federal Responsible Authorities and Federal Authorities**

24 The EIS will include a description of the Responsible Authorities and Federal Authorities.

25 A summary of the issues and concerns identified by federal agencies will be provided in the

26 EIS. Detailed agency comments and the Proponent responses will be provided in an issues

27 tracking table to be prepared by the Proponent.

28 **6.3 Co-operative Review Process**

29 The EIS will describe the cooperative BC and Canada review process.

30 The EIS will describe the Proponent's preparation of the draft EIS Guidelines, its review by

31 the BCEAO, the Agency and the Working Group, the public comment period, and its

32 finalization by the Minister of Environment of Canada and the Executive Director of the

1 BCEAO. The EIS will be prepared by the Proponent according to these EIS Guidelines and
2 will be submitted to the Agency, BCEAO and Working Group for review and comment.

3 **6.4 Permitting**

4 The EIS will list applicable federal, provincial, and municipal or regional licences, permits
5 and approvals required for the construction and operation of the Project, and will identify:

- 6 • the activity requiring regulatory approval
- 7 • the name of the permit or regulatory approval
- 8 • the applicable legislation in each case
- 9 • the regulatory agencies responsible for each permit or approval

10 A preliminary list of key licences, permits and approvals is provided in the Project
11 Description Report accepted by the BCEAO and the Agency in August 2011.

12 **6.5 References**

13 This subsection will include a list of supporting references used in this section of the EIS.

14 **7 INFORMATION DISTRIBUTION AND** 15 **CONSULTATION**

16 The requirements for distribution of information to and consultation with the public,
17 Aboriginal groups and agencies will be described in this section.

18 **7.1 Public Information Distribution and Consultation**

19 The EIS will describe and summarize the Proponent's information distribution and
20 consultation activities with local government, communities, stakeholders, property owners
21 and the public prior to and during the environmental assessment process. This section will
22 also describe expected public and stakeholder consultation during post-certification stages.

23 The Proponent will report on the results of all public and stakeholder pre-consultation,
24 project definition consultation and other consultation activities in the EIS.

25 **7.1.1 Pre-panel Review Stage**

26 The EIS will include a description and summary of the Proponent's information distribution
27 and consultation activities undertaken with the public and stakeholders.

28 This section will include:

- 29 • A description of the public consultation program
- 30 • A summary of the issues and interests identified by the public during the course of
31 the Project's information distribution and consultation activities during the pre-panel
32 stage and the means that the Proponent has used, or proposes to use, to consider
33 them. Issues tracking tables will be provided

- 1 • A summary of comments provided by the public with respect to these EIS
2 Guidelines, and the Proponent’s responses to those comments. Issues will be
3 summarized by the Proponent in an issues tracking table, which will also describe
4 how the issues will be considered, list the party or parties responsible for addressing
5 issues, and list the status of issues
- 6 • A summary of additional Proponent-led public consultation on project planning and
7 completion of the environmental assessment

8 The EIS will describe consultation undertaken to cover both the preparation of these EIS
9 Guidelines and the EIS.

10 **7.1.2 Construction Communication**

11 The EIS will describe the Proponent’s approach to continuing communications with affected
12 communities, stakeholders, property owners, leaseholders, businesses and the public in the
13 project area during project construction. The EIS will outline a construction communication
14 plan for the public.

15 **7.2 Aboriginal Group Information Distribution and** 16 **Consultation**

17 The EIS will describe the Proponent’s general approach and detailed activities to
18 consultation with Aboriginal groups prior to and during the environmental assessment
19 process.

20 The EIS will identify the Aboriginal groups potentially adversely affected by the Project.
21 Maps will be provided in the EIS showing the area in which Treaty 8 First Nations exercise
22 treaty rights.

23 **7.2.1 Pre-Panel Review Stage**

24 The EIS will present detailed information regarding the information distribution and
25 consultation activities undertaken with Aboriginal groups.

26 The EIS will also include:

- 27 • A description of how project information has been made available to potentially
28 affected Aboriginal groups
- 29 • A summary of the Proponent’s approach to facilitating the participation of Aboriginal
30 groups in the environmental assessment process
- 31 • A description of the activities undertaken to notify and consult with potentially
32 affected Aboriginal groups, during the preparation of both of these EIS Guidelines
33 and the EIS
- 34 • The issues, concerns and interests identified by Aboriginal groups. This will be
35 presented in an issues tracking table, prepared by the Proponent for posting on the
36 BCEAO and Agency’s websites

- 1 • The activities undertaken (or proposed to be undertaken) by the Proponent to
2 address any issues, concerns and interests identified by Aboriginal groups,
3 including the degree to which Aboriginal issues have been taken into account,
4 resolved and addressed
- 5 • The methods and processes to resolve any outstanding issues
- 6 • Changes that are suggested during the draft EIS Guidelines review process that
7 may be incorporated into these EIS Guidelines as appropriate

8 The Proponent will provide a description of consultations with Aboriginal groups to cover
9 both the preparation of these EIS Guidelines and the EIS.

10 **7.2.2 Construction Communication**

11 The EIS will describe the Proponent’s proposed approach to consulting with Aboriginal
12 groups potentially affected by the Project during project construction and issuances of
13 permits and authorizations. The EIS will also describe a proposed process for tracking and
14 reporting regulatory issues and concerns raised by potentially-affected Aboriginal groups
15 during project construction and operations.

16 **7.3 Government Agency Information Distribution and** 17 **Consultation**

18 The EIS will describe and summarize the Proponent’s information distribution and
19 consultation activities undertaken with federal, provincial, territorial and local governments
20 prior to and during the environmental assessment process. This section will also comment
21 on what would be expected with respect to government agency consultation during post-
22 certification stages.

23 **7.3.1 Pre-Panel Review Stage**

24 The EIS will describe the consultation and information sharing with the government
25 agencies that occurred prior to entering the environmental assessment process and during
26 the pre-panel review stage (development of these EIS Guidelines and EIS). This section will
27 identify issues raised during these consultations, and describe the Proponent’s response or
28 suggested solutions.

29 In the EIS, the Proponent will summarize issues raised prior to entering the environmental
30 assessment process, primarily through the Proponent’s Technical Advisory Committees
31 process.

32 The EIS will summarize engagement with government agencies that occurred with working
33 groups, topic-specific engagement with appropriate government agencies with the
34 Proponent, and issues raised during these meetings.

35 Issues identified during consultation with government agencies will be provided in an issues
36 tracking table prepared by the Proponent for posting to the BCEAO and Agency’s websites.

1 **7.3.2 Construction Communication**

2 The EIS will describe the Proponent’s approach to engaging with federal and provincial
3 regulatory agencies and local governments during project construction. The EIS will
4 describe the methods to be used to document and report the status of project compliance
5 with respect to requirements and conditions to the Agency, Responsibility Authorities,
6 BCEAO and provincial ministries. The EIS will also describe a proposed process for
7 tracking and reporting regulatory issues and concerns raised during project construction
8 and operations.

9 **7.4 References**

10 This subsection will include a list of supporting references used in this section of the EIS.

1 **VOLUME 2 – ASSESSMENT METHODOLOGY AND ENVIRONMENTAL**
2 **EFFECTS ASSESSMENT**

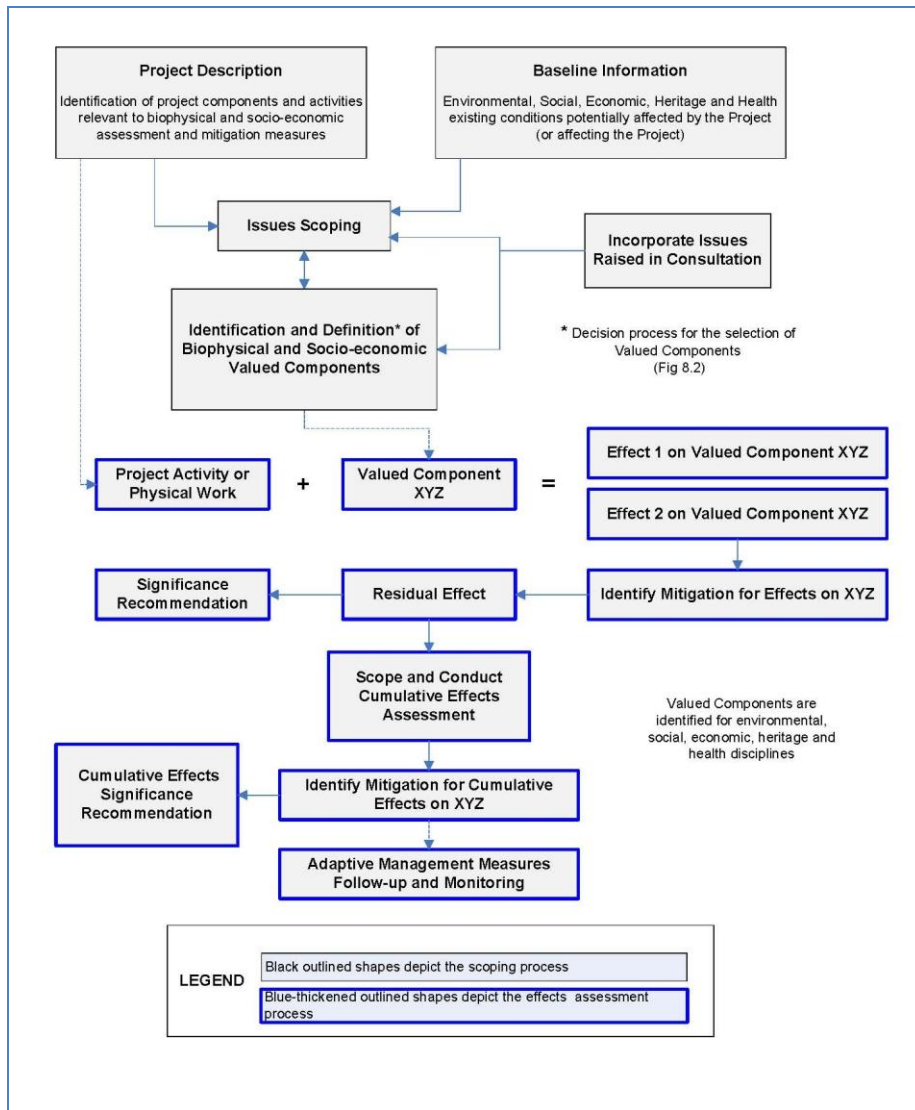
3 **8 EFFECTS ASSESSMENT METHODOLOGY**

4 **8.1 Overview**

5 The Proponent shall explain and justify all methods used in the preparation of the EIS. In
6 describing its overall approach, the Proponent shall explain how it used scientific
7 engineering, Aboriginal traditional and community knowledge. All hypotheses and
8 assumptions shall be clearly identified and justified. All data collection methods, models and
9 studies shall be documented so that the analyses are transparent and reproducible. The
10 degree of uncertainty, reliability and sensitivity of models used to reach conclusions shall be
11 indicated.

12

13 The Proponent proposes to identify the potential adverse effects of the Project using the
14 environmental assessment methodology outlined in Figure 8.1 and described in the
15 sections below.



1
2
3
4

Figure 8.1 Conceptual representation of the environmental assessment process

5 **8.2 Technical Studies and Planning**

6 To conduct an environmental assessment of the Project, planning and technical studies will
 7 be undertaken and reports will be prepared. The planning and technical studies will fall
 8 within these general categories:

- 9
- 10 • Reports summarizing consultation with government agencies, Aboriginal groups, and the public
 - 11 • Baseline conditions
 - 12 • Predictive studies

- 1 • Certain steps in project planning, for example, estimates of the direct employment
2 required for construction of the Project will be derived
- 3 • A framework for environmental management to be implemented during construction
4 and operation of the Project
- 5 The EIS will describe the planning and technical studies undertaken to produce the
6 information required for the EIS, and will include descriptions of, or attach, the results of the
7 planning and the technical studies.

8 **8.3 Selection of Valued Components**

9 The EIS will describe the valued components (VC) identified in accordance with the process
10 described below and shown in Figure 8.2. The term “valued component” also refers to the
11 federal term “valued ecosystem components”.

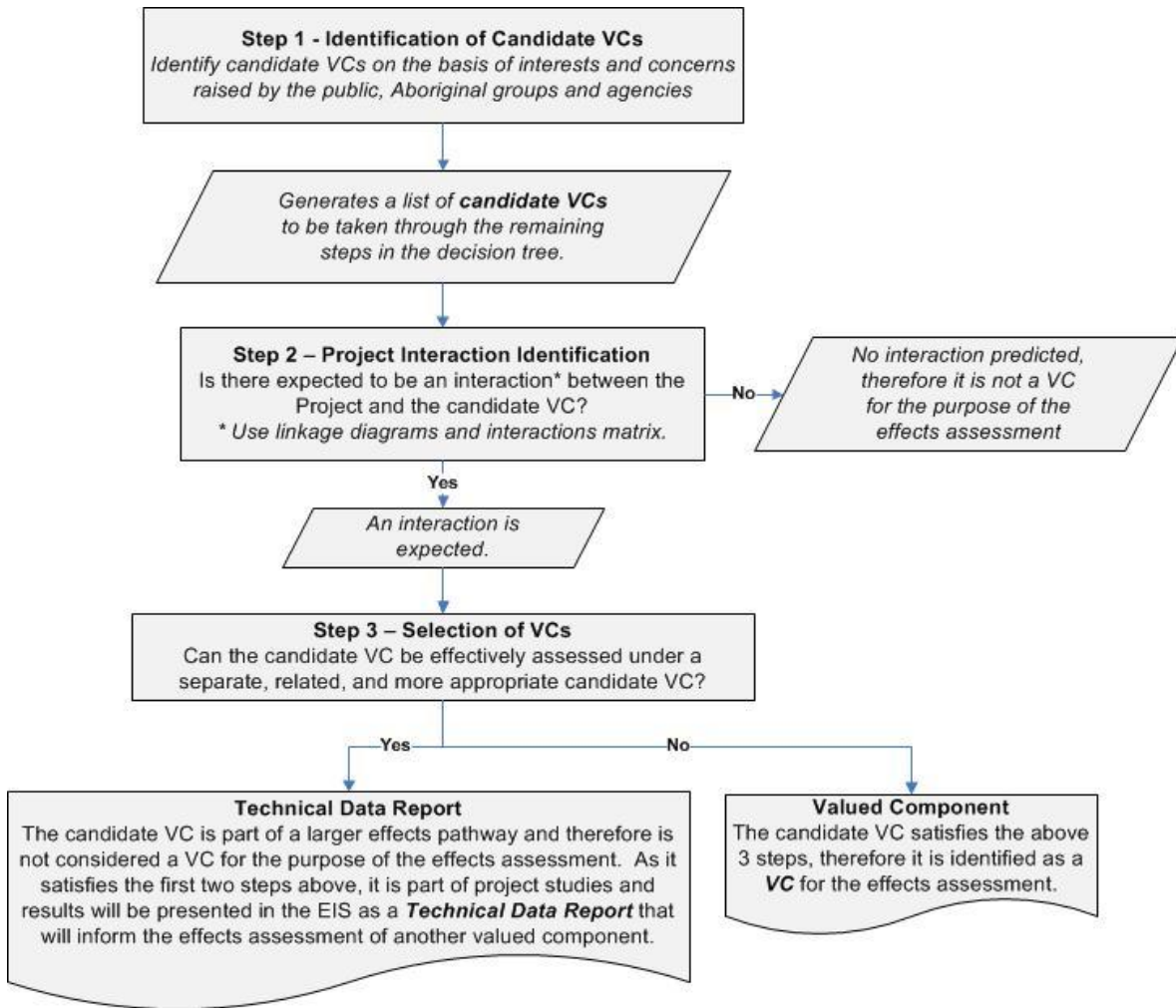
12 **8.3.1 Identification of Candidate Valued Components – Step 1**

13 The EIS will describe, as Step 1, the process for identification of candidate-valued
14 components (“candidate VCs”). Candidate VCs will be selected based on interests and
15 concerns raised by the public and Aboriginal groups prior to the submission of the EIS, and
16 input obtained during consultation with the public, government agencies and Aboriginal
17 groups leading up to submission of the EIS to the Agency and the BCEAO. In doing so, the
18 Proponent will seek to identify those components that are valued:

- 19 • For environmental, economic, social, heritage or human health reasons
- 20 • As land or resources currently used by Aboriginal persons for traditional purposes

21 Identification of candidate VCs will include the following:

- 22 • Interests and concerns raised by Aboriginal groups
- 23 • Interests and concerns raised by the public
- 24 • Regulatory status
- 25 • Protected status
- 26 • Preservation of biodiversity
- 27 • Rarity or special status
- 28 • Sensitivity to disturbance or pollution
- 29 • Important ecological role
- 30 • Transboundary Issue
- 31 • Human Health



1
 2 **Figure 8.2 Decision process for the selection of valued components**

3 **8.3.2 Project Interaction Identification – Step 2**

4 The EIS will describe how the candidate VCs will be evaluated to identify whether there is
 5 an interaction, a cause-and-effect pathway, linking the candidate VC to the Project in Step
 6 2. The approach for determining potential project interactions involved the following steps:

- 7
- 8 • Identify project components and activities
 - 9 • Map project activity zones temporally and spatially
 - 10 • Locate the candidate VC temporally and spatially
 - 11 • Identify potential interactions between the candidate VC and project components or activities

12 In the EIS the Proponent proposes to, identify, rank and present the interactions between
 13 the project components and each of the candidate VCs in the format shown in Table 8.1.

14 Potential interactions will be ranked as follows:

- 1 • A rank of “0” will be given where no interaction is predicted between a project
- 2 component and a candidate VC
- 3 • A rank of “1” will be given where an adverse effect may result from an interaction,
- 4 but standard measures to avoid or minimize the potential effect are available and
- 5 well understood to be effective, and any residual effects are negligible
- 6 • A rank of "2" will be given where interactions may result in an adverse effect and
- 7 mitigation measures are not well understood to be effective

8 Candidate VCs subject to an interaction ranked “2” will be carried forward into Step 3 of the
 9 VC selection process.

10 **Table 8.1 Example of an interactions matrix used to screen project interactions**

Select Project Components, Sub-Components and Associated Activities	Select Valued Components													
	Fish and Fish Habitat	Vegetation and Plant Communities	Wildlife Resources	Local Government Revenue	Labour Market	Current Use of Lands and Resources for Traditional Purposes	Agriculture	Forestry	Harvest of Fish and Wildlife Resources	Housing	Transportation	Community Infrastructure and Services	Human Health	Heritage Resources
Construction														
Earthfill Dam and Generating Facility														
<i>Site preparation</i>														
- clearing, grubbing and stripping														
<i>Fuel storage and refuelling sites</i>														
- filling of fuel tanks														
- filling of fuel trucks														
Operations														
Transmission Line to Peace Canyon														
<i>Right-of-Way vegetation maintenance</i>														

11

12 **8.3.3 Selection of Valued Components – Step 3**

13 Step 3 is a determination as to whether the effect of an interaction on each candidate VC
 14 carried through to this point in the selection process can be effectively assessed under a
 15 separate and related, but more appropriate, candidate VC.

16 A key consideration in determining whether a more appropriate candidate VC exists is
 17 whether, given the nature of the candidate VC, it falls within the same effects pathway as
 18 another candidate VC. An example of an effects pathway is: the burning of project-related
 19 woody debris, which may in turn lead to deterioration in “air quality”, which may in turn
 20 ultimately contribute to an adverse effect on human health. In this example, parameters of

1 “air quality” will be identified, measured and reported. This data will be used to assess the
 2 potential impact of the Project on the human health VC.
 3 The candidate VCs that are not rejected in Steps 1, 2 and 3, and that cannot be effectively
 4 assessed under another VC will be taken forward through the effects assessment.
 5 Not all candidate VCs will be carried forward through the effects assessment. However,
 6 technical data collected for these candidate VCs will be taken into account in the
 7 assessment of potential effects on the VCs that are carried through.

8 **8.4 Assessment Boundaries**

9 **8.4.1 Spatial Boundaries**

10

11 The EIS will describe the spatial boundaries within which each of the potential adverse
 12 effects of the Project will be assessed.

13 The Proponent has proposed specific spatial boundaries throughout the draft EIS
 14 Guidelines. The federal government and the BC Environmental Assessment Office are
 15 seeking input from the public on the proposed spatial boundaries before finalizing the EIS
 16 Guidelines.

17 The spatial boundaries will be presented as described in the spatial boundary tables in the
 18 VC specific effects assessment sections in these EIS Guidelines. Spatial boundaries will
 19 also describe the relevant administrative and technical boundaries, where applicable.

20 These spatial boundaries will be defined based on applicable discipline guidance
 21 documents (e.g., BCMOE 2008, BCOGC 2009). Spatial boundaries descriptors are listed in
 22 Table 8.2.

23 **Table 8.2 Spatial boundary descriptors**

Spatial Boundary	Details of Spatial Boundary
Technical study area	This is the physical extent of the data collection program, or the physical boundaries for the technical modelling program.
Project activity zone	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
Local Assessment Area	The Local Assessment Area, or LAA, is the area within which the potential adverse effects of the Project will be assessed.
Regional Assessment Area	The Regional Assessment Area, or RAA, is the area within which projects and activities, the residual effects of which may combine with residual effects of the Project, will be identified and taken into account in the cumulative effects assessment.

1 **8.4.2 Temporal Boundaries**

2 The EIS will present the rationale for the temporal boundaries to be used to assess
3 potential adverse effects of the Project relevant to each VC.

4 **8.5 Effects Assessment Methods**

5 The EIS will describe the methods used to assess potential adverse effects on VCs as
6 described below.

7 **8.5.1 Baseline Conditions**

8 In the EIS, baseline conditions will be described, as follows:

- 9 ▪ identify relevant legal framework (e.g., *Fisheries Act*)
- 10 ▪ explain the methods used to collect the baseline data
- 11 ▪ identify sources of information
- 12 ▪ explain the extent to which information has been obtained from the public and has
13 been considered
- 14 ▪ explain the extent to which Aboriginal traditional knowledge has been obtained and
15 has been considered
- 16 ▪ provide an overall baseline description

17 **8.5.2 Analysis of Effects**

18 For each VC carried through the effects assessment, the EIS will identify, describe and
19 present an analysis of each of the potential adverse effects resulting from the Project.

20 In the EIS, for each VC, the information outlined in Sections 10 to 19 of these EIS
21 Guidelines will be presented.

22 **8.5.2.1 Description of Potential Adverse Effects on Valued Components**

23 For each VC carried through the assessment process, potential adverse effects on the VCs
24 will be described, including:

- 25 ▪ cause-and-effect pathway, the mechanism by which the Project may result in each
26 potential adverse effect
- 27 ▪ quantitative and qualitative parameters by which each potential adverse effect will
28 be characterized

29 **8.5.2.2 Identification of Mitigation Measures**

30 The EIS will describe the technically and economically feasible measures that the
31 Proponent is proposing to mitigate any potentially significant adverse effects of the Project.

32 **8.5.2.3 Characterizing Residual Effects**

33 Residual adverse effects are the effects of the Project that may remain after taking into
34 account the implementation of mitigation measures. The criteria listed in Table 8.3 will be

1 used to characterize any beneficial effects and any residual adverse effects that may result
 2 from the Project.

3 Where possible, these criteria will be described quantitatively for each VC. When residual
 4 effects cannot be characterized quantitatively, they will be characterized qualitatively.

5 Definitions will be provided when qualitative terms are used. For each VC, the
 6 characterization criteria provided in Table 8.3 will be defined in specific terms in the EIS.

7 **Table 8.3 Residual effects characterization**

Criteria	Description
Direction	This refers to the ultimate long-term trend of the environmental, social, economic, heritage, or health effect (e.g., increase, decrease, or neutral).
Magnitude	This refers to the amount of change in a key indicator or variable relative to baseline case (low, moderate, high), consideration is given to factors such as the uniqueness of the effect, and the comparison to natural or background variation.
Geographic Extent	This refers to the geographic area in which an environmental, social, economic, heritage, or health effect of a defined magnitude occurs (site-specific, local, regional, provincial, national, international).
Duration	The period of time required until the valued component returns to its baseline condition, or the effect can no longer be measured or otherwise perceived (short term, medium term, long term, permanent).
Frequency	The number of times during a project or a specific project phase that an environmental, economic, social, heritage, or health effect may occur (e.g., once, daily, weekly, monthly, continuous).
Reversibility	This refers to the degree or likelihood to which existing baseline conditions can be regained after the factors causing the effect are removed. Effects can be reversible or irreversible.
Context	This refers to the ability of the environment to accept change. For example, the effects of a project may have an impact if they occur in areas that are ecologically sensitive, with little resilience to imposed stresses.
Ecological Context	The adverse environmental effects may be significant if they occur in areas or regions that: <ul style="list-style-type: none"> - Have already been adversely affected by human activities; and/or - Are ecologically fragile and have little resilience and have little resistance to imposed stressed
Level of Confidence	This is an evaluation of the scientific certainty one has in the review of project specific data, relevant literature, and professional opinion; the EIS will include a statement on the level of confidence in the assessment of direction, magnitude, extent, duration, frequency and reversibility
Probability	The likelihood that an adverse effect will occur (e.g., low, high or unknown).

8 **8.5.2.4 Significance of Residual Effects**

9 In the EIS, the Proponent will provide its assessment of the significance of any residual
 10 adverse effects and its rationale for that determination. The determination will incorporate
 11 the federal and provincial guidance (e.g., Agency 1999, FEARO 1994). The EIS will contain
 12 a summary of residual effects in a table format as shown below (Table 8.4).

1 **Table 8.4 Summary of assessment of potential significant residual adverse effects**

Valued Component	Project Phase	Potential Adverse Effects	Key Mitigation Measures	Significance Analysis of Residual Effects
VC#1				
VC#2				

2 **8.5.3 Cumulative Effects Assessment**

3 The EIS will provide an assessment of the cumulative effects that are likely to result from
 4 the Project in combination with other projects or activities that have been or will be carried
 5 out. Federal and provincial guidance will be consulted (e.g., Agency 2007c, BCEAO 2010,
 6 Hegmann et al. 1999).

7 A cumulative effects assessment of the Project on a VC will be conducted if the potential
 8 residual adverse effect of the Project on that VC has a spatial and temporal overlap with a
 9 residual effect of another project.

10 The EIS will describe the cumulative effects assessment methodology, which will follow the
 11 method outlined above for the project-specific VC effects assessment, and will include the
 12 following steps:

- 13 • Determination of spatial and temporal boundaries
- 14 • Consideration of other projects and activities and identification of project interactions
- 15 • Description of cumulative effects
- 16 • Identification of mitigation measures
- 17 • Characterization of cumulative residual effects
- 18 • Determination of significance of cumulative residual effects

19 **8.5.3.1 Spatial and Temporal Boundaries**

20 Cumulative effects will be assessed within an RAA as proposed by the Proponent defined
 21 for each VC. The spatial boundaries of the RAA will be based on:

- 22 • where possible interactions with other projects or activities overlap
- 23 • for ecological boundaries, they will be ecologically defensible (e.g., wildlife range
 24 boundaries)

25 The adequacy of data will be assessed in terms relevant to the purpose of the cumulative
 26 effects assessment.

27 The Proponent has proposed the following approach to cumulative effects assessment. The
 28 federal government and the BC Environmental Assessment Office are seeking input from
 29 the public on the proposed approach to cumulative effects assessment before the EIS
 30 Guidelines are finalized.

31

1 To assess the cumulative effects that are likely to result from the Project in combination
2 with other projects or activities that have been or will be carried out, the Proponent will
3 present the following in the EIS:

4 **Baseline Case:** The Baseline Case will demonstrate the current status of the VC. In doing
5 so, it will reflect the effect of all projects and activities that have been carried out.

6 **Future Case without the Project:** To identify the potential adverse effects of projects and
7 activities that will be carried out, the Future Case without the Project will be developed to
8 predict the status of the VC by taking into account the Baseline Case and projects and
9 activities that are at least as foreseeable as the Project. This will demonstrate the potential
10 residual effects of projects and activities that have been and will be carried out.

11 **Project Case:** To demonstrate the cumulative effects that are likely to result from the
12 Project, the Project Case will demonstrate the status of the VC, taking into account the
13 residual effects of the Project that are likely combined with those identified in the Future
14 Case without the Project.

15 **8.5.3.2 The Project Inclusion List**

16 The Proponent is proposing the following types of projects and activities within the RAA as
17 proposed by the Proponent will be taken into account in the Future Case without the Project
18 and in the Project Case:

- 19 • Registered active projects on the BCEAO and CEA Agency website, including
20 hydroelectric projects, such as Dunvegan
- 21 • Registered oil and gas applications
- 22 • Registered water licence applications
- 23 • Projects or activities associated with existing or “accepted” applications for land
24 tenure under the *Land Act* (e.g., range tenures, grazing licenses, wind, gravel)
- 25 • Currently harvest plans associated with tenured forest operations and timber sales
- 26 • Official Community Plans, and parks and recreation plans
- 27 • Large waste discharges into the watershed

28 The EIS will provide an assessment of the adequacy of existing data in conducting the
29 cumulative effects assessment.

30 The project-interaction methodology used to determine project interactions for the project-
31 specific effects assessment (shown in Section 8.3.2) will be used to identify interactions
32 with other projects and activities.

33 The EIS will provide maps that show the projects and activities that overlap with the Project
34 for each residual effect.

35 **8.5.3.3 Analysis of Cumulative Effects**

36 **Description of Potential Cumulative Effects on VCs**

37 The EIS will describe the potential cumulative effects on VCs, including the following:

- 1 • Overview of the project or activity
- 2 • Status of Project or activity
- 3 • Spatial and temporal boundary
- 4 • Potential residual cumulative effects

5 **Identification of Cumulative Effects Mitigation Measures**

6 If cumulative effects are identified, the EIS will recommend possible regional approaches to
7 mitigation.

8 **Characterizing Residual Cumulative Effect**

9 The EIS will characterize the residual cumulative effects using the approach outlined for the
10 Project-specific effects assessment described in Section 8.5.2 and the criteria provided in
11 Table 8.3.

12 **Significance of Residual Cumulative Effects**

13 In the EIS, the Proponent will provide its assessment of the significance of any residual
14 adverse cumulative effect that may result from the Project, in combination with other
15 projects, and the rationale for its assessment.

16 **8.6 References**

17 This subsection will include a list of supporting references used in this section of the EIS.

18

19 **9 ENVIRONMENTAL BACKGROUND**

20 As further described below, the EIS will describe:

- 21 • The state of land, water and air in the vicinity of the project
- 22 • Certain changes to land, water and air based on predictive analyses

23 **9.1 Land**

24 **9.1.1 Geology, Terrain and Soils**

25 The EIS will describe the physiographic and topographic setting and the stability of the
26 terrain within the project activity zone.

27 The EIS will contain a description of bedrock and surficial geology, key landforms (such as
28 mountains, uplands, slopes, terraces and streams), existing and predicted changes to
29 seismic conditions, and geotechnical and geochemical processes (such as erosion, slope
30 stability and acid rock drainage) that may affect land or resource use. This will include:

- 31 • regional bedrock and surficial geology, terrain stability and soil conditions, including
32 an interpreted geological history of valley formation and landsliding

- 1 • regional seismicity and seismic hazard
- 2 • pertinent physical and chemical properties of soils and bedrock and potential for
3 contaminants based on current and historic land uses
- 4 • relevant geologic structures such as lineaments, faults and joints
- 5 The EIS will describe the geochemical characterization program for acid rock drainage and
6 metal leaching potential that has been undertaken for the overburden and rock materials
7 that will be excavated, exposed or disturbed at the dam site and at off-site materials
8 sources.
- 9 The studies described in the EIS will conform to the requirements of:
- 10 • Policy for Metal Leaching and Acid Rock Drainage at Minesites in British Columbia
- 11 • Guidelines for Metal Leaching and Acid Rock Drainage at Minesites in British
12 Columbia
- 13 • Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials
- 14 The EIS will:
- 15 • describe the regional geology and the local geology relative to acid rock drainage
16 and metal leaching potential
- 17 • identify the geologic units that will be excavated, exposed or disturbed
- 18 • describe the collection of representative samples of the geologic unit
- 19 • present the results of static tests (one time tests to determine the balance of acid
20 generating versus acid neutralizing components of the geologic units)
- 21 • present the results of kinetic tests (laboratory and field temporal tests to determine
22 the primary rates of acid generation versus acid neutralization, and the time to the
23 on-set of acid rock drainage)
- 24 • define management units (dependent on geological, geochemical and engineering
25 factors)
- 26 • predict drainage chemistry through time for each management unit
- 27 The Acid Rock Drainage Management Plan will outline:
- 28 • the management measures to mitigate acid rock drainage and metal leaching to
29 reduce risks to water quality, with the recognition and understanding that the site
30 geochemical characterization and the management plan will be updated as new
31 information/results are subsequently obtained, through a systematic testing program
32 during construction
- 33 • describe the requirements for post construction monitoring
- 34 Characterization and classification of the proposed reservoir shoreline will be carried out,
35 including:
- 36 • description of the geology at select representative cross-sections and extrapolation
37 along the shoreline using borehole and surface mapping observations to produce
38 geological fence diagrams

- 1 • descriptions of geological materials and/or thickness of colluvium and a description
2 of the underlying geological materials located at the normal maximum reservoir level
 - 3 • inventory of landslides, including their estimated mechanism, volume and current
4 degree of activity
 - 5 • site-specific characterization of significant historic and pre-historic landslides based
6 on the results of surface mapping, geotechnical drilling, instrumentation monitoring,
7 and slope stability analyses, where available
 - 8 • predictions of potential for groundwater changes, including sensitivity to changes in
9 recharge rates and other aquifer characteristics, that could alter the potential for
10 landslides
 - 11 • classification of the erosion and landslide potential of the reservoir shoreline
12 materials (including tributaries) under current and proposed reservoir conditions
 - 13 • estimation of short and long-term beach profiles (physical changes associated with
14 erosion due to wind generated waves) for reservoir operation periods up to 100
15 years
 - 16 • physical and numerical modelling of waves that could potentially be generated by
17 landslides into the reservoir
- 18 Predicted changes to shoreline erosion and slope stability due to the Project will be
19 assessed based on the results of shoreline classification. A series of reservoir impact lines
20 will be prepared to delineate areas where limitations on residential land use or other
21 measures may be required to manage public safety.
- 22 Sources of information regarding geology and terrain stability conditions within the technical
23 study area will include:
- 24 • Historical aerial photographs, ortho-photographs and satellite imagery
 - 25 • Published topographic maps
 - 26 • Published studies, maps and academic research on regional bedrock and surficial
27 geology and engineering geology
 - 28 • Topography and digital elevation models generated from aerial photography and
29 from LiDAR
 - 30 • Published studies and academic research on landslides within the region, a detailed
31 landslide inventory within the proposed reservoir area, and relevant landslide case
32 histories
 - 33 • Historical and recent geotechnical investigations (mapping, drilling, test pits,
34 material classification, testing, instrumentation monitoring and other techniques)
- 35 The EIS will describe a regional and site-specific seismic hazard assessment, which will
36 include:
- 37 • the studies done to assess the seismic hazard at Site C, which will incorporate
38 current understanding of regional plate tectonics and seismotectonics including
39 known and inferred faults, the earthquake recurrence rates, and the maximum

- 1 earthquake magnitudes considered possible in each potential earthquake source
2 zone
- 3 • the qualifications of the seismic experts who conducted and reviewed the studies
 - 4 • the seismic design criteria selected for the project and compare them to the
5 guidelines suggested by the Canadian Dam Association and other relevant
6 guidelines or codes
 - 7 • the potential for seismicity induced by reservoir filling
 - 8 • the potential for seiches and tsunamis
 - 9 • current understanding of how fracking or other petroleum industry related activities
10 may affect seismicity
 - 11 • ongoing seismic monitoring during operation

12 **9.1.2 Land Status, Tenure, and Project Requirements**

13 The EIS will:

- 14 • Identify land ownership by area of private, the Proponent owned, and Crown land
15 within the Project activity zones
- 16 • Provide a summary of land tenure within the Project activity zones, with potential
17 effects to tenured areas or activities to be assessed in accordance with Section 16
18 Land and Resource use
- 19 • Provide maps illustrating the ownership, tenure and land management areas with
20 the Project activity zone
- 21 • Describe the requirements to acquire or obtain new rights over private or
22 government owned property to construct and operate the Project
- 23 • Describe the approach for acquiring private property and rights to Crown land

24 **9.2 Water**

25 **9.2.1 Surface Water Regime**

26 The EIS will describe existing surface water hydrology conditions in the Peace River. The
27 Proponent proposes that the spatial boundary would be from Peace Canyon Dam
28 downstream to Peace Point, Alberta.

29 The EIS will describe existing surface hydrological features (reservoirs, rivers, tributaries),
30 watershed boundaries, mean annual flows, and flood zones. The Proponent proposes that
31 the spatial boundary would be from the Peace River down to Peace Point, Alberta, and the
32 main drainage tributaries to the proposed reservoir (Lynx Creek, Farrell Creek, Halfway
33 River, Moberly River).

34 The EIS will describe in detail the hydraulic models that will be used to predict the potential
35 changes in the hydrological regime as a result of the Project.

36 The EIS will describe the following information for each model used:

- 37 • input parameters and assumptions

- 1 • outputs provided by the model
 - 2 • basis of the model methodology
 - 3 • the level of confidence
 - 4 • purpose for the model
- 5 Models, as well as additional quantitative and qualitative assessment methods as required,
 6 will be used to describe:
- 7 • the proposed reservoir (volume, bathymetry, maximum and minimum surface areas,
 8 active storage volume, and residence time)
 - 9 • anticipated changes in the hydraulic regime during construction (e.g.,
 10 channelization, diversion, reservoir filling, and commissioning), including predicted
 11 ranges of water levels with inundation mapping for the construction headpond
 12 during channelization and diversion phases
 - 13 • seasonal flow patterns of post-construction flows, water levels, wetted widths, and
 14 average cross-sectional velocity statistics at selected locations on the Peace River
 15 downstream of the proposed dam to Peace Point, Alberta
 - 16 • expected frequency and range of water levels for the project reservoir

17 **Table 9.1 The Proponent proposes to use the following hydraulic models to predict**
 18 **potential changes in surface water hydrology**

Model Name	Use	General Description and Purpose
HYSIM (**)	Operational water management	Model simulates BC Hydro generation system operations, and produces a Peace River hydrology on a monthly time-step, based on a 60-year historical stream flow sequence.
Generalized Optimization Model (**)	Operational water management	Model optimizes value of BC Hydro system operations subject to existing operating constraints. Model provides simulated Peace River generation operations for specific operating scenarios and produces, for a range of inflow years, reservoir levels and downstream water discharge on an hourly time step.
MIKE11	Construction water management for downstream flow	One-dimensional hydraulic model to characterize changes in flow volumes, velocities, and river elevations at specific locations within the river during the construction phase and downstream of the project dam during operations.
Telemac2D and River2D	Construction water management for downstream flow and side channel habitat	Two-dimensional models to provide greater detail than MIKE11 of potential changes to flow volumes, velocities, and river elevations within the river during construction and for site specific studies during operations.
Flow 3D	Construction water management for downstream flow and engineering design	Three-dimensional model to characterize the hydraulic regime during various phases of construction and operation in the immediate vicinity of the dam.

H3D (++)	Operational water management for reservoir conditions	A proprietary three-dimensional hydrodynamic circulation model of the proposed reservoir, used primarily to characterize potential future changes to water temperature, ice, sediment transport, and morphological changes in the reservoir.
Notes: Proprietary Models – (**) BC Hydro; (++) EBA Consulting Ltd.		

1 A representative flow record will be used to assess hydrological conditions during
 2 construction and operation phases.

3 **9.2.2 Water Quality**

4 The EIS will describe existing water quality conditions in the Peace River and its tributaries.
 5 The Proponent proposes the spatial boundaries to be from Williston Reservoir to Alces
 6 River, Alberta. The location of public surface drinking water sources will be identified. Water
 7 quality parameters recorded during baseline studies (including but not limited to nutrient
 8 and metals concentrations, suspended sediment levels, dissolved gas pressure levels, pH,
 9 alkalinity, temperature) will be summarized and compared with provincial and federal
 10 guidelines, including:

- 11 • British Columbia Approved Water Quality Guidelines for freshwater aquatic life,
 12 drinking water supply, wildlife water supply, recreation and aesthetics, irrigation, and
 13 livestock water supply, as applicable (BCMOE 2010a)
- 14 • Canadian Water Quality Guidelines for the protection of freshwater aquatic life and
 15 agricultural water uses, and recreational water quality and aesthetics (CCME 2011a)

16 The EIS will include a description of sediment quality in the Peace River. Sediment data
 17 from the proposed reservoir will be summarized and compared with provincial and federal
 18 guidelines (CCME 2011b).

19 **9.2.3 Groundwater Regime**

20 The EIS will contain a description of the following existing conditions and potential changes
 21 to the groundwater regime. The Proponent proposes the spatial boundary to be from Peace
 22 Canyon Dam to the proposed Site C dam site:

- 23 • location of water wells, infrastructure, contamination, and land use that could be
 24 affected by changes to the groundwater regime
- 25 • development of a series of two-dimensional cross-sections at representative
 26 reservoir locations where reservoir filling could affect slope stability, land or resource
 27 use
- 28 • in the cross-sections, subsurface geology, aquifers and water table positions will be
 29 estimated for the baseline and reservoir conditions. Estimates will be based on a
 30 literature review, surface mapping, historic and recent geotechnical drilling, water
 31 well data, instrumentation monitoring results installed for the project, aquifer tests
 32 (specifically single well rising and falling head tests), lab testing and two-
 33 dimensional numerical groundwater flow results

- 1 • qualitative extrapolation of the results of the two-dimensional cross-sections to lands
2 nearby and adjacent to the reservoir using shoreline classification, geological fence
3 diagrams and other available relevant hydrogeological information along the
4 reservoir
- 5 • the potential adverse effects of project construction and operations on groundwater
6 quality will be evaluated qualitatively by assessing the potential changes to
7 groundwater chemistry due to the release of substances related to non-natural
8 sources (known or potential contamination) or natural sources (geologic materials)

9 **9.2.4 Thermal and Ice Regime**

10 The EIS will include a description of the existing water temperature and ice regimes of the
11 Peace River. Technical study areas for reservoir and river locations are described below.
12 This section of the EIS will support a description of the anticipated predictive changes in
13 these parameters related to the Project.

14 **Reservoir**

15 The water temperature and ice regimes of the proposed reservoir will be predicted. The
16 Proponent proposes using H3D, a three-dimensional numerical model (Stronach et al.
17 1993). The Proponent proposes the spatial boundary for the technical study area for
18 thermal and ice regimes in the reservoir to be from the tailrace of the Peace Canyon Dam
19 to the proposed Site C dam. The Proponent proposes the study period will extend from
20 1995 to 2011, the period for which the data set is available for analysis. These years will be
21 used to simulate post-construction conditions. A description of the model, calibration and
22 validation methods and predicted water temperature and ice characteristics of the proposed
23 reservoir will be provided.

24 **Downstream Temperature**

25 Potential changes to downstream water temperature will be described in the EIS. The
26 Proponent proposes the spatial boundary to be to the confluence of the Alces River with the
27 Peace River (approximately 60 km downstream).

28 The Proponent proposes to conduct analysis using a two-dimensional cross-sectionally
29 averaged hydrodynamic and water quality model (CE-QUAL W2). This model is being used
30 primarily for the purpose of examining aquatic productivity. The CE-QUAL W2 model
31 simulates basic eutrophication processes such as temperature-nutrient-algae-dissolved
32 oxygen-organic matter and sediment relationships (Portland State University, 2011). The
33 Proponent proposes that changes to water temperature due to Site C will be negligible at
34 Alces River; however, if warranted, the downstream extent of the assessment will be
35 extended to capture the entire extent of Project influence.

36 **Downstream Ice**

37 Existing and post-construction ice conditions in the Peace River will be studied. The
38 Proponent proposes using the Comprehensive River Ice System Simulation Program model
39 (CRISSP), a one-dimensional numerical ice simulation model. The Proponent proposes the
40 technical study area for downstream ice conditions to extend from the proposed Site C dam
41 to a location over 700 km downstream near Fort Vermilion, Alberta. The Proponent's

1 proposed CRISSP model simulates ice processes in natural rivers, including water
2 temperature variation, young ice, anchor ice evolution, surface ice run, ice cover formation,
3 surface and undercover ice transport and jam, thermal growth and decay of ice, and
4 breakup (Clarkson University, 2005).

5 The EIS will describe the calibration, validation, and expected accuracy of the Proponent's
6 proposed CRISSP ice model.

7 The Proponent's proposed CRISSP model will be run using a representative range of
8 atmospheric conditions. Results will be compared to determine the potential change on the
9 following characteristics as a result of the Project:

- 10 • timing of ice cover formation and breakup
- 11 • maximum upstream extent of ice cover
- 12 • ice thickness
- 13 • river transportation

14 **9.2.5 Fluvial Geomorphology and Sediment Transport**

15 The EIS will present information regarding the existing conditions and predicted project-
16 related changes to fluvial geomorphology and sediment transport. The Proponent proposes
17 the spatial boundary to be the Peace River between the Peace Canyon Dam and Peace
18 Point, Alberta. The Proponent proposes the reservoir technical study area to extend from
19 the Peace Canyon Dam to the proposed Site C Dam location. The Proponent proposes the
20 downstream technical study area to extend from Site C to Peace Point, Alberta.

21 The fluvial geomorphology and sediment transport investigations will characterize baseline
22 conditions of the following parameters:

- 23 • Suspended sediment characteristics and transport rates in the Peace River and
24 tributaries in the reservoir technical study area and in the downstream technical
25 study area within the anticipated extent of Project-related effects as determined from
26 existing information
- 27 • Bed material characteristics and bedload transport rates in the Peace River and
28 tributaries in the reservoir technical study area and in the downstream technical
29 study area within the anticipated extent of Project-related effects as determined from
30 existing information
- 31 • Historical locations, patterns, and rates of channel erosion and deposition in the
32 downstream technical study area

33 The sources of information reviewed will include:

- 34 • Channel mapping from remote sensing imagery (aerial photographs and satellite
35 imagery)
- 36 • Water Survey of Canada streamflow records
- 37 • Project streamflow, turbidity and suspended sediment records

- 1 • Project bed material sampling and bedload transport calculations
- 2 • Any other relevant information
- 3 The EIS will also present the results of predictive modelling, including a discussion of model
4 reliability, used to characterize the potential changes in fluvial geomorphology and sediment
5 transport and will consider the following:
- 6 • Suspended sediment dynamics (inflow, deposition and outflow) in the proposed
7 reservoir
- 8 • Suspended sediment concentrations and tributary sediment mixing in the Peace
9 River downstream of the proposed reservoir. The Proponent proposes the spatial
10 boundary to be to Peace Point, Alberta
- 11 • Bed material mobilization in the proposed Site C tailrace area
- 12 • Channel erosion and deposition downstream of proposed Site C dam site. The
13 Proponent proposes the spatial boundary to be to Peace Point, Alberta
- 14 The EIS will describe the approaches used for predictive analyses of these parameters.

15 **9.2.6 Methyl mercury**

16 The EIS will describe the approach used to determine the dynamics of mercury in the
17 environment and an understanding of the conversion of inorganic mercury to methyl
18 mercury. The Proponent proposes the spatial boundary to be from the reservoir creation
19 from the Peace Canyon Dam to the proposed Site C dam.

20 The Proponent proposes that existing conditions and an understanding of the methylation
21 process will be conducted by:

- 22 • Reviewing historic information within the Peace River system
- 23 • Collecting mercury and methyl mercury baseline data in the technical study area
- 24 • Reviewing other hydroelectric developments elsewhere in Canada that may pertain
25 to mercury

26 The EIS will summarize aquatic and terrestrial baseline information on mercury in
27 environmental media within the technical study area, and will consider mercury
28 concentrations within and downstream of the Site C reservoir. The Proponent proposes the
29 spatial boundary to be from the Site C reservoir to Many Islands, Alberta.

30 The EIS will also describe the methods used to develop a mechanistic model (RESMERC is
31 proposed by the Proponent) for the purpose of predicting mercury and methyl mercury
32 concentrations in water and biota (e.g., invertebrates, fish) over the life of the Site C
33 reservoir. This section of the EIS will summarize modelling results that will predict the rates
34 of mercury methylation and de-methylation, as well as transfer and bioaccumulation of
35 mercury through the food chain.

1 **9.3 Air**

2 **9.3.1 Micro-Climate**

3 The EIS will present information regarding the existing conditions and predicted project-
4 related changes to the microclimate. The Proponent proposes the spatial boundary to be
5 the Peace River valley and at the Fort St. John airport.

6 The Proponent proposes the microclimate technical study area to be defined by the results
7 of preliminary modelling that indicated the spatial extent of potential project changes to
8 meteorology and microclimate. This area the Proponent proposes is the segment of the
9 Peace River valley from upstream of Hudson’s Hope to downstream of Taylor, includes the
10 predicted extent of the reservoir, and includes the Fort St John airport. This length is
11 buffered by a rectangular shape with the edges between 10 to 20 km away from the
12 reservoir’s water surface.

13 The Proponent proposes to use the most current 30-year climate normals and hourly
14 meteorological observations, both from Fort St John Airport, to characterize baseline
15 climate conditions. For parameters not provided in standard climate normal format (e.g.,
16 absolute humidity), the hourly data for the 30-year period will be summarized in a format
17 consistent with the climate normals provided by Environment Canada. This will include the
18 following parameters:

- 19 • Temperature: Annual average, extreme minimum and maximum, daily average,
20 minimum and maximum by month
- 21 • Precipitation - Annual and monthly total precipitation
- 22 • Wind speed - Monthly and annual average, monthly extreme maximum
- 23 • Relative and absolute humidity - Monthly and annual average humidity
- 24 • Fog - Monthly and annual hours of potential fog

25 The climate monitoring network in the Peace River valley between Hudson’s Hope and
26 Taylor installed by the Proponent will be used to improve the understanding of micro-
27 climate parameters, including precipitation levels, wind speed and direction, air
28 temperature, barometric pressure, humidity, solar radiation, and heat flux.

29 The Proponent proposes to use the Weather Research and Forecast model to assess and
30 evaluate potential changes in microclimate due to the proposed reservoir. The Weather
31 Research and Forecast Model is a mesoscale numerical weather prediction system
32 designed to serve both operational forecasting and atmospheric research needs. It is
33 suitable for a broad spectrum of applications across scales ranging from metres to
34 thousands of kilometres. It allows practitioners the opportunity to conduct simulations
35 reflecting either real data or idealized configurations.

36 The EIS will describe the model, including a discussion of the level of confidence of the
37 predictions of the model, and its input and outputs. Inputs to the model that will be
38 described in the EIS include: meteorological data and geophysical inputs that define land
39 use category and terrain.

1 **9.3.2 Air Quality**

2 The EIS will present information regarding the existing conditions and predicted project-
3 related changes to air quality. The Proponent proposes the spatial boundary to be in the
4 Peace River valley associated with project activity zones. The air quality technical study
5 area encompasses all of the project activity zones and a rectangular spatial buffer that is
6 135 km by 100 km.

7 This section of the EIS will describe current ambient levels of the following:

- 8 • Nitrogen Oxides (NO_x)
- 9 • Sulphur Dioxide (SO₂)
- 10 • Carbon Monoxide (CO)
- 11 • Particulate Matter less than 10 microns (PM₁₀)
- 12 • Particulate Matter less than 2.5 microns (PM_{2.5})
- 13 • Other possible contaminants and emissions from the proposed project, as may be
14 identified

15 Baseline air quality conditions will be determined from ambient air quality data and emission
16 inventories. Ambient air quality monitors were installed for the Project to collect baseline
17 particulate matter (PM₁₀ and PM_{2.5}) data. Background ambient air quality data for other
18 contaminants will be obtained from the BC Ministry of Environment (BCMOE). The BCMOE
19 operates a network of ambient air quality monitoring stations in the province of British
20 Columbia. The closest ambient air quality monitoring stations to the potential Site C
21 reservoir that would be included in the baseline study are located at the Fort St. John North
22 Peace Cultural Centre, Taylor Townsite, and Taylor South Hill. Information on existing
23 emissions in the technical study area will also be obtained from BCMOE's 2000 provincial
24 emission inventory and from the National Pollutant Release Inventory.

25 This section of the EIS will describe the estimated air quality emissions during construction
26 activities. The emission estimation methodology will primarily adhere to the US
27 Environmental Protection Agency's Compilation of Air Pollutant Emission Factors guidelines
28 (US EPA 1995). The scope of the emission inventory will consider vehicles and equipment,
29 clearing and burning of vegetation and debris, extraction of construction materials from
30 quarries, gravel pits and borrow pits, material handling and processing, and fugitive
31 emissions from access roads.

32 **9.3.3 Noise and Vibration**

33 The EIS will present information regarding the existing conditions and predicted project-
34 related changes to noise and vibration. The Proponent proposes the spatial boundary to be
35 within the project activity zone, buffered by 1.5 km.

36 The EIS will summarize baseline noise conditions determined from noise monitoring at
37 identified receptor sites and through transportation studies.

38 Noise receptors will be identified in the vicinity of anticipated construction and operation
39 activities and along equipment movement corridors that are used by people and wildlife.
40 The criteria available from the BC Oil and Gas Commission guidance document (BCOGC

1 2009) and the Ministry of Transportation and Infrastructure will be considered for the
2 purposes of identifying noise effects.

3 Noise levels will be modelled for selected scenarios during construction and operations.
4 The Proponent proposes to use the CadnaA noise modelling prediction software (ISO
5 9613). The CadnaA modelling will include, where applicable, the topographic, temperature
6 and wind effects on noise propagation of transportation- and equipment-generated sound
7 emissions. The modelling will be conducted on the basis of sound power levels emitted by
8 equipment that are established using previous measurements, published literature or
9 manufacturer data.

10 The EIS will describe the evaluation of blasting vibration and "sound-induced" or airborne
11 vibration.

12 Airborne vibration will be estimated using Canadian and international standards for
13 calculation of vibration, including guidance from the Ontario Ministry of Environment NPC
14 119 and the US Office of Surface Mining and Reclamation.

15 **9.4 Electric and Magnetic Fields**

16 The EIS will describe the existing electric and magnetic fields associated with the existing
17 138 kV transmission lines, and will identify and evaluate the potential changes from
18 operational activities on these parameters.

19 The EIS will summarize baseline conditions based on measurements of electric and
20 magnetic field levels associated with the existing sources. It will describe the modelling
21 approach and results used to predict electric and magnetic fields associated with existing
22 sources and potential changes associated with the Project.

23 **9.5 References**

24 This subsection will include a list of supporting references used in this section of the EIS.

25 **10 FISH AND FISH HABITAT EFFECTS ASSESSMENT**

26 The EIS will summarize the effects assessment on the aquatic environment based on the
27 methodology described in Section 8, including characterization of the benefits of the
28 Project.

29 Technical data will inform the fish and fish habitat effects assessment. The interests of
30 Aboriginal groups will be presented in the EIS in accordance with Section 15 and Section
31 20 of these EIS Guidelines. Where Aboriginal groups have identified interests in a VC, The
32 Proponent will incorporate Aboriginal traditional and local knowledge studies as made
33 available.

34 **10.1 Valued Component Scoping and Rationale**

35 The fish and fish habitat VC rationale for selection is described in Table 10.1. Fish and fish
36 habitat has the potential to interact with the Project and there is a legal requirement to
37 address potential effects on fish and fish habitat under the *Fisheries Act*.

1 **Table 10.1 Fish and fish habitat valued component rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Fish and Fish Habitat	Construction and operation activities, water impoundment, flow management and permanent infrastructure will result in a change to fish and fish habitat	Subsistence, and cultural reasons; Exercise of asserted or established Aboriginal rights and treaty rights	Food fisheries, recreation, health of aquatic ecosystems, fish habitat and fish populations; Biodiversity	<i>Fisheries Act</i> Sections 20, 22, 30, 32, 35 and 36; Provincial water quality guidelines; Canadian water quality guidelines for the protection of aquatic life

2 **10.2 Fish and Fish Habitat**

3 **10.2.1 Fish and Fish Habitat Spatial Boundaries**

4 The Proponent proposes the LAA and RAA as described in Table 10.2.

5 **Table 10.2 Fish and fish habitat assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Fish and Fish Habitat	Peace River in the proposed reservoir area; Tributaries entering the proposed reservoir; The Peace River downstream of the proposed Site C dam to Many Islands, Alberta; Watercourses within the transmission line and roadway rights-of-way; Watercourses within the project activity zone (construction materials); Riparian areas	Peace River from Peace Canyon Dam, BC to Vermilion Chutes, AB, which is a distance of approximately 865 km

6 **10.2.2 Fish and Fish Habitat Temporal Boundaries**

7 The EIS will describe the temporal boundaries which will reflect the methodology described
 8 in Section 8 of these EIS Guidelines.

1 **10.2.3 Fish and Fish Habitat Baseline**

2 The fish and fish habitat baseline data will provide an understanding of the existing fish
3 community, distribution, movement and life history parameters of species populations, fish
4 habitat characteristics, biological assemblages, water quality, and production of aquatic
5 invertebrates that support fish populations in the Peace River and its tributaries in the LAA
6 as proposed by the Proponent. Aquatic conditions in the proposed reservoir and
7 downstream of the dam site will be assessed using a predictive modelling approach. Data
8 will be collected for the following key indicators.

- 9 • Fish species including identification of species composition, distribution, relative
10 abundance, stock structure, migration and movement patterns, and general life history
11 parameters (including spawning periods) in the LAA. Fish communities will also be
12 described.
- 13 • Fish habitat use including an evaluation of the quality and quantity of fish habitats in the
14 LAA. Critical or sensitive areas such as spawning, rearing, and over-wintering habitats
15 and migration routes will be described and/or mapped. Seasonal variability of the
16 habitat will be considered. The criteria used in the evaluation process will be described.
- 17 • Changes in environmental factors in their environment (e.g., food, water temperature,
18 sediment transport)

19 The EIS will identify sensitive fish species or species of provincial or federal conservation
20 concern, including any species listed in the federal *Species at Risk Act* (SARA),
21 endangered fish species listed in the BCMOE's Endangered Species and Ecosystems,
22 Provincial Red and Blue Lists (BCMOE 2010b), and fish species of conservation or
23 ceremonial concern identified by Aboriginal groups. The principles of the BC Conservation
24 Framework will be applied.

25 Information used to describe baseline conditions and predictive analyses will consist of:

- 26 • Traditional land use studies or traditional knowledge made available to the
27 Proponent by Aboriginal groups
- 28 • Peace River and tributaries fish and fish habitat inventories
- 29 • Peace River radio telemetry studies
- 30 • Peace River microchemistry-genetics studies
- 31 • Peace River water quality studies
- 32 • Peace River baseline aquatic productivity studies
- 33 • Site C aquatic productivity modelling, consisting of:
- 34 ○ Multivariate statistical approaches to estimate changes in primary and
35 secondary production based on field data and habitat variables
- 36 ○ The Proponent proposes to use predictive computer modelling using the CE-
37 QUAL W2 software package originally developed by the US Corps of
38 Engineers for simulating conditions in reservoirs and associated influent and

- 1 effluent streams to simulate physical and chemical conditions, and primary
2 production
- 3 ○ The Proponent proposes to use ECOPATH (Christensen and Walters 2004),
4 a steady state model that provides a biological mass balance of an
5 ecosystem
- 6 ○ Peace River mercury studies and modelling

7 **10.2.4 Potential Effects of the Project and Proposed Mitigation**

8 The EIS will assess how the Project has the potential to adversely affect fish populations.

9 The potential to adversely affect fish and fish habitat will be assessed by taking into account
10 the potential for the Project to result in changes to the following key aspects of fish and fish
11 habitat:

- 12 ● Habitat changes created by the reservoir in the mainstem and affected tributaries as
13 well as upstream and downstream of the dam due to flow alterations
- 14 ● Upstream and downstream fish migrations by species and life history stage and
15 their potential to be affected by the Project
- 16 ● Fish mortality
- 17 ● Potential impacts on the genetic diversity of fish populations above and below the
18 project site
- 19 ● Potential impacts to predator-prey interactions and expected changes
- 20 ● Potential impacts to food web composition and structure
- 21 ● Potential impacts of gas pressure on fish resulting from water discharge over the
22 structure

23 Should potential adverse effects be identified, the potential mitigation and benefit
24 enhancement measures will be identified and will include a description of how the mitigation
25 measures can address the potential adverse effect on fish and fish habitat and any
26 mitigation options being considered to minimize the impacts of the project on fish passage.

27 The EIS will identify and describe the aquatic and riparian habitat expected to be harmfully
28 altered, disrupted or destroyed by the project. Proposed mitigation and compensation
29 measures to offset loss in a productive capacity of fish habitat during construction and
30 operation of the project will be discussed in relation to DFOs National Policy For the
31 Management of Fish Habitat “No Net Loss” Guiding Principle. The EIS will provide a Fish
32 Habitat Mitigation and Compensation Plan with sufficient detail to demonstrate that no net
33 loss of productive capacity of fish habitat can be achieved and that identifies measures that
34 are technically, economically and biologically feasible.

35 The EIS will describe follow up and monitoring plans to determine the effectiveness of
36 measures to mitigate or compensate for the adverse environmental effects of the project.

1 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 2 residual effects characterization described in Table 8.3. A statement of significance will be
 3 provided.

4 **10.2.5 Summary of Residual Effects on Fish and Fish Habitat**

5 The EIS will summarize residual effects in a table format as shown in Table 8.4.

6 **10.3 References**

7 This subsection will include a list of supporting references used in this section of the EIS.

8 **11 VEGETATION AND ECOLOGICAL COMMUNITIES**
 9 **EFFECTS ASSESSMENT**

10 The EIS will summarize the vegetation and ecological communities' effects. The Proponent
 11 proposes to do this based on the methodology described in Section 8.

12 Technical data will inform the vegetation and ecological communities' effects assessment.
 13 The interests of Aboriginal groups will be presented in the EIS in accordance with Section
 14 15 and Section 20 of these EIS Guidelines. Where Aboriginal groups have identified
 15 interests in a VC, the Proponent will incorporate Aboriginal traditional and local knowledge
 16 studies as made available.

17 The EIS will identify and assess any change the project may cause to a listed wildlife
 18 species, its critical habitat or the residences of individuals of that species as defined in the
 19 Species at Risk Act.

20 **11.1 Valued Component Scoping and Rationale**

21 The vegetation and ecological communities VC rationale for selection is described in Table
 22 11.1. Where available, supporting information that shows the importance of the VC is
 23 included as part of the rationale for selection, as are regulatory requirements.

24 **Table 11.1 Vegetation and ecological communities valued component rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Vegetation and Ecological Communities*	Land clearing and water impoundment will result in a change to vegetation and ecological communities	Direct use of plants for food, medicinal, spiritual and cultural purposes, indirect effects on wildlife, cultural importance	Direct use of plants for food, agriculture, timber harvesting, and indirect effects on wildlife	<i>Species at Risk Act</i> , and provincial and federal guidelines on vegetation and biodiversity

Notes: *Includes Rare and Sensitive Plant Communities and Ecological Communities at Risk

1 **11.2 Vegetation and Ecological Communities**

2 **11.2.1 Vegetation and Ecological Communities Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in (Table 11.2).

4 **Table 11.2 Vegetation and ecological communities assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Vegetation and Ecological Communities	An approximate 4-km-wide corridor centered on the Peace River from Hudson’s Hope to the Alberta border; a 1-km-wide corridor centered on the existing 138 kV wood pole transmission line from the Peace Canyon Dam to Taylor and Fort St. John; a 400 m corridor centered on roads identified for upgrading; a 1-km wide corridor centered on new roads; and a 500 m buffer around the proposed quarry and till sites	Peace Lowlands Ecosection

5 **11.2.2 Vegetation and Ecological Communities Temporal Boundaries**

6 The EIS will describe the temporal boundaries, which will reflect the methodology described
 7 in Section 8 of these EIS Guidelines.

8 **11.2.3 Vegetation and Ecological Communities Baseline**

9 The Composite and Terrestrial Ecosystem Mapping information will provide an
 10 understanding of the existing location and spatial extent of these ecosystems within the
 11 LAA as proposed by the Proponent using completed ecosystem mapping and field
 12 verification. Key indicators will include:

- 13 • Total area (hectares) of each ecosystem type, including wetlands, within the
 14 mapped area
- 15 • Area (hectares) of each ecosystem by structural stage will be calculated for each of
 16 the mapped ecosystems using the final map databases. The 7 class structural stage
 17 classification system will be used (BCMOE and BCMFLNRO 1998).
- 18 • Number of unique ecosystems mapped and their distribution within the technical
 19 study area described
- 20 • Number of and distribution of rare plant species observed within the technical study
 21 area

1 **11.2.3.1 Rare and Sensitive Ecological Communities**

2 The EIS will describe ecological communities at risk, which are identified as those
3 ecological communities currently designated on the provincial Red and Blue lists³,
4 communities that are ranked 1 or 2 for Goal 2 of the Conservation Framework⁴, and
5 sensitive communities that are communities that are less resilient to disturbance such as
6 wetlands.

7 The EIS will describe the methods used to identify rare and sensitive ecological
8 communities including:

- 9 • Descriptions of rare and sensitive ecological community posted on the Conservation
10 Data Center's website, along with descriptions in local field guides (De Long in prep
11 and MacKenzie and Moran 2004) will be used to identify occurrences within the
12 technical study area
- 13 • An assessment of wetland function, including migratory birds, Species at Risk Act
14 and COSEWIC listed species.
- 15 • Evaluation and mapping of potential rare and sensitive communities will be
16 conducted using the protocol developed by the Conservation Data Center. Field
17 visits will be used as required to verify community occurrences
- 18 • Field verification of rare and sensitive ecological communities will be conducted
19 using the protocol outlined in the *Field Manual for Describing Terrestrial Ecosystems*
20 (Ministry of Forests and Range, and Ministry of Environment 2010)

21 **11.2.3.2 Rare Plants**

22 The EIS will describe rare plants, including both vascular and non-vascular species; focal
23 species, including species listed in Schedule I of the SARA; provincially Red-listed and
24 Blue-listed species; and species considered to be rare, based on the professional judgment
25 of the rare plant specialist.

26 The EIS will identify the locations of rare plants observed within the LAA as proposed by the
27 Proponent. The methods used to identify rare plants will be based on the following:

- 28 • Timing (Klinkenberg and Penny 2006)
- 29 • Survey selection and intensity (Whiteaker et al. 1998; USDA FS and USDI BLM
30 1999)

³ Red-listed species and subspecies have or are candidates for official Extirpated, Endangered or Threatened Status in B.C. Placing taxa on these lists flags them as being at risk and requiring investigation (Harper et al. 1994)). The Blue List includes "ecological communities, and indigenous species and subspecies of special concern (formerly vulnerable) in British Columbia" (Harper et al. 1994).

⁴ Information on species rankings can be found on the Internet at <http://www.env.gov.bc.ca/cdc/methods.html>

- 1 • Voucher collection (Klinkenberg and Penny 2006; RIC 1999a)

2 The EIS will also discuss the results of reviews of established herbarium collections that
3 include the University of British Columbia, the University of Alberta, the Royal Alberta
4 Museum, the Royal British Columbia Museum and the Canadian National Museum.

5 **11.2.4 Potential Effects of the Project and Proposed Mitigation**

6 The EIS will assess how the Project has the potential to adversely affect terrestrial habitat.

7 The potential to adversely affect Vegetation and Ecological Communities will be assessed
8 by taking into account the potential for the Project to result in changes to the following key
9 aspects:

- 10 • The area of vegetation/ecological community loss, assessed by overlaying the
11 project activity zone on the ecosystem maps and conducting a GIS-based analysis
12 of the area lost due to project activities.
- 13 • The area of vegetation/ecological community fragmentation, identified through GIS
14 analysis.
- 15 • The area of temporary vegetation/ecological community disturbance will be
16 assessed by overlaying the project activity zone on the ecosystem maps and
17 conducting a GIS-based analysis of the area disturbed.
- 18 • The long-term effects of maintenance of vegetation/ecological communities in an
19 early seral stage along the transmission line and around the dam site.
- 20 • Wetlands

21 Should potential adverse effects be identified, the potential mitigation measures will be
22 identified (including a wetland compensation plan, if applicable) and will include a
23 description of how the mitigation measures can address the potential adverse effect.

24 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
25 residual effects characterization described in Table 8.3. A statement of significance will be
26 provided.

27 **11.2.5 Summary of Residual Effects on Vegetation and Ecological Communities**

28 The EIS will summarize residual effects in a table format as shown in Table 8.4.

29 **11.3 References**

30 This subsection will include a list of supporting references used in this section of the EIS.

31 **12 WILDLIFE RESOURCES EFFECTS ASSESSMENT**

32 The EIS will summarize the wildlife resources effects based on the Proponent's proposed
33 methodology described in Section 8 of these EIS Guidelines.

34 Technical data will inform the effects assessment on wildlife resources. The interests of
35 Aboriginal groups will be presented in the EIS in accordance with Section 15 and Section
36 20 of these EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the

1 Proponent will incorporate Aboriginal traditional and local knowledge studies as made
 2 available.

3

4 The EIS will identify and assess any change the project may cause to a listed wildlife
 5 species, its critical habitat or the residences of individuals of that species as defined in the
 6 Species at Risk Act.

7

8 **12.1 Valued Component Scoping and Rationale**

9 The wildlife resources VC rationale for selection is described in Table 12.1. Where
 10 available, supporting information that shows the importance of wildlife resources is included
 11 as part of the rationale for selection, as are regulatory requirements. Assessment of
 12 potential adverse effects on wildlife resources will be based on the following key species
 13 groups: butterflies and dragonflies; amphibians and reptiles; migratory birds; non-migratory
 14 game birds; raptors; bats; furbearers; and ungulates.

15 **Table 12.1 Wildlife resources valued component rationale**

Valued Component	Interactions with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Wildlife Resources	Change in or loss of feeding, breeding or winter habitat due to dam construction and reservoir creation; Habitat fragmentation	<ul style="list-style-type: none"> - Biodiversity - Loss of habitat, including but not limited to feeding, breeding or over-wintering habitat for: bats; garter snakes; nesting birds including raptors, birds on migration, and game birds; furbearers (incl. rabbit and hare); and ungulates - Changes to populations and distribution of furbearers and ungulates and their predators - Caribou - Impacts on ability to carry out traditional land use practices and on asserted or established Aboriginal rights and treaty rights. - Cultural reasons 	Biodiversity; loss of feeding, breeding or winter habitat for: garter snakes, nesting birds including raptors, birds on migration, game birds, furbearers and ungulates; changes to populations and distribution of furbearers and ungulates and their predators	<i>Species at Risk Act, Migratory Birds Convention Act, B.C. Wildlife Act, Provincial conservation strategy, Provincial guidelines and management strategies</i>

1 **12.2 Wildlife Resources**

2 **12.2.1 Wildlife Resources Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in Table 12.2.

4 **Table 12.2 Wildlife resource assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Wildlife Resources	An approximate 4-km-wide corridor centered on the Peace River from Hudson’s Hope to the Alberta border; a 1-km-wide corridor centered on the existing 138 kV wood pole transmission line from the Peace Canyon Dam to Taylor and Fort St. John; a 400 m corridor centered on roads identified for upgrading; a 1-km wide corridor centered on new roads; and a 500 m buffer around the proposed quarry and till sites	Peace Lowlands Ecosection

5 **12.2.2 Wildlife Resources Temporal Boundaries**

6 The EIS will describe the temporal boundaries, which will reflect the methodology described
 7 in Section 8 of these EIS Guidelines.

8 **12.2.3 Wildlife Resources Baseline**

9 **12.2.3.1 Butterflies and Dragonflies**

10 The butterfly and dragonfly baseline information will provide an understanding of the
 11 existing habitat and species within the LAA as proposed by the Proponent.

12 The baseline information will be collected following methodology guidelines presented in
 13 Inventory Methods for Terrestrial Arthropods (RIC 1998a). Surveys will focus on
 14 establishing presence/not-detected status for each listed taxon.

15 **12.2.3.2 Amphibians and Reptiles**

16 The amphibian and reptile baseline information will provide an understanding of the existing
 17 habitat and species within the LAA as proposed by the Proponent.

18 All species observations will be summarized, but the focus will be placed upon the western
 19 toad (*Bufo boreas*) as it is a species of concern under the *Species at Risk Act*.

1 The baseline information will be collected following the protocols outlined in Inventory
2 Methods for Pond-breeding Amphibians and Painted Turtle (RIC 1998b) and Inventory
3 Methods for Snakes (RIC 1998c).

4 **12.2.3.3 Migratory Birds**

5 The migratory bird baseline information will provide an understanding of the existing habitat,
6 species, relative abundance, distribution and temporal use within the LAA as proposed by
7 the Proponent for the following categories of migratory birds:

- 8 • songbirds
- 9 • waterfowl and shorebirds
- 10 • marsh birds (Yellow Rail, American Bittern, Le Conte's Sparrow, Nelson's Sharp-
11 tailed Sparrow)
- 12 • woodpeckers
- 13 • common nighthawk
- 14 • and others as appropriate

15 All species observations will be summarized.

16 The baseline information will be collected following the protocols outlined in Inventory
17 Methods for Forest and Grassland Songbirds (RIC 1999b), Inventory Methods for Swallows
18 and Swifts (RIC 1998d), Inventory Methods for Riverine Birds: Harlequin Duck, Belted
19 Kingfisher and American Dipper (RIC 1998e) and Inventory Methods for Waterfowl and
20 Allied Species: Loons, Grebes, Swans, Geese, Ducks, American Coot and Sandhill Crane
21 (RIC 1999c), Inventory Methods for Marsh Birds: Bitterns and Rails (RIC 1998f), Inventory
22 Methods for Woodpeckers (RIC 1999d), and Inventory Methods for Nighthawk and Poorwill
23 (RIC 1998g).

24 **12.2.3.4 Non-Migratory Game Birds**

25 The non-migratory game bird baseline information will provide an understanding of the
26 existing habitat, species, relative abundance, distribution and location of lek sites (Sharp-
27 tailed Grouse only) within the LAA as proposed by the Proponent.

28 The baseline information will be collected following the methods outlined in Inventory
29 Methods for Upland Game birds (RIC 1997a). The location of lek sites for Sharp-tailed
30 Grouse within the Peace River valley will be included with baseline information where
31 available and permitted.

32 **12.2.3.5 Raptors**

33 The raptor (eagles, hawks and owls) baseline information will provide an understanding of
34 the existing habitat, location of observed nests, presence, abundance (as feasible) and
35 distribution, and temporal use patterns within the LAA as proposed by the Proponent.

36 All species observations will be summarized. The Broad-winged Hawk and Short-eared Owl
37 are listed species while Northern Goshawk, Northern Harrier and Bald Eagle are species of
38 regional concern.

1 The baseline information will be collected following the protocols outlined in *Inventory*
2 *Methods for Raptors* (RIC 2001) and *Inventory Methods for Owl Surveys* (Hausleitner
3 2006). Call playback and stand watch studies will be used to document and confirm the
4 presence, possible abundance, and associated habitat use of select species of owls
5 (including Northern Saw-whet, Short-eared, Great Horned, Great Gray, and Boreal Owls),
6 Northern Goshawk, Northern Harrier and Broad-winged Hawk. An inventory of large raptor
7 nest sites along the Peace River will be collected.

8 **12.2.3.6 Bats**

9 The bat baseline information will provide an understanding of the existing habitat, presence
10 and characteristics of hibernacula, and location and characteristics of roost sites within the
11 LAA as proposed by the Proponent.

12 The baseline information will be collected following protocols outlined in *Inventory Methods*
13 *for Bats* (RIC 1998h), using mist-netting (to confirm species presence), acoustic detection
14 (to verify bat activity, quantify the level of activity and document species not captured), and
15 radio-telemetry (to investigate day-roost selection).

16 **12.2.3.7 Furbearers**

17 The furbearer baseline information will provide an understanding of the population
18 estimates and distribution of beavers, distribution of potential fisher den trees, seasonal
19 habitat use, orientation and size of fisher home ranges within the LAA as proposed by the
20 Proponent.

21 All species observations will be summarized, but the focus will be on species that are
22 provincially listed.

23 The baseline information will be collected following the protocols outlined in *Inventory*
24 *Methods for Beaver and Muskrat* (RIC 1998i) and *Inventory Methods for Medium Sized*
25 *Terrestrial Carnivores: Coyote, Red Fox, Lynx, Bobcat, Wolverine, Fisher and Badger* (RIC
26 1997b).

27 **12.2.3.8 Ungulates**

28 The ungulate (including moose, elk and mule deer) baseline information will provide an
29 understanding of the population estimates; habitat use; movement and migration patterns,
30 including river crossings; and birthing site locations and characteristics within the LAA as
31 proposed by the Proponent.

32 The baseline information will be collected following the protocols outlined in: *Aerial-based*
33 *Inventory Methods for Selected Ungulates: Bison, Mountain Goat, Mountain Sheep, Moose,*
34 *Elk, Deer and Caribou* (RIC 2002); *Ground-Based Inventory Methods for Selected*
35 *Ungulates (Moose, Elk and Deer)* (RIC 1998j); and *Ground-Based Inventory Methods for*
36 *Ungulate Snow-track Surveys* (D'Eon et al. 2006).

37 **12.2.3.9 Large Carnivores**

38 The baseline conditions will be characterized using information from published studies and
39 information made available to the Proponent from local, regional, and provincial
40 organizations and governments.

1 **12.2.4 Potential Effects of the Project and Proposed Mitigation**

2 The EIS will assess how the Project has the potential to adversely affect habitat available
 3 for wildlife resources, as represented by the key species groups.

4 The potential to adversely affect wildlife resources will be assessed by taking into account
 5 the potential for the Project to result in changes to the following key aspects:

- 6 • permanent and temporary habitat alteration and fragmentation
- 7 • disturbance and/or displacement
- 8 • potential for direct and indirect mortality to individuals

9 Should potential adverse effects be identified, the potential mitigation measures will be
 10 identified and will include a description of how the mitigation measures can address the
 11 potential adverse effects.

12 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 13 residual effects characterization described in Table 8.3. A statement of significance will be
 14 provided.

15 **12.2.5 Summary of Residual Effects on Wildlife Resources**

16 The EIS will summarize residual effects in a table format as shown in Table 8.4.

17 **12.3 References**

18 This subsection will include a list of supporting references used in this section of the EIS.

19 **13 GREENHOUSE GASES EFFECTS ASSESSMENT**

20 The EIS will describe the greenhouse gases (GHG) effects based on the methodology
 21 described in Section 8 of these EIS Guidelines.

22 Technical data will inform the GHG effects assessment. The interests of Aboriginal groups
 23 will be presented in the EIS in accordance with Section 15 and Section 20 of these EIS
 24 Guidelines. Where Aboriginal groups have identified interests in a VC, the Proponent will
 25 incorporate additional baseline information as made available.

26 **13.1 Valued Component Scoping and Rationale**

27 The greenhouse gases VC rationale for selection is described in Table 13.1. Where
 28 available, supporting information that shows importance of the VC is included as part of the
 29 rationale for selection, as are regulatory requirements.

30 **Table 13.1 Greenhouse gases valued component rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Greenhouse	Emissions of GHG	Concerns with	Increased	Canada – British

Gases	and the conversion of land use through the creation of the reservoir results in GHG emissions.	respect to climate as it relates to Aboriginal interests; Exercise of asserted or established Aboriginal rights and existing Treaty 8 Rights	GHG emissions contribute to global climate change.	Columbia Agreement in Principle on Climate Change; B.C. <i>Greenhouse Gas Reduction Targets Act</i>
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1 **13.2 Greenhouse Gases**

2 **13.2.1 Greenhouse Gases Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in Table 13.2.

4 **Table 13.2 Greenhouse gases assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Greenhouse Gases	A 30-metre buffer zone around the maximum reservoir elevation to describe GHGs from land conversion and the project activity zone to characterize emissions associated with construction activities.	National

5 **13.2.2 Greenhouse Gases Temporal Boundaries**

6 The EIS will describe the temporal boundaries, which will reflect the methodology described
 7 in Section 8 of these EIS Guidelines.

8 **13.2.3 Greenhouse Gases Baseline**

9 The GHG baseline information will provide an understanding of the potential net
 10 contribution of GHG by using site specific mass balance models to account for net GHG
 11 emissions under current conditions using CO₂ equivalents.

12 **13.2.4 Potential Effects of the Project and Proposed Mitigation**

13 The EIS will provide an assessment of how the Project has the potential to result in a net
 14 change in GHG emissions and GHG intensity based on inundation over a 100-year period.

1 Methods developed by the Intergovernmental Panel on Climate Change (IPCC) will be used
2 to estimate emissions associated with land use conversion to the reservoir as well as
3 construction-phase emissions based on estimates for quantities of fuel, electricity and
4 materials expected to be required during project development.

5 This section of the EIS will provide:

- 6 • An estimate of the multi-year GHG emissions profile associated with the
7 construction and ongoing operations of the Project
- 8 • An estimate of the net change in GHG emission from current conditions to post-
9 inundation scenarios
- 10 • A comparison of the GHG profile of the Project with other electricity supply options

11 Should potential adverse effects be identified, the potential mitigation measures will be
12 identified and will include a description of how the mitigation measures can address the
13 potential adverse effects.

14 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
15 residual effects characterization described in Table 8.3. A statement of significance will be
16 provided.

17 **13.2.5 Summary of Residual Effects for Greenhouse Gas**

18 The EIS will summarize residual effects in a table format as shown in Table 8.4.

19 **13.3 References**

20 This subsection will include a list of supporting references used in this section of the EIS.

1 **VOLUME 3 – ECONOMIC AND LAND AND RESOURCE USE EFFECTS**
 2 **ASSESSMENT**

3 **14 ECONOMIC EFFECTS ASSESSMENT**

4 The EIS will summarize the economic effects based on the methodology described in
 5 Section 8 of these EIS Guidelines.

6 Technical data will inform the economic effects assessment. The interests of Aboriginal
 7 groups will be presented in the EIS in accordance with Section 15 and Section 20 of these
 8 EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the Proponent
 9 will incorporate additional baseline information as made available.

10 **14.1 Valued Component Scoping and Rationale**

11 Economic effects arise from changes to economic transactions, such as the Project’s use of
 12 goods and services, employment of direct and indirect labour, and contracting and business
 13 opportunities, as well as Project-induced changes to government revenues. Government
 14 revenues will be reported in the Project Benefits section. Economic VCs and rationale for
 15 selection are described in Table 14.1.

16 **Table 14.1 Economic conditions valued components rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Group Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Local Government Revenue	Potential change in local and regional government expenditure and revenue streams.		Potential property tax impacts associated with local government expenditure and revenue.	Required by the BCEAO guidelines for environmental assessment
Labour Market	Demand for labour during construction phase will draw skilled persons from local, provincial and national labour markets. Competition with other projects for labour.	Employment, skill development, and training opportunities.	Employment, skill development, and training opportunities.	Required by the BCEAO guidelines for environmental assessment
Regional Economic Development	Project offers new contracting opportunities; may diversify and expand local business capacity.	Contracting and business opportunities	Contracting and business opportunities	Required by the BCEAO guidelines for environmental assessment

14.2 Local Government Revenue

14.2.1 Local Government Revenue Spatial Boundaries

The Proponent proposes the LAA and RAA as described in Table 14.2.

Table 14.2 Local government revenue assessment areas

Valued Component	Local Assessment Area	Regional Assessment Area
Local Government Revenue	City of Fort St. John, District of Taylor, District of Hudson’s Hope, District of Chetwynd, City of Dawson Creek, and Peace River Regional District	City of Fort St. John, District of Taylor, District of Hudson’s Hope, Peace River Regional District, Chetwynd and Dawson Creek

14.2.2 Local Government Revenue Temporal Boundaries

The EIS will describe the temporal boundaries, which will reflect the methodology described in Section 8 of these EIS Guidelines.

14.2.3 Local Government Revenue Baseline

The EIS will describe the current local government revenue baseline and likely future local government revenue and expenditure streams. Key indicators will include:

- Local government expenditures on specific programs and services
- Local government revenue from the Proponent grants-in-lieu payments, property taxes, transfers, income taxes, consumption taxes and royalties

Information sources for the baseline will include publicly available federal, provincial and local government data and reports and additional information made available to the Proponent.

14.2.4 Potential Effects of the Project and Proposed Mitigation

The EIS will assess how the Project has the potential to adversely affect local government revenues.

The potential to adversely affect local government revenues will be assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- Legal and policy factors that may influence the effects
- The British Columbia Input-Output Model (BC Stats, 2011a) proposed by the Proponent will be used to model the timing and magnitude of project-related transactions

Should potential adverse effects be identified, the potential mitigation measures will be identified and will include a description of how the mitigation measures can address the potential adverse effects.

1 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 2 residual effects characterization described in Table 8.3. A statement of significance will be
 3 provided.

4 **14.2.5 Summary of Residual Effects on Local Government Revenue**

5 The EIS will summarize residual effects in a table format as shown in Table 8.4.

6 **14.3 Labour Market**

7 **14.3.1 Labour Market Spatial Boundaries**

8 The Proponent proposes the LAA and RAA as described in Table 14.3.

9 **Table 14.3 Labour market assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Labour Market	Peace River Regional District, and Northern Rockies Regional Municipality	Peace River Regional District, Northern Rockies Regional Municipality, and Fraser-Fort George Regional District

10 **14.3.2 Labour Market Temporal Boundaries**

11 The EIS will describe the temporal boundaries, which will reflect the methodology described
 12 in Section 8 of these EIS Guidelines.

13 **14.3.3 Labour Market Baseline**

14 The EIS will describe labour market baseline and forecast conditions. The labour market
 15 baseline data collection will focus on skills and occupations required by the Project, using
 16 the following key indicators:

- 17 • Number of persons by occupation and industry affiliation, and available skills in the
 18 local labour force, turnover rates
- 19 • Unemployment rates, demographics and characteristics, length of unemployment,
 20 job search period
- 21 • Contribution of non-resident workers in the North East Development Region’s labour
 22 force
- 23 • Estimates of skill shortages and surpluses

24 Baseline information sources will include published employment studies and statistics, and
 25 information made available to the Proponent from local, regional, provincial and federal
 26 governments (e.g., BC Stats 2011b) and from interviews with local, regional and provincial
 27 employment and trade organizations.

14.3.4 Potential Effects of the Project and Proposed Mitigation

The EIS will assess how the Project has the potential to adversely affect the labour market.

The potential to adversely affect the labour market will be assessed by taking into account the potential for the Project to result in changes to the following key aspects:

- The direct Project’s needs for labour relative to the expected availability and type of skills of the persons in the LAA as proposed by the Proponent
- The indirect project employment calculated using the BC Input-Output Model
- A comparison of the project labour requirements against the baseline and forecast local labour supply and demand by skill category where possible (Work B.C. 2009)

Should potential adverse effects be identified, the potential mitigation measures will be identified and will include a description of how the mitigation measures can address the potential adverse effects.

The EIS will describe project residual effects, and cumulative effects, if applicable, using the residual effects characterization described in Table 8.3. A statement of significance will be provided.

14.3.5 Summary of Residual Effects on Labour Market

The EIS will summarize residual effects in a table format as shown in Table 8.4.

14.4 Regional Economic Development

14.4.1 Regional Economic Development Spatial Boundaries

The Proponent proposes the LAA and RAA as described in Table 14.4.

Table 14.4 Regional economic development assessment areas

Valued Component	Local Assessment Area	Regional Assessment Area
Regional Economic Development	Peace River Regional District, and Northern Rockies Regional Municipality	Peace River Regional District, Northern Rockies Regional Municipality, and Fraser-Fort George Regional District

14.4.2 Regional Economic Development Temporal Boundaries

The EIS will describe the temporal boundaries, which will reflect the methodology described in Section 8 of these EIS Guidelines.

14.4.3 Regional Economic Development Baseline

The EIS will describe current and likely future regional economic development activity. The regional economic development baseline data collection will focus on the types of

1 businesses and contractors required by the Project, as well as those currently required and
2 forecast to be required by other industries in the region, using the following key indicators:

- 3 • regional business and contracting profile
- 4 • regional business and contracting capabilities and capacity

5 Information sources will include:

- 6 • information about the project procurement strategy, including local purchasing
7 policies, if any
- 8 • published studies and statistics
- 9 • information made available to the Proponent from the private sector, industry and
10 trade organizations, and local, regional and provincial organizations and
11 governments

12 **14.4.4 Potential Effects of the Project and Proposed Mitigation**

13 The EIS will assess how the Project has the potential to adversely affect regional economic
14 development.

15 The potential to adversely affect regional economic development will be assessed by taking
16 into account the potential for the Project to result in changes to the following key aspects:

- 17 • Project contract opportunities in the LAA as proposed by the Proponent.
- 18 • A comparison of the Project's contracting requirements with the regional business
19 and contracting profile, capabilities and capacity

20 Should potential adverse effects be identified, the potential mitigation measures will be
21 identified and will include a description of how the mitigation measures can address the
22 potential adverse effects.

23 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
24 residual effects characterization described in Table 8.3. A statement of significance will be
25 provided.

26 **14.4.5 Summary of Residual Effects on Regional Economic Development**

27 The EIS will summarize residual effects in a table format as shown in Table 8.4.

28 **14.5 References**

29 This subsection will include a list of supporting references used in this section of the EIS.

30 **15 TRADITIONAL LANDS AND RESOURCE USE** 31 **EFFECTS ASSESSMENT**

32 The EIS will contain an assessment of the potential adverse effects of the Project on the
33 current use and reasonably anticipated future use of lands and resources by Aboriginal
34 persons for traditional purposes. This could also include activities conducted in the exercise

1 of asserted or established Aboriginal rights and treaty rights articulated in Section 20 of the
 2 EIS Guidelines.

3 Technical data, traditional land use studies and traditional knowledge will inform the effects
 4 assessment on current use of lands and resources for traditional purposes. Requirements
 5 for Aboriginal interests and information requirements are addressed in Section 20 of these
 6 EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the Proponent
 7 will incorporate additional baseline information as made available.

8 **15.1 Valued Component Scoping and Rationale**

9 The potential for effects on current use of lands and resources for traditional purposes arise
 10 from the Project’s use of land or resources. Table 15.1 outlines the rationale for selection of
 11 this VC based on Aboriginal interests and federal regulatory requirements.

12 **Table 15.1 Current use of lands and resources for traditional purposes valued**
 13 **component rationale**

Valued Component	Interaction with the Project	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Current Use of Lands and Resources for Traditional Purposes	Overlap of the potential project impacts with lands and resources that may be used by Aboriginal persons for traditional purposes.	Potential for change to the land, water, resources, or access to lands, water or resources used by Aboriginal persons for traditional purposes	n/a	CEAA

14 **15.2 Current Use of Lands and Resources for Traditional** 15 **Purposes**

16 **15.2.1 Current Use of Lands and Resources for Traditional Purposes Spatial** 17 **Boundaries**

18 The Proponent proposes the LAA and RAA as described in Table 15.2.

19 **Table 15.2 Current use of lands and resources for traditional purposes assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Current Use of Lands and Resources for Traditional	Fish and Fish Habitat LAA: Peace River in the proposed reservoir area; Tributaries entering the proposed reservoir; The Peace River	Fish and Fish Habitat RAA: Peace River from Peace Canyon Dam, BC to Vermilion Chutes, AB, which

Purposes	downstream of the proposed Site C dam to Many Islands, Alberta; Watercourses within the transmission line and roadway rights-of-way; Watercourses within the project activity zone (construction materials); Riparian areas Wildlife Resources LAA: An approximate 4-km-wide corridor centered on the Peace River from Hudson’s Hope to the Alberta border; a 1-km-wide corridor centered on the existing 138 kV wood pole transmission line from the Peace Canyon Dam to Taylor and Fort St. John; a 400 m corridor centered on roads identified for upgrading; a 1-km wide corridor centered on new roads; and a 500 m buffer around the proposed quarry and till sites	is a distance of approximately 865 km Wildlife Resources RAA: Peace Lowlands Ecosection
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1 **15.2.2 Current Use of Lands and Resources for Traditional Purposes Temporal**
 2 **Boundaries**

3 The EIS will describe the temporal boundaries defined for the assessment of the potential
 4 adverse effects of the Project on current use of lands and resources for traditional purposes
 5 in accordance with the methodology proposed by the proponent set out in Section 8 of
 6 these EIS Guidelines.

7 **15.2.3 Current Use of Lands and Resources for Traditional Purposes Baseline**

8 The EIS will describe the current use of lands and resources for traditional purposes by
 9 Aboriginal groups within the LAA and RAA as proposed by the Proponent, using the
 10 following key indicators:

- 11 • Current use of lands and resources for hunting, fishing and trapping activities,
 12 including the location of the activity, the species targeted, and the traditional uses of
 13 the harvested animals
- 14 • Current use of lands and resources for activities other than hunting, fishing and
 15 trapping, by Aboriginal groups, including the nature, location and traditional use
 16 purpose

17 Information sources may include publicly available information and information as made
 18 available to the Proponent, including traditional land use studies, traditional knowledge,
 19 consultations between Aboriginal groups and the Proponent, consultations between
 20 Aboriginal groups and the provincial and federal governments.

1 **15.2.4 Potential Effects of the Project and Proposed Mitigation**

2 The EIS will assess how the Project has the potential to adversely affect current use of
3 lands and resources by Aboriginal persons for traditional purposes.

4 The potential to adversely affect current use of lands and resources by Aboriginal persons
5 for traditional purposes will be assessed by taking into account the potential for the Project
6 to result in changes to key aspects:

- 7 • Use of and access to lands used for traditional purposes
- 8 • Availability of harvested species based on the results of the assessment of the
9 potential effects of the Project on fish and fish habitat, vegetation and ecological
10 communities, and wildlife resources

11 Should potential adverse effects be identified, the potential mitigation measures will be
12 identified and will include a description of how the mitigation measures can address the
13 potential adverse effects.

14 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
15 residual effects characterization described in Table 8.3. A statement of significance will be
16 provided.

17 **15.2.5 Summary of Residual Effects for Current Use of Lands and Resources for**
18 **Traditional Purposes**

19 The EIS will summarize the residual adverse effects on the current use of lands and
20 resources for traditional purposes VC in a table format as shown in Table 8.4.

21 **15.3 References**

22 This subsection will include a list of supporting references used in this section of the EIS.

23 **16 LAND AND RESOURCE USE EFFECTS**
24 **ASSESSMENT**

25 The EIS will summarize the Land and Resource Use effects based on the methodology
26 described in Section 8 of these EIS Guidelines.

27 Technical data will inform the effects assessment on land and resource use. The interests
28 of Aboriginal groups will be presented in the EIS in accordance with Section 15 and Section
29 20 of these EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the
30 Proponent will incorporate additional baseline information as made available.

31 **16.1 Valued Component Scoping and Rationale**

32 The land and resource use VCs are agriculture, forestry, oil, gas and energy, minerals and
33 aggregates, harvest of fish and wildlife resources, outdoor recreation and tourism,
34 navigation (air and water), and visual resources. Section 23.4 will summarize in a table
35 format the renewable resources that have been considered in the various sections of the
36 EIS.

1 Table 16.1 outlines the rationale for selection of VCs in the Land and Resource Use
 2 section.

3 **Table 16.1 Land and resource use valued components rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Agriculture	Change to the agricultural land base, crop and livestock production	Interest in loss of agricultural lands; Loss of regional food supply	Interest in loss of agricultural land, and effect on farm operations. Loss of regional food supply.	Required by the BCEAO, Agricultural Land Reserve lands within project areas, provincial land use plans
Forestry	Change to crown forested land base, harvest of merchantable trees from project activity zones	Interest in loss of productive forest land and commensurate habitat. Loss of source of sustainable livelihood for timber and fuel use.	Forest licensee and logging contractor activity in vicinity of the Project. Interest in Reservoir clearing and usable fibre. Interest in TFL, TSA or AAC that may be affected by project area.	<i>Forest Act, Forest and Range Practices Act</i> , provincial land use plans
Oil, Gas and Energy	Changed access roads, and potential for tenures that overlap with the project activity zones	Concern with increased access and resulting fragmentation of habitat. impacts to general landform and habitat; noise; safety	Interest in improvement to access roads, project road use. Interest in tenures that overlap with project area. Concern with increased access and resulting fragmentation of wildlife habitat.	<i>Land Act, Petroleum and Natural Gas Act, Oil and Gas Activities Act</i> , provincial land use plans
Minerals and Aggregates	Changed access roads, and location of known pits in relation to environmental or social VCs.	Concern respecting transport of materials and impacts on wildlife	Interest in alienation of aggregate due to reservoir inundation. Project use of and improved access to local aggregate pits.	<i>Land Act, Mines Act, Coal Act, Mineral Tenure Act</i> , provincial land use plans

Harvest of Fish and Wildlife Resources	Changed environmental setting, fish and wildlife population and opportunities to trap, hunt and fish. Effects on tenured trapping, guide outfitting areas or activities.	Concern where public or tenured trapping, hunting and fishing may interfere with Aboriginal trapping, hunting and fishing	Interest in continued public and tenured opportunities to trap, hunt and fish.	<i>Fisheries Act, BC Land Act, Wildlife Act, Migratory Birds Convention Act, provincial land use plans</i>
Outdoor Recreation and Tourism	Resident and tourist use of outdoor recreation areas within project activity zones	Aboriginal participation in outdoor recreation activities.	Resident and tourist use of outdoor recreation areas within the project area.	Local and provincial parks and recreation areas, provincial land use plans
Navigation (air and water)	Dam, bridges, causeways, booms, culverts interact with water based navigation Consider project interactions with air based navigation.	Concern that reservoir will enhance access to tributaries	Public use of navigable waterways. Aviation routes near the project area.	<i>Navigable Waters Protection Act</i> Canadian Aviation Regulations, provincial land use plans
Visual Resources	Changes to the visual landscape, from scenic viewpoints	Inundation of reservoir will change the visual landscape	Public interest in scenic viewpoints	BC Ministry of Forests, Lands and Natural Resource Operations Guidebook (BCMOF 2001), and Visual Landscape Inventory (BCMOF 1997), provincial land use plans

1 **16.2 Agriculture**

2 **16.2.1 Agriculture Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in Table 16.2.

1 **Table 16.2 Agriculture assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Agriculture	Project activity zone and the Peace River Valley between Peace Canyon Dam and the Alberta border.	Peace River Regional District Peace River Census Division (Census Division 55, Agricultural Region 8) ¹
¹ Statistics Canada Census Division 55 in Agricultural Region 8 - Peace River, encompasses the organized areas of Hudson's Hope, Chetwynd, Tumbler Ridge, Pouce Coupe, Dawson Creek, Fort St. John, Taylor and the Electoral Areas D, C, B and E in the Peace River Regional District.		

2 **16.2.2 Agriculture Temporal Boundaries**

3 The EIS will describe the temporal boundaries, which will reflect the methodology described
 4 in Section 8 of these EIS Guidelines.

5 **16.2.3 Agriculture Baseline**

6 The agricultural baseline information will provide an understanding of the current
 7 agricultural land base, operations and systems, including the following key indicators:

- 8 • Agricultural land capability ratings, using updated field observations or existing
 9 provincial mapping, and updated climatic capability using current climate data (see
 10 Kenk and Cotic 1983)
- 11 • Agricultural suitability of lands within the project activity zone for growing different
 12 crops, determined using updated or available capability ratings, and rated as well
 13 suited, suited or not suited for various crops using methodologies similar to the
 14 former Gough et al. (1994)
- 15 • Agricultural utility ratings, to reflect the likelihood of each area being used for
 16 agricultural production in the future. The rating will be based on land capability
 17 ratings, as well as constraints to agricultural use (such as location, access, parcel
 18 size, land ownership or tenure, and land use plans or designations)
- 19 • Agricultural land use, determined from recent air photos of the project area, Crown
 20 land tenures, field observations and land owner/operator interviews
- 21 • Agricultural tenure on Crown lands, including range tenures and grazing licenses,
 22 determined from provincial data sources, within and near the project activity zone
- 23 • Current and expected future agricultural operations and practices, determined
 24 through interviews with owners and operators of potentially affected agricultural
 25 operations, as well as through review of agricultural census information for the LAA
 26 as proposed by the Proponent
- 27 • Local and regional agricultural economic activity, determined through interviews with
 28 owners and operators, relevant agricultural associations, representatives of
 29 agriculturally related industries and representatives of government agencies

- 1 • Local and regional food production and consumption estimates, determined through
2 interviews with owners and operators of potentially affected agricultural operations,
3 relevant agricultural associations, representatives of agriculturally related industries
4 and representatives of government agencies.

5 **16.2.4 Potential Effects of the Project and Proposed Mitigation**

6 The EIS will assess how the Project has the potential to adversely affect agriculture.

7 The potential to adversely affect agriculture will be assessed by taking into account the
8 potential for the Project to result in changes to the following key aspects:

- 9 • An estimate of the loss of agricultural land, including a description of these changes
10 to the agricultural resource base on a local, regional and provincial scale
- 11 • Description of effects to individual farm operations, including loss of land, effects to
12 farm infrastructure, and changes to farm activities
- 13 • Quantification of projected immediate and longer-term effects to local, regional and
14 provincial agricultural economies. This will include estimating changes in agricultural
15 costs and revenues at the farm level, changes in opportunities for potential new
16 agricultural economic activity, and changes to primary and secondary agricultural
17 economic activity
- 18 • Identification of potential changes to local food production and any changes to the
19 ratio of food production to food consumption (a measure of food self-reliance)

20 Should potential adverse effects be identified, the potential mitigation measures will be
21 identified and will include a description of how the mitigation measures can address the
22 potential adverse effects.

23 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
24 residual effects characterization described in Table 8.3. A statement of significance will be
25 provided.

26 **16.2.5 Summary of Residual Effects on Agriculture**

27 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

28 **16.3 Forestry**

29 **16.3.1 Forestry Spatial Boundaries**

30 The Proponent proposes the LAA and RAA as described in Table 16.3.

1 **Table 16.3 Forestry assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Forestry	Project activity zone	Dawson Creek TSA, Fort St. John TSA, Peace River supply block of TFL 48

2 **16.3.2 Forestry Temporal Boundaries**

3 The EIS will describe the temporal boundaries, which will reflect the methodology described
 4 in Section 8 of these EIS Guidelines.

5 **16.3.3 Forestry Baseline**

6 The EIS will provide an overview of forest and land management planning, and forest
 7 industry activities, within the LAA, as proposed by the Proponent, and the Peace Forest
 8 District. The future case will consider forest management plans, including any constraints
 9 on timber harvesting or land use management. Baseline information using the following key
 10 indicators will be collected:

- 11 • Timber harvesting land base
- 12 • Site productivity
- 13 • Annual Allowable Cut
- 14 • Forest sector employment
- 15 • Forest sector based government revenue
- 16 • The inventory of existing merchantable and non-merchantable timber in the
 17 reservoir as identified in the project clearing plan

18 The forest industry activity information will be collected from industry and Ministry of
 19 Forests, Lands and Natural Resource Operations sources. Spatial indicators will be
 20 collected from an analysis of GIS data obtained from the same sources.

21 **16.3.4 Potential Effects of the Project and Proposed Mitigation**

22 The EIS will assess how the Project has the potential to adversely affect forestry.

23 The potential to adversely affect forestry will be assessed by taking into account the
 24 potential for the Project to result in changes to the following key aspects:

- 25 • Land use, resource use, access and activities related to industrial forestry use
- 26 • Crown forest management

27 The spatial analysis will identify tenured interests or facilities occurring within the Project
 28 activity zone that may be alienated from future use, or affected by changes in Crown land
 29 use and access during construction and operations.

30 Should potential adverse effects be identified, the potential mitigation measures will be
 31 identified and will include a description of how the mitigation measures can address the
 32 potential adverse effects.

1 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 2 residual effects characterization described in Table 8.3. A statement of significance will be
 3 provided.

4 **16.3.5 Summary of Residual Effects on Forestry**

5 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

6 **16.4 Oil, Gas and Energy**

7 **16.4.1 Oil, Gas and Energy Spatial Boundaries**

8 The Proponent proposes the LAA and RAA as described in Table 16.4.

9 **Table 16.4 Oil, gas and energy assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Oil, Gas and Energy	Project activity zone	Project activity zone

10 **16.4.2 Oil, Gas and Energy Temporal Boundaries**

11 The EIS will describe the temporal boundaries, which will reflect the methodology described
 12 in Section 8 of these EIS Guidelines.

13 **16.4.3 Oil, Gas and Energy Baseline**

14 The EIS will describe current conditions and recent trends related to oil, gas and energy
 15 sectors within the LAA as proposed by the Proponent, using the following key indicators:

- 16 • Tenured oil, gas and energy activities, operations and facilities
- 17 • Production activity
- 18 • Industry characteristics including new extraction technologies

19 Spatial indicators will be collected using a GIS analysis. Other industry data will be
 20 collected from the Oil and Gas Commission, Canadian Association of Petroleum Producers
 21 and B.C. Ministry of Energy and Mines. Interviews and information requests will be made
 22 with these same agencies for information pertaining to production activity and investments.

23 **16.4.4 Potential Effects of the Project and Proposed Mitigation**

24 The EIS will assess how the Project has the potential to adversely affect oil, gas and energy
 25 sectors.

26 The potential to adversely affect the oil, gas and energy sectors will be assessed by taking
 27 into account the potential for the Project to result in changes to the following key aspects:

- 28 • land use
- 29 • resource use
- 30 • access and activities for the oil, gas and energy sectors

1 Should potential adverse effects be identified, the potential mitigation measures will be
 2 identified and will include a description of how the mitigation measures can address the
 3 potential adverse effects.

4 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 5 residual effects characterization described in Table 8.3. A statement of significance will be
 6 provided.

7 **16.4.5 Summary of Residual Effects on Oil and Gas**

8 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

9 **16.5 Minerals and Aggregates**

10 **16.5.1 Minerals and Aggregates Spatial Boundaries**

11 The Proponent proposes the LAA and RAA as described in Table 16.5.

12 **Table 16.5 Mineral and aggregates assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Minerals and Aggregates	Project activity zone	Fort St John/Hudson’s Hope/Taylor/Area “C” for aggregate market assessment.

13 **16.5.2 Minerals and Aggregates Temporal Boundaries**

14 The EIS will describe the temporal boundaries, which will reflect the methodology described
 15 in Section 8 of these EIS Guidelines.

16 **16.5.3 Minerals and Aggregates Baseline**

17 The EIS will provide an overview of current conditions related to mineral and aggregate
 18 resource development within the LAA as proposed by the Proponent, using the following
 19 key indicators:

- 20 • Record of metal, industrial mineral, and aggregate potential
- 21 • Record of exploration and development
- 22 • Historic production records
- 23 • Remaining mine, quarry or pit life
- 24 • Existing mineral or aggregate tenures
- 25 • Local and regional aggregate pricing and current and forecast consumption
 26 profile

27 Spatial data will be collected (e.g., mineral potential, tenures, mineral reserves, current and
 28 past producers). Baseline information will be collected from government databases (e.g.,
 29 mineral potential, mineral tenures, record of development activity), and interviews with

1 Ministry of Transportation and Infrastructure staff, and other information as made available
 2 to the Proponent.

3 **16.5.4 Potential Effects of the Project and Proposed Mitigation**

4 The EIS will assess how the Project has the potential to adversely affect the mineral and
 5 aggregate sector.

6 The potential to adversely affect the mineral and aggregate sector will be assessed by
 7 taking into account the potential for the Project to result in changes to the following key
 8 aspects:

- 9 • Land use, resource use, access and activities related to industrial mineral and
 10 aggregate utilization within the Project activity zone
- 11 • The Project’s consumption of local aggregate deposits for construction activities
- 12 • Any new or improved access to aggregate sources created by the Project

13 Spatial analysis will be used to determine the Project’s effect on minerals and aggregates in
 14 the context of the market for minerals and aggregates.

15 Should potential adverse effects be identified, the potential mitigation measures will be
 16 identified and will include a description of how the mitigation measures can address the
 17 potential adverse effects.

18 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 19 residual effects characterization described in Table 8.3. A statement of significance will be
 20 provided.

21 **16.5.5 Summary of Residual Effects on Minerals and Aggregates**

22 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

23 **16.6 Harvest of Fish and Wildlife Resources**

24 **16.6.1 Harvest of Fish and Wildlife Resources Spatial Boundaries**

25 The Proponent proposes the LAA and RAA as described in Table 16.6.

26 **Table 16.6 Harvest of fish and wildlife resources assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Harvest of Fish and Wildlife Resources	Project activity zone and the Peace River downstream to the Alberta border.	Peace River Regional District.

27 **16.6.2 Harvest of Fish and Wildlife Resources Temporal Boundaries**

28 The EIS will describe the temporal boundaries, which will reflect the methodology described
 29 in Section 8 of these EIS Guidelines.

1 **16.6.3 Harvest of Fish and Wildlife Resources Baseline**

2 The EIS will provide an overview of current conditions related to the public and tenured
3 harvest of fish and wildlife resources within the LAA as proposed by the Proponent, using
4 the following key indicators:

5 Public Hunting and Fishing:

- 6 • Public hunting and fishing licence sales
- 7 • Public hunting and fishing areas
- 8 • Public hunting and fishing harvest information, including numbers and species
- 9 • Angler creel survey results within the LAA as proposed by the Proponent

10 Tenured Trapping:

- 11 • Tenured trapline areas
- 12 • Tenured trapline infrastructure (e.g. cabins, trails)
- 13 • Tenured trapline harvest volumes and areas
- 14 • Tenured trapline operating and economic information
- 15 • Aboriginal employment or use of tenured traplines

16 Tenured Guide-Outfitting:

- 17 • Tenured guide outfitter areas
- 18 • Tenured guide outfitter infrastructure (e.g., cabins, trails)
- 19 • Tenured guide-outfitter harvest volumes and areas
- 20 • Tenured guide-outfitter operating and economic information
- 21 • Aboriginal participation in tenured guide outfitting operations

22 Public hunting data will be acquired from BCMOE hunter harvest data, studies on economic
23 effects and value of resident hunting, wildlife studies, interviews with local rod and gun
24 clubs, traditional land use studies, and other data as made available to the Proponent.

25 Fishing data will be acquired from BCMOE licence sales, creel survey results (LGL 2010),
26 regional angling surveys, fisheries studies, interviews with rod and gun clubs, traditional
27 land use studies, and other data as made available to the Proponent.

28 Trapping data will be acquired from trapper interviews, trapline tenure and harvest data
29 from provincial government sources, and other information as made available to the
30 Proponent.

31 Data will be acquired from wildlife studies, BCMOE hunter harvest data, guide outfitter
32 licence areas, Guide Outfitting Association of BC database, and studies on the economic
33 effects and value of guided hunting, and other information as made available to the
34 Proponent.

1 **16.6.4 Potential Effects of the Project and Proposed Mitigation**

2 The EIS will assess how the Project has the potential to adversely affect the use of fish and
 3 wildlife resources.

4 The potential to adversely affect harvest of fish and wildlife resources will be assessed by
 5 taking into account the potential for the Project to result in changes to the following key
 6 aspects:

- 7 • Use of and access to hunting and fishing areas
- 8 • Use of and access to trapline areas
- 9 • Use of and access to guide outfitter areas
- 10 • Tenured areas, and specific harvest areas within tenured areas, using spatial
 11 analysis
- 12 • Availability of harvested species based on the results of the assessment of the
 13 potential effects of the Project on the VC, fish and fish habitat, and on the VC wildlife
 14 resources

15 Should potential adverse effects be identified, the potential mitigation measures will be
 16 identified and will include a description of how the mitigation measures can address the
 17 potential adverse effects.

18 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 19 residual effects characterization described in Table 8.3. A statement of significance will be
 20 provided.

21 **16.6.5 Summary of Residual Effects on Harvest of Fish and Wildlife Resources**

22 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

23 **16.7 Outdoor Recreation and Tourism**

24 **16.7.1 Outdoor Recreation and Tourism Spatial Boundaries**

25 The Proponent proposes the LAA and RAA as described in Table 16.7.

26 **Table 16.7 Outdoor recreation and tourism assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Outdoor Recreation and Tourism	Project activity zone and downstream to Peace Island Park	Peace River Regional District.

27 **16.7.2 Outdoor Recreation and Tourism Temporal Boundaries**

28 The EIS will describe the temporal boundaries, which will reflect the methodology described
 29 in Section 8 of these EIS Guidelines.

1 **16.7.3 Outdoor Recreation and Tourism Baseline**

2 The EIS will present an overview of current conditions related to outdoor recreation and
3 tourism within the LAA as proposed by the Proponent, using the following key indicators:

- 4 • Outdoor recreation features and amenities, including recreation sites, trails, parks,
5 and proposed Peace River Boudreau Lakes protected area
- 6 • Outdoor recreation use levels
- 7 • Tourism features and amenities, including visitor centres, tourist accommodations,
8 and attractions
- 9 • Regional tourism visitor levels
- 10 • Recreation activities undertaken on the land base, including activities, locations and
11 seasonal nature of activities
- 12 • Commercial outdoor recreation interests

13 Spatial data will be collected through a GIS analysis using available provincial data and
14 data from other sources. Information sources will include information from and interviews
15 with government agencies, local recreation and tourism groups, and other information as
16 made available to the Proponent.

17 **16.7.4 Potential Effects of the Project and Proposed Mitigation**

18 The EIS will assess how the Project has the potential to adversely affect outdoor recreation
19 and tourism.

20 The potential to adversely affect outdoor recreation and tourism will be assessed by taking
21 into account the potential for the Project to result in changes to the following key aspects:

- 22 • Managed and unmanaged outdoor recreation sites, trails and parks, using spatial
23 analysis
- 24 • Visitor centres, tourist accommodations, tourist attractions, and regional visitor
25 levels
- 26 • Outdoor recreation use, outdoor recreation use levels, and regional tourism visitor
27 levels

28 Should potential adverse effects be identified, the potential mitigation measures will be
29 identified and will include a description of how the mitigation measures can address the
30 potential adverse effects.

31 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
32 residual effects characterization described in Table 8.3. A statement of significance will be
33 provided.

34 **16.7.5 Summary of Residual Effects on Outdoor Recreation and Tourism**

35 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

1 **16.8 Navigation**

2 **16.8.1 Navigation Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in Table 16.8.

4 **Table 16.8 Navigation assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Navigation	Project activity zone, downstream to Peace Island Park, and the Shaftesbury and Tompkins Landing ice bridges	Project activity zone, downstream to Peace Island Park, and the Shaftesbury and Tompkins Landing ice bridges

5 **16.8.2 Navigation Temporal Boundaries**

6 The EIS will describe the temporal boundaries, which will reflect the methodology as
 7 proposed by the proponent described in Section 8 of these EIS Guidelines.

8 **16.8.3 Navigation Baseline**

9 The EIS will present an overview of current conditions related to navigation within the LAA
 10 as proposed by the proponent, using the following key indicators:

- 11 • Defined existing navigable waters using the methodology outlined in the River
 12 Classification System established for rivers in British Columbia
- 13 • Current navigation use (e.g., vessel/boat traffic) of the defined navigable waters for
 14 transportation, recreation and commercial purposes
- 15 • Air navigation routes and airports
- 16 • The ice bridge at Shaftesbury and Tompkins Landing

17 Information sources will include information from and interviews with government agencies,
 18 local boating groups, Aboriginal groups, and other information as made available to the
 19 Proponent.

20 **16.8.4 Potential Effects of the Project and Proposed Mitigation**

21 The EIS will assess how the Project has the potential to adversely affect navigation.

22 The potential to adversely affect navigation will be assessed by taking into account the
 23 potential for the Project to result in changes to the following key aspects:

- 24 • The navigability and navigation use of defined navigable waters existing, altered or
 25 created by the Project in the context of the operation of the W.A.C. Bennett Dam
 26 and the Peace Canyon Dam.
- 27 • Potential navigation hazards in waterways

- 1 • Proposed public and navigation safety measures, the rationale for any restrictions,
2 and the cause of any interferences to navigation
- 3 • Micro-climate changes (Section 9.3.1) on aviation use at the Fort St. John airport
- 4 • Visibility of structures and overhead wiring, and proposed temporary aviation
5 restrictions
- 6 • Operation of the Shaftesbury and Tompkins Landing ice bridges and associated
7 ferry operations, using the results of the Proponent’s proposed CRISSP ice model in
8 Section 9.2.4

9 Should potential adverse effects be identified, the potential mitigation measures will be
10 identified and will include a description of how the mitigation measures can address the
11 potential adverse effects.

12 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
13 residual effects characterization described in Table 8.3. A statement of significance will be
14 provided.

15 **16.8.5 Summary of Residual Effects on Navigation**

16 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

17 **16.9 Visual Resources**

18 **16.9.1 Visual Resources Spatial Boundaries**

19 The Proponent proposes the LAA and RAA as described in Table 16.9.

20 **Table 16.9 Visual resources assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Visual Resources	The reservoir and dam site as viewable from Visual Landscape Inventory viewpoints	Visual Landscape Inventory viewpoints within or adjacent to Project activity zone

21 **16.9.2 Visual Resources Temporal Boundaries**

22 The EIS will describe the temporal boundaries, which will reflect the methodology described
23 in Section 8 of these EIS Guidelines.

24 **16.9.3 Visual Resources Baseline**

25 The EIS will identify current visual resource conditions within the LAA as proposed by the
26 Proponent that may be changed by the Project, using the following key indicators:

- 27 • Representative visual receptor sites, considering provincial Visual Landscape
28 Indicator (VLI) sites, and sites identified during field reconnaissance, that offer views
29 of the proposed reservoir and dam site

- 1 • A public viewpoint of the river from Hudson’s Hope, and from near the dam site
- 2 For each site the baseline conditions will be characterised using a photomontage, with
 3 quantitative and descriptive information for visual sensitive units. The VLI classifies the
 4 provincial land base into visually sensitive areas versus not visually sensitive areas and, for
 5 each visually sensitive unit in terms of its existing visual condition, visual absorption
 6 capability, biophysical and viewing characteristics, determines or recommends a visual
 7 sensitivity class. The provincial Visual Landscape Inventory receptor sites proposed for use
 8 in the baseline are shown in Table 16.10. The location and number of receptor sites will be
 9 confirmed by field reconnaissance to cover the main view opportunities.

10 **Table 16.10 Proposed visual resources receptor sites**

Location	Easting (UTM)	Northing (UTM)
Fort St. John, 100 th Street Lookout	633529.33	6231502.12
Highway 29, MOT rest stop overlooking Attachie	598892.44	6233874.26
Hudson’s Hope, location to be determined	-	-
Hudson’s Hope, Peace Canyon Road	562876.16	6205166.12
Highway 29, overlooking Bear Flat	609645.23	6239176.48
Highway 29, west of Halfway River	591764.45	6228586.29
Highway 29, east of Farrell Creek	586430.13	6224072.87
Highway 29, west of Farrell Creek	575138.92	6219550.34

11 **16.9.4 Potential Effects of the Project and Proposed Mitigation**

12 The EIS will assess how the Project has the potential to adversely affect visual resources.

13 The potential to adversely affect visual resources will be assessed by taking into account
 14 the potential for the Project to result in changes to the following key indicators:

- 15 • The visibility of project features from selected receptor sites using GIS-based
 16 viewshed modelling proposed by the Proponent
- 17 • Scenic values predicted using photomontages and assessed according to the Visual
 18 Impact Assessment Guidebook’s visual impact summary form (BCMOF, 2001).

19 Should potential adverse effects be identified, the potential mitigation measures will be
 20 identified and will include a description of how the mitigation measures can address the
 21 potential adverse effects.

22 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 23 residual effects characterization described in Table 8.3. A statement of significance will be
 24 provided.

25 **16.9.5 Summary of Residual Effects on Visual Resources**

26 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

1 **16.10 References**

- 2 This subsection will include a list of supporting references used in this section of the EIS.

1 **VOLUME 4 – SOCIAL, HERITAGE, AND HEALTH EFFECTS ASSESSMENT**

2 **17 SOCIAL EFFECTS ASSESSMENT**

3 The EIS will summarize the social effects based on the methodology described in Section 8
 4 of these EIS Guidelines.

5 Technical data will inform the social effects assessment. The interests of Aboriginal groups
 6 will be presented in the EIS in accordance with Section 15 and Section 20 of these EIS
 7 Guidelines. Where Aboriginal groups have identified interests in a VC, the Proponent will
 8 incorporate additional baseline information as made available.

9 **17.1 Valued Component Scoping and Rationale**

10 Social considerations include potential adverse effects of the Project on the workforce, on
 11 local population, housing and community services, including health, emergency, education
 12 and transportation. Table 17.1 outlines the rationale for the selection of social VCs.

13 **Table 17.1 Social valued components rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Population and Demographics	Project workforce would increase local and regional population.	Regional and First Nation communities interest in population change; concerns related to encroachment and perhaps subsequent displacement, and social effects, thereof	Regional interest in population change.	Required by the BCEAO guidelines for environmental assessment.
Housing	Project employment and population increase likely to cause measurable increase in demand for housing.	Concern about cost and supply of housing in the region with implications for on-reserve housing; concerns related to encroachment and perhaps subsequent displacement, and social effects, thereof	Regional interest in housing supply, cost of housing short and long term.	Required by the BCEAO guidelines for environmental assessment

Community Infrastructure and Services	Project-induced population change may increase demand for social and community services.	Regional interest of Project demand on access and quality of infrastructure and services; concerns related to encroachment and perhaps subsequent displacement, and social effects, thereof	Regional interest of Project demand on access and quality of infrastructure and services	Required by the BCEAO guidelines for environmental assessment
Transportation	Project use of existing, or development of new, road and rail transportation routes to move people, equipment, goods and materials to and from construction and operating sites.	Regional interest in project demand on transportation and infrastructure; concerns related to encroachment and perhaps subsequent displacement, and social effects, thereof	Regional interest in project demand on transportation and infrastructure	Required by the BCEAO guidelines for environmental assessment.

1 **17.2 Population and Demographics**

2 **17.2.1 Population and Demographics Spatial Boundaries**

3 The Proponent proposes the LAA and RAA as described in Table 17.2.

4 **Table 17.2 Population and demographics assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Population and Demographics	Peace River Regional District	Peace River Regional District

5 **17.2.2 Population and Demographics Temporal Boundaries**

6 The EIS will describe the temporal boundaries, which will reflect the methodology described
 7 in Section 8 of these EIS Guidelines.

8 **17.2.3 Population and Demographics Baseline**

9 The EIS will present an overview of current baseline and forecast population and
 10 demographic characteristics within the LAA as proposed by the Proponent, using the
 11 following key indicators:

- 12
 - Population numbers (gender, age profile, labour force participation)

- 1 • Household number and demographic characteristics, including marital status and
 2 dependents

3 Information sources will include published studies and statistics, and information made
 4 available to the Proponent from local, regional and provincial organizations and
 5 governments. Information sources will include historic and most currently available census
 6 data and population forecasts.

7 **17.2.4 Potential Effects of the Project and Proposed Mitigation**

8 The EIS will assess how the Project has the potential to adversely affect population and
 9 demographics.

10 The potential to adversely affect population and demographics will be assessed by taking
 11 into account the potential for the Project to result in changes to the following key aspects:

- 12 • The Peace River Regional District population, with specific reference to the City of
 13 Fort St. John
- 14 • The results of the assessment of the Project on the labour market will be used to
 15 assess the effects on population and demographics

16 Should potential adverse effects be identified, the potential mitigation measures will be
 17 identified and will include a description of how the mitigation measures can address the
 18 potential adverse effects.

19 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 20 residual effects characterization described in Table 8.3. A statement of significance will be
 21 provided.

22 **17.2.5 Summary of Residual Effects on Population and Demographics**

23 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

24 **17.3 Housing**

25 **17.3.1 Housing Spatial Boundaries**

26 The Proponent proposes the LAA and RAA as described in Table 17.3.

27 **Table 17.3 Housing assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Housing	Peace River Regional District	Peace River Regional District.

28 **17.3.2 Housing Temporal Boundaries**

29 The EIS will describe the temporal boundaries, which will reflect the methodology described
 30 in Section 8 of these EIS Guidelines.

1 **17.3.3 Housing Baseline**

2 The EIS will describe housing baseline conditions within the LAA as proposed by the
3 Proponent, using the following key indicators:

- 4 • Occupancy and vacancy rates
- 5 • Occupancy costs
- 6 • Multiple Listing Service activity (BC Stats 2011c)
- 7 • Residential construction activity
- 8 • Planned housing developments
- 9 • Land zoned and available for housing development

10 Information sources will include published studies and statistics, and information made
11 available to the Proponent from the private sector, local, regional and provincial
12 organizations and governments.

13 **17.3.4 Potential Effects of the Project and Proposed Mitigation**

14 The EIS will assess how the Project has the potential to adversely affect housing.

15 The potential to adversely affect housing will be assessed by taking into account the
16 potential for the Project to result in changes to the following key aspects:

- 17 • The demand for housing, with specific reference to the City of Fort St. John
- 18 • The assessment of the Project on the labour market and on Population and
19 Demographics will be used to assess the effects on housing
- 20 • Specific plans by the Proponent to directly provide worker accommodation

21 Should potential adverse effects be identified, the potential mitigation measures will be
22 identified and will include a description of how the mitigation measures can address the
23 potential adverse effects.

24 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
25 residual effects characterization described in Table 8.3. A statement of significance will be
26 provided.

27 **17.3.5 Summary of Residual Effects on Housing**

28 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

29 **17.4 Community Infrastructure and Services**

30 **17.4.1 Community Infrastructure and Services Spatial Boundaries**

31 The Proponent proposes the LAA and RAA as described in Table 17.4.

1 **Table 17.4 Community infrastructure and services assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Community Infrastructure and Services	Peace River Regional District	Peace River Regional District

2 **17.4.2 Community Infrastructure and Services Temporal Boundaries**

3 The EIS will describe the temporal boundaries, which will reflect the methodology described
 4 in Section 8 of these EIS Guidelines.

5 **17.4.3 Community Infrastructure and Services Baseline**

6 The EIS will describe the capacity, statistics of, and approved plans for community
 7 infrastructure and services, using the following key indicators:

- 8 • Community Services – recreation and leisure facilities, sewer and water services
- 9 • Emergency Services – police, court, fire protection, ambulance services and
 10 provincial emergency planning
- 11 • Education Services – public schools, private schools, post-secondary institutions
- 12 • Health and Social Services – vital statistics, medical service expenditures, medical
 13 and dental facilities, practitioner numbers and services

14 Information sources will include published studies and statistics, and information made
 15 available to the Proponent from the private sector, local, regional and provincial
 16 organizations and governments.

17 **17.4.4 Potential Effects of the Project and Proposed Mitigation**

18 The EIS will assess how the Project has the potential to adversely affect community
 19 infrastructure and services.

20 The potential to adversely affect community infrastructure and services will be assessed by
 21 taking into account the potential for the Project to result in changes to the following key
 22 aspects:

- 23 • The demand for or provision of community, emergency, education, and health and
 24 social services and facilities
- 25 • Specific displacement or effects to infrastructure, such as sewer and water systems
- 26 • The results of the assessment of the Project on population and demographics will
 27 be used to assess the effects on community infrastructure and services

28 Should potential adverse effects be identified, the potential mitigation measures will be
 29 identified and will include a description of how the mitigation measures can address the
 30 potential adverse effects.

1 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 2 residual effects characterization described in Table 8.3. A statement of significance will be
 3 provided.

4 **17.4.5 Summary of Residual Effects on Community Infrastructure and Services**

5 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

6 **17.5 Transportation**

7 **17.5.1 Transportation Spatial Boundaries**

8 The Proponent proposes the LAA and RAA as described in Table 17.5.

9 **Table 17.5 Transportation assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Transportation	Road and rail networks within the project activity zone	Peace River Regional District

10 **17.5.2 Transportation Temporal Boundaries**

11 The EIS will describe the temporal boundaries, which will reflect the methodology described
 12 in Section 8 of these EIS Guidelines.

13 **17.5.3 Transportation Baseline**

14 The EIS will describe current road and rail transportation conditions, using the following key
 15 indicators:

- 16 • Road traffic volumes
- 17 • Road traffic counts
- 18 • Road accident rates
- 19 • Regional Road restrictions
- 20 • Rail movements

21 Information sources will include published studies and statistics, and information made
 22 available to the Proponent from the private sector, local, regional and provincial
 23 organizations and governments, as well as traffic counts conducted by the Proponent.

24 **17.5.4 Potential Effects of the Project and Proposed Mitigation**

25 The EIS will assess how the Project has the potential to adversely affect transportation.

26 The potential to adversely affect transportation will be assessed by taking into account the
 27 potential for the Project to result in changes to the following key aspects:

- 28 • Road and rail transportation in the LAA as proposed by the Proponent

- 1 • The need to develop and use regional road and rail transportation routes for the
- 2 movement of equipment, materials and people
- 3 • Specific transportation plans proposed by the Proponent
- 4 • Local road and rail traffic forecasts of vehicle and rail movements, with specific
- 5 reference to intersections near the City of Fort St. John, and to specific rail sidings
- 6 and yards
- 7 • The results of the assessment of the Project on population and demographics, the
- 8 workforce accommodation plan, and assumptions about workforce shift schedules
- 9 during construction will be used to assess the effects on transportation

10 Should potential adverse effects be identified, the potential mitigation measures will be
11 identified and will include a description of how the mitigation measures can address the
12 potential adverse effects.

13 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
14 residual effects characterization described in Table 8.3. A statement of significance will be
15 provided.

16 **17.5.5 Summary of Residual Effects on Transportation**

17 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

18 **17.6 References**

19 This subsection will include a list of all supporting references used in the social sections of
20 the EIS.

21 **18 HERITAGE RESOURCES EFFECTS ASSESSMENT**

22 The EIS will summarize the potential adverse effects of the Project on heritage resources,
23 including physical and cultural heritage resources, and any structure, site or thing that is of
24 historical, archaeological, palaeontological or architectural significance.

25 Technical data for physical and tangible cultural heritage resources will inform the effects
26 assessment on the heritage resources VC. The interests of Aboriginal groups, including
27 intangible heritage resources, will be presented in the EIS in accordance with Section 20 of
28 these EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the
29 Proponent will incorporate additional baseline information as made available.

30 The EIS assessment should be informed by the Canadian Environmental Assessment
31 Agency “Reference Guide: Assessing Environmental Effects on Physical and Cultural
32 Heritage Resources (April 1996)”.

33 Technical data will inform the effects assessment on heritage resources. The interests of
34 Aboriginal groups will be presented in the EIS. Where Aboriginal groups have identified
35 interests in a VC, the Proponent will incorporate additional baseline information as made
36 available.

1 18.1 Valued Component Scoping and Rationale

2 The heritage resource VC includes paleontological, historical and archaeological sites, and
 3 the rationale for its selection is described in Table 18.1. The selected VC for heritage
 4 resources has an identified interaction with the Project and there is a legal requirement to
 5 address potential adverse effects on heritage resources.

6 **Table 18.1 Heritage resources valued component rationale**

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Heritage resources	Loss or damage to heritage sites during construction of project components; Inundation as a result of operation of dam and reservoir; Improved access to, exposure of, or publication of heritage sites may increase theft of resources, prospecting or damage to resources; Reduced access to sites may decrease opportunity for study	Interest in heritage sites for cultural heritage preservation	Interests in heritage values, which may have regional, provincial, national or international significance	Required by the BCEAO; Required by Section 2 (b) CEAA; Some sites are protected under <i>Heritage Conservation Act</i> ; Reference Guide on Physical and Cultural Heritage Resources (Agency 1996)

7 18.2 Heritage Resources

8 18.2.1 Heritage Resources Spatial Boundaries

9 The Proponent proposes the LAA and RAA as described in Table 18.2.

10 **Table 18.2 Heritage resources assessment areas**

Valued Component	Local Assessment Area	Regional Assessment Area
Heritage Resources	Project activity zone	Project activity zone

11 18.2.2 Heritage Resources Temporal Boundaries

12 The EIS will describe the temporal boundaries, which will reflect the methodology described
 13 in Section 8 of these EIS Guidelines.

14 18.2.3 Heritage Resources Baseline

15 The EIS will describe location and nature of known heritage resources within the LAA as
 16 proposed as the Proponent.

1 Baseline data will be acquired through literature reviews of published and unpublished
2 records, interviews with stakeholders, and inventory field work. Interviews and literature
3 reviews will identify cultural heritage resources from various sources of information
4 including, but not limited to, Aboriginal communities, academic and research institutions,
5 professional societies and organizations, land use plans, and local citizens or associations
6 involved in the area of heritage conservation and protection.

7 Archaeological and historical site inventory field work will include surface and subsurface
8 inspections, completed in accordance with British Columbia Archaeological Impact
9 Assessment Guidelines (BCMNR01998:13) and permits issued under the *Heritage*
10 *Conservation Act*. Paleontological field work will include surface inspections and specimen
11 collection, completed in accordance with standard practice for the paleontological impact
12 assessment, including development of a geologically based paleontological sensitivity map
13 to guide field investigations.

14 The significance of archaeological and historical resources will be determined using criteria
15 set out in the British Columbia Archaeological Impact Assessment Guidelines (BCMNR0
16 1998:13). Categories of significance include scientific, public, ethnic, historic and economic.
17 The developing BC Fossil Management Framework (BCMNR0 2010) will guide the
18 significance evaluation of paleontological resources.

19 **18.2.4 Potential Effects of the Project and Proposed Mitigation**

20 The EIS will assess how the Project has the potential to adversely affect heritage
21 resources.

22 The potential to adversely affect heritage resources will be assessed by taking into account
23 the potential for the Project to result in changes to the following key aspects:

- 24 • Disturbing heritage sites and features
- 25 • Disturbing elements essential to the heritage character of features
- 26 • Disturbing artifacts, features, human remains and fossils
- 27 • Hindering or increasing access to sites and destroying contextual information (Davis
28 et al. 2004; Williams and Corfield 2003)

29 Should potential adverse effects be identified, the potential mitigation measures will be
30 identified and will include a description of how the mitigation measures can address the
31 potential adverse effects.

32 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
33 residual effects characterization described in Table 8.3. A statement of significance will be
34 provided.

35 **18.2.5 Summary of Residual Effects on Heritage Resources**

36 The EIS will summarize the residual effects in a table format as shown in Table 8.4.

37 **18.3 References**

38 This subsection will include a list of supporting references used in this section of the EIS.

19 HEALTH EFFECTS ASSESSMENT

The EIS will summarize the human health effects based on the methodology described in Section 8 of these EIS Guidelines.

Technical data will inform the effects assessment on human health. The interests of Aboriginal groups will be presented in the EIS in accordance with Section 15 and Section 20 of these EIS Guidelines. Where Aboriginal groups have identified interests in a VC, the Proponent will incorporate additional baseline information as made available.

19.1 Valued Component Scoping and Rationale

The health VC and rationale for its selection is described in Table 19.1. The selected VC is based on health values with potential interaction with the Project, regulatory requirements, and health assessment guidelines (e.g., HC 2010a, HC 2010b, HC 2011).

Table 19.1 Human health valued component rationale

Valued Component	Interaction with Project Components and Activities	Aboriginal Concerns	Public and Stakeholder Issues	Federal and Provincial Regulations and Guidelines
Human Health	Health effects of potential changes to air quality, water quality, noise, electric and magnetic fields and mercury concentrations in country foods.	Changes to use of the land, or environmental conditions, may affect access to or quality of country foods, diet and health; Changes to water quality may affect human health	Public interest in human health	Canadian Environmental Assessment Act, Canadian Public Health Act, BC Health Act, BC Drinking Water and Protection Act, Canadian Handbook on Health Impact Assessment (HC 2004) Environmental Health Assessment (HC 2010a, 2010b); WHO

Notes: HC – Health Canada, WHO – World Health Organization, CIW – Canadian Index of Well-being (CCSD 2009).

19.2 Human Health

19.2.1 Human Health Spatial Boundaries

The Proponent proposes the LAA and RAA as described in Table 19.2. A map characterizing the location of known human receptors will be included in the EIS.

Table 19.2 Human health assessment areas

Valued Component	Local Assessment Area	Regional Assessment Area
Human Health	LAA corresponds to relevant biophysical study areas for air quality, noise, water quality,	Consistent with LAA. RAA corresponds to relevant biophysical study areas for air

	electric and magnetic fields, country foods and mercury	quality, noise, water quality, electric and magnetic fields and mercury
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1 **19.2.2 Human Health Temporal Boundaries**

2 The EIS will describe the temporal boundaries, which will reflect the methodology described
 3 in Section 8 of these EIS Guidelines.

4 **19.2.3 Human Health Baseline**

5 The EIS will describe the current baseline data for human health indicators using
 6 information provided in technical data reports on air quality, water quality, noise, electric
 7 and magnetic fields, and methyl mercury. The baseline data will include the identification of
 8 human health receptor locations.

9 **19.2.4 Potential Effects of the Project and Proposed Mitigation**

10 The EIS will assess how the Project has the potential to adversely affect human health.

11 The potential to adversely affect human health will be assessed by taking into account the
 12 potential for the Project to result in changes to the following key aspects:

- 13 • Ambient air quality
- 14 • Potable and recreational water quality
- 15 • Noise and vibration
- 16 • Electric and magnetic fields
- 17 • Country Foods, including methyl mercury concentrations in fish consumed by
 18 humans

19
 20 Should potential adverse effects be identified, the potential mitigation measures will be
 21 identified and will include a description of how the mitigation measures can address the
 22 potential adverse effects.

23 The EIS will describe project residual effects, and cumulative effects, if applicable, using the
 24 residual effects characterization described in Table 8.3. A statement of significance will be
 25 provided.

26 **19.2.5 Summary Residual Effects on Human Health**

27 The EIS will summarize the residual effects in table format as shown in Table 8.4.

28 **19.3 References**

29 This subsection will include a list of supporting references used in this section of the EIS.

1 **VOLUME 5 – ASSERTED OR ESTABLISHED ABORIGINAL RIGHTS AND**
2 **TREATY RIGHTS, ABORIGINAL INTERESTS AND INFORMATION,**
3 **ENVIRONMENTAL MANAGEMENT PLANS, AND FEDERAL INFORMATION**
4 **REQUIREMENTS**

5 **20 ASSERTED OR ESTABLISHED ABORIGINAL**
6 **RIGHTS AND TREATY RIGHTS, ABORIGINAL**
7 **INTERESTS AND INFORMATION REQUIREMENTS**

8 The EIS will contain an assessment of the potential adverse effects of the Project the
9 exercise of asserted or established Aboriginal rights and treaty rights. This could include the
10 current use and reasonably anticipated future use of lands and resources by Aboriginal
11 persons for traditional purposes as outlined in Section 15.

12 The EIS will:

- 13 • Identify the Aboriginal groups potentially affected by the project, with the guidance of
14 the Governments of British Columbia and Canada, and provide background
15 information about each group
- 16 • Provide the Proponent’s understanding of the asserted or established Aboriginal
17 rights and treaty rights held by each potentially affected Aboriginal group

18

19 **20.1 Aboriginal Groups**

20 The Proponent must consult with the Aboriginal groups that have the potential to be
21 adversely affected by the Project.

22 **[In the final version of the EIS Guidelines, the Minister of Environment of**
23 **Canada and Executive Director of the BCEAO will identify the Aboriginal**
24 **groups that the Proponent must consult with and insert the list here**

25 **20.2 Aboriginal Groups Background Information**

26 The EIS will:

- 27 • Identify Aboriginal groups whose asserted or established Aboriginal rights and treaty
28 rights and Aboriginal interests are potentially affected by the Project
- 29 • Provide background information for each potentially affected Aboriginal group
30 identified in this section, to the extent that information is made available to the
31 Proponent by the Aboriginal groups, or that may be publicly available.

1 **20.3 Asserted or Established Aboriginal Rights and Treaty**
2 **Rights**

3 The EIS will:

- 4 • Identify past, current and reasonably anticipated future use of lands and resources
5 by Aboriginal persons for traditional purposes who may be adversely impacted by
6 the project
- 7 • Identify any asserted or established Aboriginal rights and treaty rights of Aboriginal
8 groups who may be adversely impacted by the project. Assess potential adverse
9 effects of the Project on the current and reasonably anticipated future use of lands
10 and resources for traditional purposes identified above and as assessed in section
11 15
- 12 • Assess potential adverse impacts of the Project on the exercise of asserted or
13 established Aboriginal rights and treaty rights identified above
- 14 • Describe measures to avoid, reduce or otherwise mitigate potential adverse effects
15 on current and reasonably anticipated future use of lands and resources for
16 traditional purposes
- 17 • Describe measures to avoid, reduce or otherwise mitigate potential adverse impacts
18 on the exercise of asserted or established Aboriginal rights and treaty rights
19 identified above

21 **20.4 Other Interests of Aboriginal Groups**

22 The EIS will:

- 23 • Identify interests that Aboriginal groups may have with respect to potential social,
24 economic, health, and physical and cultural heritage effects of the Project
- 25 • Describe how the potential effects on those interests have been considered in the
26 assessment of the potential adverse effects of the Project on VCs or otherwise
- 27 • Describe the Proponent’s approach to building capacity, for example opportunities
28 for Aboriginal employment, contracting, and business development

29 **20.5 Aboriginal Consultation and Engagement**

30 The EIS will:

- 31 • Summarize project consultation and engagement undertaken prior to the
32 acceptance of the Project Description Report, the issuance of these EIS Guidelines,
33 and the submission of the EIS
- 34 • Identify any Impact Benefit Agreements that have been concluded by the time the
35 EIS is submitted

- 1 • Describe mitigation measures identified by Aboriginal groups and the Proponent's
- 2 response to those measures
- 3 • Describe consultation and engagement methods, including specific consultation
- 4 agreements entered into between the Proponent and Aboriginal groups, and
- 5 opportunities provided to Aboriginal groups to identify rights, interests and concerns
- 6 related to the Project
- 7 • Provide a plan for consultation with Aboriginal groups on the EIS

8 **20.6 Aboriginal Summary**

9 The EIS will provide a summary of the Proponent's understanding of the Aboriginal groups'
10 asserted or established Aboriginal rights and treaty rights, and other Aboriginal interests
11 potentially impacted by, and concerns with respect to, the Project. The summary will also
12 provide the Proponent's understanding of the potential adverse effects of the Project on
13 those asserted or established Aboriginal rights and treaty rights and interests.

14

15 The Proponent will provide a copy of the summary to Aboriginal groups.

16 **20.7 References**

17 This subsection will include a list of supporting references used in this section of the EIS.

18 **21 SUMMARY OF PROPOSED ENVIRONMENTAL**

19 **MANAGEMENT PLANS**

20 The EIS will describe the framework for environmental management to be implemented
21 during construction and operation to mitigate potential adverse effects. The framework will
22 include:

- 23 • The Proponents' environmental policies
- 24 • Statutory requirements
- 25 • Objectives and voluntary commitments
- 26 • Relevant human resource plans
- 27 • Environmental compliance monitoring
- 28 • Mitigation and environmental protection measures
- 29 • Contingency planning for accidents

30 The framework, in the form of an annotated outline, will be presented in the EIS for each
31 environment management plan (EMP). Annotated outlines will be provided for the following
32 EMPs:

1 **Construction Safety Management Plans**

- 2 • Emergency Response Plan
- 3 • Fire Hazard and Abatement Plan
- 4 • Public Safety Management Plan
- 5 • Worker Safety and Health Management Plan

6 **Construction Environmental Management Plans**

- 7 • Acid Rock Drainage Management Plan
- 8 • Air Quality Management Plan
- 9 • Archaeological and Heritage Resources Management Plan
- 10 • Blasting Management Plan
- 11 • Borrow and Quarry Sites Reclamation Plan
- 12 • Communication Plan: Construction
- 13 • Construction Waste Management Plan
- 14 • Contaminated Sites Management Plan
- 15 • Dust Control Plan
- 16 • Environmental Training Management Plan
- 17 • Erosion Prevention and Sediment Control Plan
- 18 • Fisheries and Aquatic Habitat Management Plan
- 19 • Groundwater Protection Plan
- 20 • Hazardous Waste Management Plan
- 21 • Ice Management Plan
- 22 • Noise and Vibration Management Plan
- 23 • Reservoir, Transmission Line and Road Clearing Plans
- 24 • Soil Management, Site Restoration and Re-Vegetation Plan
- 25 • Solid Waste Management Reduction and Recycling Plan
- 26 • Surface Water Quality Protection Plan
- 27 • Traffic Management Plan
- 28 • Wildlife Management Plan
- 29 • Vegetation and Invasive Plant Management Plan

1 **Operational Safety Management Plans**

- 2 • Emergency Response Plan
- 3 • Public Safety Management Plan
- 4 • Worker Safety and Health Management Plan
- 5 • Reservoir Shoreline Monitoring and Management Plan

6 **Operational Environmental Management Plans**

- 7 • Hazardous Materials Management Plan
- 8 • Ice Management Plan
- 9 • Materials Management Plan
- 10 • Vegetation Management Plan
- 11 • Waste Management Plan
- 12 • Water Management Plan

13 The Emergency Response Plans for construction and operations and the Environmental
14 Management plans will address contingency and response planning for the accidents and
15 malfunctions identified in the EIS.

16 **21.1 References**

17 This subsection will include a list of supporting references used in this section of the EIS.

18 **22 COMPLIANCE REPORTING**

19 The EIS will describe the reporting structure as identified in the environmental management
20 plans and conditions.

21 **22.1 References**

22 This subsection will include a list of supporting references used in this section of the EIS.

23 REQUIREMENTS FOR THE FEDERAL ENVIRONMENTAL ASSESSMENT

Federal requirements of the environmental assessment of the Project are addressed in various sections of these EIS Guidelines. Table 23.1 describes how the federal requirements will be addressed in the EIS.

Table 23.1 Federal requirements effects assessment concordance table

Federal Requirement	Relevant Section of These EIS Guidelines
Indirect Effects: Section 16(1) of the CEAA requires an assessment of the “environmental effects” of the Project. Subsection 2(1) of CEAA defines “environmental effect” to include certain indirect effects.	The requirements to assess the following indirect effects are found in the sections of these EIS Guidelines referred to below: <ul style="list-style-type: none"> • socio-economic - Volume 3 (Economic) and Volume 4 (Social) • health - Section 19 • the current use of lands and resources for traditional purposes by Aboriginal persons - Section 15 • any structure, site or thing that is of historical, archaeological, paleontological or architectural significance - Section 18 • physical and cultural heritage – Section 18
Alternatives to and Alternative means	Section 4 of these EIS Guidelines
Need for and Purpose of the Project	Section 4 of these EIS Guidelines
<i>Species at Risk Act</i>	Volume 2 of these EIS Guidelines
Comments from the Public and Aboriginal persons	Volume 1 of these EIS Guidelines
Current Use of Lands and Resources for Traditional Purposes by Aboriginal persons	Section 15 of these EIS Guidelines
Effects of the Environment on the Project	Section 23.1 of these EIS Guidelines
Potential Accidents and Malfunctions	Section 23.2 of these EIS Guidelines
Cumulative Effects	Section 23.3 of these EIS Guidelines and the Effects Assessment sections 10-19
Capacity of Renewable Resources	Section 23.4 of these EIS Guidelines
Consideration of the Need for, and Requirement of,	Section 23.5 of these EIS Guidelines

any Follow-up Program	
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23.1 Effect of the Environment on the Project

The EIS will identify the type, location, frequency and magnitude of environmental factors that may adversely affect the Project. The environmental factors that will be assessed are: extreme weather events; sedimentation of the reservoir; seismic activity; wildfire; flooding; slope stability and mass wasting events; and climate change.

The EIS will identify changes and assess the potential adverse effects on the Project that may be caused by the above-mentioned environmental factors, evaluate the likelihood and severity of the changes or effects, and describe design strategies and management measures planned to mitigate the potential adverse effects of the Project.

23.2 Potential Accidents and Malfunctions

The EIS will review all parts of the Project to identify those that have the potential, through accident or malfunction, to adversely affect the environment.

The EIS will identify potential accidents and malfunctions that could occur during the construction and operations phases. For example:

Construction phase:

- release or spill of chemicals or hazardous materials; containment pond leakage or failure; cofferdam failure; sediment control failure; fire and explosion.

Operations phase:

- dam safety incidents; release or spill of chemicals or hazardous materials; fire and explosion.

The EIS will describe the effects of a dam break at Site C by tabulating the expected flood arrival time and water surface elevation at all inhabited locations downstream until the estimated water surface is within the estimated 200 year flood level (the level used in British Columbia to delineate natural flood hazard areas).

Dam break analyses will be described for

- construction – failure of the main upstream cofferdam; and
- operations – failure of the earthfill dam.

The EIS will describe the Emergency Preparedness Plans that will be prepared for the cofferdams and the completed facility. Emergency Preparedness Plans will follow the Canadian Dam Association's Dam Safety Guidelines and comply with the BC Dam Safety Regulations. The EIS will commit to submitting the Emergency Preparedness Plans to the BC Comptroller of Water Rights (as the regulator responsible for dam safety in BC). The Emergency Preparedness Plans for the cofferdams will be submitted prior to diversion of the river through the diversion tunnel, and the Emergency Preparedness Plans for the dam would be submitted prior to reservoir filling. In both cases the Emergency Preparedness Plans will be submitted with sufficient time to make changes that the BC Comptroller of Water Rights may require prior to impounding water.

1 The EIS will identify the potential effects of accidents and malfunctions on Valued
2 Components.
3 The likelihood and circumstances under which these events could occur will be assessed
4 along with the potential adverse effects that may result from such events.
5 The EIS will provide an overview of the measures that would be implemented to reduce the
6 likelihood and those that could be implemented to mitigate the potential occurrence of an
7 accident or malfunction.

8 **23.3 Cumulative Environmental Effects**

9 The EIS will provide an assessment of the potential cumulative adverse effects that are
10 likely to result from the Project in combination with other projects or activities that have
11 been or will be carried out.

12 **23.4 Capacity of Renewable Resources**

13 The EIS will describe the type of renewable resources that may be significantly adversely
14 affected by the Project.

15 **23.5 Consideration of the Need for, and Requirements of, any** 16 **Follow-up Program**

17 In each case where the environmental assessment demonstrates that the Project is likely to
18 result in a residual adverse effect, the EIS will describe the consideration given to the need
19 for, and the requirements of, any follow-up program, including monitoring and adaptive
20 management, taking into account the following:

- 21 • Whether, taking into account mitigation, the residual adverse effect would be
22 significant
- 23 • The feasibility and nature of any mitigation measures proposed by the Proponent
- 24 • Taking into account any mitigation measures proposed by the Proponent, the level
25 of confidence with which the assessment of the magnitude, extent, duration,
26 frequency, and reversibility of the residual adverse effect have been assessed

27 **23.6 References**

28 This subsection will include a list of supporting references used in this section of the EIS.

29 **24 SUMMARY OF POTENTIAL RESIDUAL EFFECTS** 30 **OF THE PROJECT**

31 The EIS will summarize each residual environmental, economic, social, heritage or health
32 effect in a table format as shown below.

1 **Table 24.1 Summary of assessment of potential environmental effects**

Potential Residual Effects	Project Phase	Contributing Project Activity or Physical Works	Proposed Mitigation	Significance
e.g., Fish and Fish Habitat, Wildlife Resources				
e.g. Furbearers				

2 **25 PROPONENT’S TABLE OF CONDITIONS**

3 The EIS will provide a description of each condition that may be necessary to conclude that
 4 a potential adverse effect is either unlikely to result from the Project or unlikely to be
 5 significant.

6 The EIS will present the conditions in table format as shown below.

7 **Table 25.1 Table of conditions**

Number	Condition	Project Phase	Basis for Condition	Interested Government Agency	Status
e.g., Fish and Fish Habitat, Wildlife Resources					

8 **26 CONCLUSION**

9 The EIS will provide the Proponent’s conclusion as to the potential benefits of the Project
 10 and whether the Project will result in any significant adverse effects.

11 **27 EIS GUIDELINES REFERENCES**

12 In preparing these EIS Guidelines, the following references were used:

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1 **28 APPENDICES**

- 2 The EIS will include a series of technical data reports and other documentation used to
- 3 support the content of the EIS.