RESPONSE TO WORKING GROUP AND PUBLIC COMMENTS ON THE SITE C CLEAN ENERGY PROJECT ENVIRONMENTAL IMPACT STATEMENT

Technical Memo

CUMULATIVE EFFECTS ASSESSMENT

MAY 8, 2013

Subject: Cumulative Effects Assessment

Purpose

A number of comments have been received from the public, Aboriginal groups and some government agencies suggesting the need to expand the scope of the cumulative effects assessment to include a pre-development case and to take into account a broad range of future projects and activities. A number of comments also asked for additional detail on the methods used in the EIS to assess cumulative effects.

The purpose of this memorandum is to demonstrate that the potential cumulative effects of the Project have been assessed in a reliable, scientifically sound manner that meets the requirements of the EIS Guidelines. This memorandum also demonstrates that the requirement of Section 19(1)(a) of CEAA 2012 to assess the "… cumulative environmental effects that are likely to result from the [Project] in combination with other physical activities that have been or will be carried out…" has been met.

Information about the following is provided in this Technical Memo:

- Scope of the Cumulative Effects Assessment and the Development of the EIS Guidelines
- The Spatial Boundaries of the Assessment of the Cumulative Effects of the Project: the Regional Assessment Area
- The Temporal Boundaries of the Assessment of Potential Cumulative Effects
    - The Statutory Requirement
    - Suggestions to Incorporate a Pre-development Case
    - The Scope of Reasonably Foreseeable Projects and Activities
    - Three "Cases" for Assessment of Potential Cumulative Effects of the Project
- Further Information on the Methodology for Assessing Cumulative Effects
    - Development of the Project Inclusion List for the Cumulative Effects Assessment
    - Mitigation Measures of Cumulative Effects
    - Characterization of Cumulative Effects
    - Characterization of Context
- The Potential Cumulative Effects of the Project
- Inclusion of Additional Projects in the Cumulative Effects Assessment

Scope of the Cumulative Effects Assessment and the Development of the EIS Guidelines

In section 8.5.3 of the EIS Guidelines, the requirements for conducting the assessment of the potential cumulative effects of the Project are set out. The methodology used to conduct the assessment of the

potential cumulative effects of the Project is described in detail in the EIS in section 10.5 (Cumulative Effects Assessment) and in section 37.3 (Cumulative Environmental Effects).

The EIS Guidelines were developed in accordance with the requirements of Sections 3.4 through 3.8 of the BC/Canada Agreement. That process commenced in January 2012, when BC Hydro submitted the first draft of the EIS Guidelines, and concluded on September 7, 2012 when the Minister of Environment of Canada and the Executive Director of the EAO issued the final EIS Guidelines. During that process, members of the public and of the Working Group submitted, and BC Hydro responded to, numerous comments on the scope of the assessment of the cumulative effects of the Project. The Minister of Environment of Canada and the Executive Director of the EAO had the benefit of those comments and responses, and of the advice of the members of the Working Group, when exercising their authority to review, finalize and issue the EIS Guidelines.

The Spatial Boundaries of the Assessment of the Cumulative Effects of the Project: the Regional Assessment Area

In order to meet the requirements of the EIS Guidelines to predict the cumulative effects of the Project on each VC where the Project is likely to result in a residual adverse effect, a Regional Assessment Area (RAA) was developed. The RAA for each VC is described in Table 10.4 and again in Table 37.22 of the EIS. The spatial boundaries of the RAA for each VC (see Table 10.4 and Table 37.22) have been developed based on consideration of:

- The extent to which the residual effects of other projects or activities could overlap spatially and temporally
- Ecologically defensible boundaries (e.g., wildlife range boundaries)

In accordance with Section 8.5.3.1 of the EIS Guidelines, "… *cumulative effects in the RAA* … " were to be assessed "… *if the potential residual effect of the Project on that VC has a spatial and temporal overlap with a residual effect of another project or activity*." As required by Section 8.5.2.3 and Table 8.3 of the EIS Guidelines, the geographic extent of all of the potential residual effects of the Project have been characterized. Consequently, the analysis identifies the potential cumulative effects of the Project wherever they would likely occur.

To assess the potential cumulative effects of the Project on Wildlife Resources[1] the RAA was defined such that the potential effects of reasonably foreseeable projects and activities well removed from the LAA were taken into account, as they may still remove suitable habitats or affect species that are the same as those affected by the Project. Similarly, in order to assess the potential cumulative effects of the Project on Vegetation and Ecological Communities,[2] the RAA was defined such that the potential effects of reasonably foreseeable projects and activities well removed from the LAA were taken into account, as they may still remove rare plants and terrestrial habitats that are the same as those affected by the Project.

[1] EIS, Section 14.6.2, page 14-91.

[2] EIS, Section 13.5.2, page 13-40.

The Temporal Boundaries of the Assessment of Potential Cumulative Effects

The temporal boundaries of the assessment of the potential cumulative effects of the Project were established taking into account the statutory requirement set out in Section 19(1)(a) of CEAA 2012 and the requirements of the EIS Guidelines. Discussed below are the following:

- The statutory requirement to assess cumulative effects
- The three "cases" for assessment of potential cumulative effects of the Project
- Accounting for the effects of physical activities that "will be carried out"
- BC Hydro's response to suggestions to incorporate a pre-development case
- BC Hydro's response to suggestions to incorporate a Pre-Bennett Dam case
- BC Hydro's response to suggestions to use "scenarios" to account for activities that "will be carried out"
- The purpose of the description of Previous Developments in Section 11.1 of the EIS

The Statutory Requirement to Assessment Cumulative Effects

Section 19(1)(a) of CEAA 2012 requires the assessment of:

> "… any cumulative environmental effects that are likely to result from the designated project in combination with other physical activities that have been or will be carried out;"

In order to assess the potential cumulative effects of the Project, the effects of two other types of physical activities have to be accounted for, those that "have been" carried out and those that "will be" carried out.

Three "Cases" for Assessment of Potential Cumulative Effects of the Project

To meet the requirements of CEAA 2012 and the EIS Guidelines, three cases were developed in assessing the potential cumulative effects of the Project.

Baseline Case

The Baseline Case demonstrates the current status of the VC, which necessarily ensures that the effects of all projects and activities that "…*have been … carried out* …" are accounted for in the assessment of the cumulative effects of the Project. September 5, 2012 was chosen to demarcate the Baseline Case from the future cases described below, because 1) the EIS Guidelines are dated September 5, 2012 (they were issued by the federal Minister of Environment and the Executive Director of the BCEAO on September 7, 2012), and 2) by September 5, 2012, BC Hydro had developed the assessment of potential effects and cumulative effects of the Project.

Future Case without the Project

Projects and activities that "will be carried out" are necessarily more certain than the Project itself. The assessment of cumulative effects recognizes that while those projects and activities will be undertaken, their residual effects are not necessarily reflected in the current status of the VC. To address this, for

each VC carried through the cumulative effects assessment, a "future case without the Project" was developed taking into account the residual effects of projects and activities that are as likely, or more likely, than the Project itself, to proceed (see EIS Guidelines, Section 8.5.3, EIS Sections 10.5.1.2 and 37.3.1.2. The list of those projects and activities was developed in accordance with the requirements of Section 8.5.3.2 of the EIS Guidelines. The "future case without the Project," is the baseline against which the potential cumulative effects of the Project have been characterized.

Project Case

To demonstrate the cumulative effects that are likely to result from the Project, the Project Case for each VC was developed. In this case, the potential cumulative effects of the Project on each VC have been predicted by taking into account the potential residual effects of the Project that are likely to combine in time and space with those identified in the Future Case without the Project.

Accounting for the Effects of Physical Activities that "Will Be Carried Out"

The CEA Agency has published guidance stating that in order to account for the effects of other projects and activities that "will be carried out," reasonably foreseeable future projects and activities should be considered. For the reasons discussed below, for the purposes of an environmental assessment conducted under BCEAA, CEAA 2012, and the BC/Canada Agreeement, only those projects that are at least as foreseeable as the project undergoing assessment – the Project in this case - should be considered reasonably foreseeable.

Under BCEAA, the purpose of environmental assessment is to determine whether an Environmental Assessment Certificate can be issued.[3] Under CEAA 2012, the purpose is to determine whether an affirmative "decision"[4] can be made and "decision statement"[5] issued. These determinations are made, in part on the basis of the assessment of the potential cumulative effects of the project being assessed. If, taking into account a project that is less foreseeable and less certain than the project being assessed, a significant cumulative adverse effect may result, then a potentially illogical situation would arise. The project undergoing assessment, which is relatively advanced and the effects of which are otherwise acceptable, might not be allowed to proceed in the near term because a less certain, less well-understood, more speculative project <u>might</u> proceed in the longer term future.

The analytical objective of environmental assessment is to determine whether adverse effects are likely to occur. In order to conduct a cumulative effects assessment that takes into account less certain projects and activities, it would be necessary to assume, incorrectly, that those projects are at least as likely as the Project to proceed and, consequently, that they are as likely to result in residual effects. This assumption introduces uncertain information about activities that fall outside the statutory requirement to account for the effects of physical activities that "will be" carried out. The introduction of uncertain, irrelevant information would mean that the environmental assessment authorities would not be able treat the results with confidence nor conclude that they had conducted the assessment of cumulative effects required by Section 19(1)(a) of CEAA 2012.

[3] BCEAA, Section 17.
[4] CEAA 2012, Sections 52, 53.
[5] CEAA 2012, Section 54.

A more scientifically sound approach, and one which is consistent with the statutory requirement to take into account the effects of physical activities that will be carried out,[6] is to limit the scope of the cumulative effects assessment to projects and activities that are at least as foreseeable as the project under assessment. If, and when, a less certain project is advanced, the potential residual effects of that project would be better understood and any residual effects of the Project would then be taken into account. The result would be a more scientifically objective and reliable prediction of whether a significant cumulative effect is likely.

Suggestions to Incorporate a Pre-development Case

A number of parties have suggested that BC Hydro undertake a "pre-development" case as part of the cumulative effects assessment of the Project. BC Hydro notes that this suggestion was considered in the process of development of the EIS Guidelines.

As BC Hydro explained in its Topic Summary: Cumulative Effects Assessment (June 22, 2012), i) a pre-development case is not necessary in order to predict the cumulative effects of the Project; ii) any pre-development case would be inherently unreliable; and iii) there is no method for extrapolating from a pre-development case in order to predict the potential cumulative effects of the Project, effects which would occur in the future.

A Pre-Development Case is Not Required

A pre-development case is not required in order to take into account the effects of all past projects and activities that have been carried out, because those effects are necessarily reflected in the current baseline conditions. Similarly, a pre-development case is not required to take into account the residual effects of other physical activities that will be carried out. Accordingly, the cumulative effects of the Project can be predicted without a pre-development case. This has been done in many other environmental assessments.

A Pre-Development Case Would be Unreliable

Further, a pre-development case would be unreliable. There are two methods by which a pre-development case might be developed. Firstly, if direct, reliable data about the pre-development state is available, that information could be used. BC Hydro is not aware of data from the pre-development era. Secondly, in the absence of data from the pre-development era, various assumptions would have to be made in order to emulate pre-development conditions. The longer the period of time between current conditions and the pre-development era, the greater the uncertainty would be.

BC Hydro is aware that a pre-development case was done for the environmental assessment of an oil sands project and is currently underway for another. However, the method used for the assessment of that project could not be applied reliably in the context of the Project. The reason for this is that oil sands projects are located in relatively undisturbed and homogeneous ecological and geological environments where baseline conditions generally reflect the pre-development state. This is not the case for the Project. The area in the vicinity of the Project has been subject to a wide variety of relatively intense development activities for a long period of time (see section 4.1 of the EIS). Creating a pre-development case for the Project would require hind-casting over a century. The resulting uncertainty would make the results meaningless for the purpose of an environmental assessment.

[6] CEAA 2012, Section 19(1)(a).

The most reliable means by which the effects of past activities and projects can be taken into account in assessing the potential cumulative effects of Project, which will arise in the future, is to use the present day baseline, which can be assessed directly.

There is No Method to Predict Cumulative Effects Using a Pre-Development Case

Finally, there is no "formula" by which the cumulative effects of the Project, which will arise in the future, can be predicted using a pre-development case.

Suggestions to Incorporate a Pre-Bennett Dam Case

Several parties have made comments suggesting that a pre-Bennett Dam case ought to be developed. As explained above, a pre-development case is not required to assess the potential cumulative effects of the Project. For the same reasons, an intermediate case, such as a case set at an arbitrary point in time prior to the construction of the Bennett Dam, which was commissioned over 40 years ago, is not required to assess the potential cumulative effects of the Project.

Suggestions to Use "Scenarios" To Account for Activities that "Will Be Carried Out"

Some comments from the public and the Working Group have suggested that a number of different future scenarios be developed for the assessment of cumulative effects. The "Scenarios of Future Developments in Cumulative Effects Assessment: Approaches for the Mackenzie Gas Project" was referenced in a comment. This document was prepared by Greig and Duinker at the request of the Joint Review Panel to help address issues raised by intervenors of potential cumulative effects of future developments. The study states the following:

> "Cumulative effects (positive and negative) of many types clearly depend heavily on goverment preparedness and choices. Strategic environmental assessments, land use plans and systems of protected areas are instruments with which governments prepare themselves to manage such effects. Unlike some other jurisdictions, however, the Mackenzie Valley contains regions where some or all of these management instruments are absent."

In the assessment of the MacKenzie Gas Project, the "scenarios" assisted in the identification of physical activities that were likely to be carried out. A scenario analysis is not required for that purpose in order to assess the potential cumulative effects of the Project. In British Columbia, government agencies have issued various planning policy documents in order to guide development in the region. The scope of reasonably foreseeable projects and activities can be identified reliably.

Previous Developments

As required by Section 9.1 of the EIS Guidelines, in the EIS, the existing hydroelectric facilities on the Peace River, WAC Bennett Dam and Peace Canyon Dam, have been described. While this information may be relevant to the assessment of potential cumulative effects,[7] the Minister of Environment of

[7] EIS Guidelines, Section 8.5.3, page 34: "Information contained in Section 9.1 Previous Developments may contribute to the cumulative effects assessment".

Canada and and the Executive Director of the EAO did not require this information for that purpose. Rather, as stated in Section 9.1:

> "An understanding of those facilities, of the environmental changes understood to have resulted from those facilities, and of the mitigation measures employed may provide information that could be used to better assess the potential effects of the Project and the feasibility of proposed mitigation measures … This narrative discussion should include historical data, where available and applicable, to assist interested parties to understand the potential effects of the Project and how they may be addressed."

Further Information on the Methodology for Assessing Cumulative Effects

Some of the comments submitted by the public and the Working group ask for additional detail on the cumulative effects assessment methodology for each VC. Additional information is provided in the section below.

Development of the Project Inclusion List for the Cumulative Effects Assessment

In order to develop a project inclusion list, the information sources identified in Section 8.5.3.2 of the EIS Guidelines[8] were reviewed to identify other projects and activities located within the largest RAA to be taken into account in the Future Case without the Project and in the Project Case.[9]

To determine whether specific projects or activities identified from the information sources were to be taken into account in the cumulative effects assessment, project wide spatial and temporal criteria were developed (Table 10.5).[10] Those criteria were used to develop a conservative list of candidate projects and activities found within the largest RAA. [11]

[8] EIS Guidelines, page 35.
[9] EIS, Section 10.5.2.1, page 10-13.
[10] EIS, Section 10.5.2.2, page 10-15.
[11] EIS, Section 10.5.2.2,. page 10-14.

Table 1 Screening Criteria Used to Identify Other Projects and Activities for Consideration in the Cumulative Effects Assessment (Table 10.6 in the EIS)

Type of Overlap	Excluded	Included
Spatial	– Project or activity is outside the largest RAA. By using a conservatively large RAA, all potential cumulative effects for VCs were captured. – Project or activity is located in Alberta beyond 100 m of the Peace River high water mark or further downstream than Fort Vermilion (i.e., downstream of the RAA boundary of the Fish and Fish Habitat VC).	– Project or activity is within the largest RAA. – Project or activity is located in Alberta within 100 m of Peace River high water mark and as far downstream as Fort Vermilion.
Temporal	– Project was in operation or activity was occurring prior to September 5, 2012; therefore, associated residual effects may be reflected in baseline case conditions.[a] – Project or activity is not reasonably foreseeable (i.e., not as likely to proceed as Site C Clean Energy Project).	– Active projects in federal or provincial environmental assessment or other regulatory process. – Approved projects and activities that are: o not constructed o under construction or o constructed, but not operational – Project or activity is reasonably foreseeable (i.e., at least as likely to proceed as the Site C Clean Energy Project).

NOTES:

[a] Effects from potentially overlapping projects or activities that are recently operational may or may not be fully reflected in baseline conditions. Those projects and activities have been evaluated in the VC cumulative effects sections to determine whether they should be included in Baseline Case or the Future Case without the Project and the Project Case.

Sections 10.5.2.3 through 10.5.2.10 of the EIS[12] contain a detailed discussion of the process undertaken to review the information sources is set out in Section 8.5.3.2 of the EIS Guidelines to identify specific projects to be considered in the assessment of cumulative effects of the Project.

A list of all other future foreseeable projects and activities considered in the assessment of the potential residual effects of the Project is provided in Volume 2 Section 10.5.3 Cumulative Effects Assessment, Table 10.7.[13] That table is reproduced below. The locations of these other projects and activities are shown in Figure 10.3, Figure 10.4, Figure 10.5, and Figure 10.6 in the EIS.

[12] EIS, pages 10-15 to 10-19.

[13] EIS, page 1—20.

Table 2 List of other Projects and Activities for Consideration in the Cumulative Effects Assessments

Project Name	
Alliance Pipeline Sunrise Meter Station Relocation*	Moberly River Pipeline Replacement Project*
Babkirk Secure Landfill Project	Montney Gas Play
Cabin Gas Plant Project*	Mount George Wind Park
Carbon Creek Coal Mine	Mt. Milligan Gold-Copper Project (Town of Mackenzie Rail Loadout Facility Options)
Dawson Creek-Chetwynd Area Transmission	Murray River Coal Project
Dawson Creek Processing Plant*	Northern Gateway Pipeline Project
Dokie Wind Project Phases I* and II	Northern Rockies Secure Landfill*
Dunvegan Hydroelectric Project	Ojay Pipeline Project*
Farrell Creek 88-I South Gas Plant	Provident Beatton River Replacement *
Fort Nelson Processing Plant*	Pacific Trail Pipeline Project
Fortune Creek Gas	Quality Wind Project
Gething Coal Project	Quintette Coal Project
Giscome Quarry and Lime Project	Rocky Creek Energy Project
Groundbirch East Receipt Meter Station*	Roman Coal Mine
Groundbirch Mainline Project*	Septimus Pipeline Project*
Hackney Hills Wind Project	Thunder Mountain Wind Project
Heritage Secure Landfill Project	Transmission North 2011 Pipeline Project*
Hermann Mine Project	Transmission North 2012 Pipeline Project
Horizon Mine Coal Project	Tumbler Ridge Wind Energy Project
Horn River Basin Gas Play	Wartenbe Wind Energy Project
Komie North Extension Pipeline Project	Wildmare Wind Energy Project
McGregor/Herrick Hydroelectric Project	Wolverine Secure Landfill Project
Meikle Wind Energy Project	
*These projects have been in operation since 2010, 2011, or 2012, so residual effects on VCs may be reflected in baseline conditions. However, the determination of whether these projects were included in the baseline conditions or future case scenarios and the supporting rationale will vary for VCs, and is described in Sections 12 to 33.	
Administrative Plans	
City of Dawson Creek Official Community Plan (2009)	North Peace Fringe Area Bylaw No. 1870 (2009)
District of Chetwynd Official Community Plan Bylaw No. 919 (2010) and Amendments	Peace River Regional District, Dawson Creek Rural Area Official Community Plan Bylaw No. 477 (1986)
District of Hudson's Hope Official Community Plan Amendment Bylaw No. 804 (2011)	Peace River Regional District, Rural Area Official Community Plan Bylaw No. 1940 (2011)
District of Mackenzie Official Community Plan and Amendments (1996 - 2010)	Peace River Regional District, West Peace Official Community Plan Bylaw No. 1986 (1997)
District of Taylor Official Community Plan Bylaw No. 509 (1995)	Proposed Peace River - Boudreau Lake Protected Area
District of Tumbler Ridge Official Community Plan Bylaw No. 498 (2005)	South Peace Fringe Area Official Community Plan (2009 - 2012)
Fort St. John Official Community Plan Bylaw No. 2076 (2011)	Village of Pouce Coupe Official Community Plan Bylaw No. 930 (2010)

Northern Rockies Regional Municipality, Fort Nelson, Official Community Plan	
Water Licences	
Crew Energy Oilfield Injection, Pine River, 25 km west of Septimus pipeline	Refer to Figure 10.6 Forestry and Water Use Tenure Applications Considered in the Cumulative Effects Assessment
Tenure Applications	
Refer to Figure 10.5 British Columbia Land Tenure Applications Considered in the Cumulative Effects Assessment	Refer to Figure 10.6 Forestry and Water Use Tenure Applications Considered in the Cumulative Effects Assessment
Timber Harvesting	
Refer to Figure 10.6 Forestry and Water Use Tenure Applications Considered in the Cumulative Effects Assessment	
Spatially Relevant Existing Waste Discharges	
Fort St. John's treated sewage outfall	Spectra Gas Inc. refinery outfall in Taylor
Peace River Regional District's outfall	Town of Peace River, Alberta treated sewage outfall

To assess the potential cumulative effects on particular VCs, this list of projects and activities was reviewed to identify specific projects and activities to be taken into account.[14] Details for each VC are provided below.

The following steps were taken in the assessment of cumulative effects on a VC:

- Projects and activities listed in section 10.5.2 in the EIS were identified for consideration in the assessment of cumulative effects based on whether they were located within the RAA specific for each VC.
- Residual effects of these other projects and activities were estimated based on publicly available Project information (e.g., documentation, schedules, details and locations. Projects considered for each VC are appended to this Technical Memo. Projects listed in Volume 2, Table 10.7 as being in operation since 2010, 2011, and 2012 were reflected in baseline conditions.
- Temporal and spatial overlap of residual effects was determined.

Mitigation Measures for Cumulative Effects

Section 8.5.3.3 of the EIS Guidelines requires BC Hydro to provide recommendations for possible regional approaches to mitigation where potential cumulative effects have been identified. This requirement reflects the fact that cumulative effects are a combination of residual effects of separate projects and activities. Those residual effects would arise after the application of mitigation by the separate proponents.

[14] EIS, Section 10.5.2.2,. page 10-14.

As required, the EIS provides recommendations for possible regional approaches to mitigation. These mitigation measures involve government departments and third parties in independent and in collaborative initiatives. No mitigation has been proposed where no cumulative effects are predicted.

Characterization of Cumulative Effects

As required by Section 8.5.3.3 of the EIS Guidelines, the potential cumulative effects of the Project have been characterized using the criteria set out in Table 8.3 of the EIS Guidelines. Specific criteria were developed for each VC and are described in each VC specific section of the EIS (Volume 2 sections 12 to 15, Volume 3 sections 16 to 27 and Volume 4 section 28 to 33).

The Potential Cumulative Effects of the Project

In the EIS, the assessment of the potential cumulative effects of the Project on each VC are, along with the potential effects of the Project, described in separate sections. In addition, the potential cumulative effects of the Project are summarized in Volume 5, Section 37.3.

The results of the assessment of the potential cumulative effects of the Project on the VCs can be grouped into five categories. Each of these categories is discussed below.

No Cumulative Effects because no Residual Adverse Effects

The first category is for those VCs where the assessment demonstrates that the Project is unlikely to result in a residual adverse effect. The VCs in this category are:

1. Local Government
2. Labour Market
3. Regional Economic Development
4. Forestry
5. Oil, Gas and Energy
6. Minerals and Aggregates
7. Human Health

In the absence of a residual effect, the Project would not result in a cumulative effect on these VCs.

Residual effects of Reasonably Foreseeable Projects and Activities Accounted for in the Baseline

A second category is where the assessment of the potential effects of the Project on the VC was, in effect, an assessment of potential cumulative effects. For these VCs, the effects of other reasonably foreseeable projects were accounted for in the baseline of the effects assessment. For example, the potential effects of the Project on Population and Demographics were assessed taking into account the projections of population that were themselves derived taking into account changes in population that would result from reasonably foreseeable projects and activities. This made a separate cumulative effects assessment redundant.

The VCs which fall into this catgory are:

1. Population and Demographics[15]
2. Housing[16]
3. Community Infrastructure and Services[17]
4. Transportation[18]

For each of these VCs, the cumulative effects of other reasonably foreseeable projects was included in the effects assessment of the Project.

VCs with Residual Effects but No Cumulative Effects

A third category includes those VCs where the assessment demonstrates that the Project is likely to result in residual adverse effects on the VC, but those residual effects are unlikely to overlap in time and space with the potential adverse effects of other reasonably foreseeable projects or activities. Consequently, for the VCs in this category, the Project is unlikely to result in a cumulative effect. Each of the VCs in this category are discussed below.

Fish and Fish Habitat

The assessment of the potential cumulative effects of the Project on Fish and Fish Habitat identified two projects within the RAA (Dunvegan and the Montney Gas Play) that might have residual effects within the LAA that overlap with residual effects of the Project on Fish and Fish Habitat. However, upon review of the potential effects of these projects, neither Dunvegan nor the Montney Gas Play are expected to have overlapping residual effects with the Project. Accordingly, no cumulative effects are anticipated.[19]

Agriculture

The assessment of the potential cumulative effects of the Project on Agriculture concluded that no other reasonably foreseeably projects have any spatial overlap with the residual effects of the Project on Agriculture because none have residual effects on the agricultural land in the LAA. Further, while there is one land tenure within the LAA, this tenure is included within the effects assessment of the Project. Accordingly, there was no need to conduct any further assessment of cumulative effects.[20]

Navigation

The project results in a residual effect on water-based navigation. There are no other water-based projects within the RAA. Although the Project overlaps in time and space with recreational activities in the RAA, there is no adverse cumulative effect of these activities that would combine with the residual effects of the Project on water-based navigation.

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15 EIS, Section 28.6, p. 28-21.
16 EIS, Section 29.7, p. 29-35.
17 EIS, Section 30.6, p. 30-58.
18 EIS, Section 31.7, p. 31-46.
19 EIS, Section 12.7, pp. 12-95 to 12-96.
20 EIS, Section 20.6, pp. 20-76 to 20-77.

Heritage Resources

The assessment of the potential cumulative effects of the Project on Heritage Resources identified no other reasonably foreseeable projects or activities that temporally or spatially overlap with the effects of the Project on Heritage Resources.

VCs with Cumulative Effects Which Would Not be Significant

A fourth category of VCs includes those where the Project is likely to result in cumulative effects on the VC, but the cumulative effects would not be significant. Each of the VCs in this category are discussed below.

Harvest of Fish and Wildlife Resources

The assessment of the potential cumulative effects of the Project on Harvest of Fish and Wildlife Resources identified other reasonably foreseeable projects or activities expected to interact with harvest of fish and wildlife resources. Of those identified, the assessment found that some reasonably foreseeable projects within the RAA are expected to have similar effects on hunting opportunities as the Project.[21] Since hunting would be displaced in the LAA due to the Project and other identified projects in the RAA would similarly displace hunting, the assessment concluded that access to public hunting would decrease overall, resulting in a cumulative residual adverse effect. The cumulative effects are not considered significant, however, as they are not expected to result in a reduction in bag limits.[22]

Outdoor Recreation and Tourism

The assessment of the potential cumulative effects of the Project on Outdoor Recreation and Tourism considered other reasonably foreseeable projects or activities that are expected to interact with outdoor recreation and tourism. These projects and activities included the Montney Gas Play, Applications for Land Act tenures, new oil and gas facilities, and forestry harvest plans and tenures, and population changes. No cumulative effects were identified.[23]

Current Use of Land and Resources for Traditional Purposes

The assessment of the potential cumulative effects of the Project on Current Use of Lands and Resources for Traditional Purposes identified other reasonably foreseeable projects or activities that could have an effect on hunting and trapping because they may reduce habitats associated with ungulates, fur-bearers, grouse and migratory waterfowl. The potential effects of these projects and activities was considered, but no cumulative effects were identified.[24]

The Project is likely to result in a cumulative effect on current use of lands and resources for other cultural and traditional purposes. This effect would arise in combination with the residual effect of a highway improvement project. The resulting cumulative effect of the Project would not be significant because the current use would not be permanently undermined and the practice can be readily reproduced elsewhere.

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[21] EIS, Section 24.7.1, p. 24-55.
[22] EIS, Section 27.7, pp. 24-54 to 24-58.
[23] EIS, Section 25.7, pp. 25-43 to 25-45.
[24] EIS, Section 19.6, pp. 19-108 to 19-114.

Visual Resources

The assessment of the potential cumulative effects of the Project on Visual Resources considered other projects or activities that are expected to occur in the RAA during the potential construction and operations phases of the Project and interact with residual visual resource effects of the Project. Of these, the asssement found that the Montney Gas Play Project and land tenure applications are expected to affect visual resources in the RAA. The assessment concluded that the Project, together with other projects expected to occur in the RAA, is predicted to increase the amount of visible anthropogenic disturbances in relation to base conditions. Cumulative residual effects within the LAA would be identified as significant, if effects were rated as high magnitude, combined with long term in duration and continuous in frequency (see Section 27.4). Cumulative effects on visual resources are rated as not significant, as they do not meet this threshold.

VCs with Significant Cumulative Effects

The residual effects of the Project on two of the VCs, Vegetation and Ecological Communities and Wildlife Resources, are expected to be significant and, accordingly, those effects are also significant when considered in combination with the effects of other projects or activities. However, the effects on those VCs resulting from other projects and activities that have been or will be carried out are considered significant, even without the Project. [25]

Increasing GHG emissions from the many sources globally and the resulting increase in GHG concentrations in the atmosphere, and the consequent changes to the global climate, are currently believed to be a significant cumulative environmental effect, even without the Project. While the Project's contribution to a net change in global GHG emissions is relatively small and the environmental effect of the Project related GHG emissions (on its own) on global climate is not measurable, the cumulative effect is considered significant.[26]

Inclusion of Additional Projects in the Cumulative Effects Assessment

In a letter dated December 21, 2012, the Treaty 8 Tribal Association provided a transmittal with comments on the list of projects and activities on the Project Inclusion List, and included a list of projects and activities for consideration in the assessment of cumulative effects of the Project. BC Hydro reviewed the list suggested by the Treaty 8 Tribal Association, applied the criteria for identification of projects. By letter dated March 18, 2013, BC Hydro responded to the transmittal. In summary: some of the projects suggested by the Treaty 8 Tribal Association were already on the Project Inclusion List; some of the projects were properly excluded from the Project Inclusion List; and four projects were added to the Project Inclusion List. Those projects are: Sierra Yoyo Desan Road Upgrades, Horn River Mainline Loop (Kyklo Creek Section), Highway 2 and Highway 97N Improvements, Chetwynd Forest Industries Biomass Project.

The assessment of the potential cumulative effects of the Project on Fish and Fish Habitat, Vegetation and Ecological Communities, Wildlife Resources, Greenhouse Gases, Current Use of Lands and Resources for Traditional Purposes, Agriculture, Harvest of Fish and Wildlife Resources, Outdoor Recreation and Tourism, Navigation, Visual Aesthetics, Population and Demographics, Housing, Community Infrastructure and Services, Transportation, and Heritage, has been reconsidered in view of

[25] EIS, Section 40.11, page 40-5.
[26] EIS, Section 40.11, page 40-5.

these additional projects because at least one of these projects falls within the RAA of each of these VCs. Inclusion of these additional projects was not considered for those VCs with no residual effects.

A description of the 4 projects is provided below.

1. Sierra Yoyo Desan Road Upgrades Project

The Province of British Columbia and Sierra Yoyo Desan (SYD) Road Limited Partnership signed a 16 year, $40 million partnership agreement in June 2004 to design and upgrade the SYD road, then to operate and maintain the road for a further 14 years (http://www.sydroad.com/about-the-project/general-information/). The SYD Road is a public resource road that is used, to access the oil and gas resources in the northeastern region of British Columbia. The SYD Road project footprint is located east of Fort Nelson. Project activities associated with road building are located in the Liard River watershed. The 188-km long SYD multi-user resource road provides the main access to over 27,000 square kilometres of oil, gas and forestry terrain. It also connects to the end of the 15 km Clarke Lake Road, which joins the Alaska Highway just south of Fort Nelson.

Recently a contract was awarded for work on a section of the SYD Road, from KM 61 to KM 90. The existing road will be widened from approximately eight metres to 9.2 metres (http://www.fnnews.ca/2013/01/02/additional-work-awarded-along-sierra-yoyo-desan-road-corridor-fort-nelson/). Work was to begin in January 2013, with completion in October 2014. In addition, Ledcor Highway Maintenance Ltd is conducting upgrades on the SYD Road between km 90 and 121 (posted construction schedule dated March 1-8 2013). According to the project reference map, there are seven river crossings on the SYD Road (http://www.sydroad.com/about-the-project/general-information/map_lg/).

During construction and maintenance it is assumed that standard best management practices (BMP) established by provincial agencies would be implemented to mitigate potential fish and fish habitat effects, such as Ministry of Environment (http://www.env.gov.bc.ca/wld/BMP/bmpintro.html#second) and Ministry of Transportation (http://www.th.gov.bc.ca/publications/eng_publications/environment/bestpractice.htm).

2. Horn River Mainline Loop (Kyklo Creek Section) Project

On 29 April 2011, NGTL, applied to the National Energy board (NEB), pursuant to the NEB Act for a Certificate to construct and operate the Horn River Mainline Loop (Kyklo Creek Section) Project. The Project is a proposed expansion of NGTL's existing Alberta System in Alberta and British Columbia. NGTL's Alberta System consists of approximately 24,000 km of natural gas pipeline within Alberta and British Columbia.

The Project includes the construction and operation of three gas pipeline loops totalling 111.2 km of new pipeline. The pipeline loops would be contiguous (alongside) to existing rights-of-way (RoW) and other linear disturbances for approximately 103.8 km. The Project would require a minimum 32 m-wide construction RoW for its entire length. One component of the Horn River Mainline Loop Project is the Kyklo Creek section. This pipeline route is located approximately 100 km east of Fort Nelson, British Columbia and is required to meet customer demand to transport sweet natural gas from the Horn River area in northeast British Columbia.

NGTL received project approval from the NEB in February 2012 for the Kyklo Creek section. Construction was scheduled to start November 2012 and the pipeline would be in-service April 2013. (http://www.transcanada.com/5518.html). Other portions of the Horn River Mainline Loop Project (Komie North Section) are still under review. Project maps can be found at this website https://www.neb-one.gc.ca/ll-eng/livelink.exe/fetch/2000/90464/90550/554112/590465/601085/614026/600585/B-01-4_-_NGTL_Horn_River_Project_-_Section_1_Project_Overview_-_A1R8A0_.pdf?nodeid=600586&vernum=0&redirect=3.

3. Highway 2 and 29N Improvements Projects

The Province is investing almost $4 million this year to prepare seven initial projects for construction along Highway 2 and 29N routes. The projects will improve safety and build capacity, and include the construction of passing lanes and the widening of the highway to four lanes (http://www2.news.gov.bc.ca/news_releases_2009-2013/2011TRAN0056-000919.htm).

The projects under development include:

- Highway 2: widen to four lanes (3.3 km) from Tupper Creek to Rusheinski Rd
- Highway 2: widen Tupper Creek Bridge and 4-Mile Culvert to four lanes
- Highway 2: widen to four lanes (1.8 km) from 1st St. to 8th St. in Dawson Creek
- Highway 2: widen to four lanes (3 km) from Rolla Rd. to 1st St.
- Highway 2: Blockline southbound passing lane and intersection improvements
- Highway 97: widen to four lanes (2 km) at the bottom of the South Taylor Hill
- Highway 97: construct northbound passing lane at Farmington Fairways

Engineering is underway for all projects. Projects will be tendered as design work is completed. Project construction areas are shown at (http://www.flickr.com/photos/tranbc/5974017083/in/set-72157627277789434).

The Highway 97 widening at the South Taylor Hill is located on a portion of the highway south of the Peace River mainstem. This project will widen Highway 97 at the base of South Taylor Hill to four lanes, south from Taylor Bridge for two kilometres. Improvements will be made to the intersections of Big Bam and Johnson Roads, and a larger truck chain-up area will be built to ensure truckers have a safe place to put on chains in the winter months. The slopes above the highway will also be contoured to enhance slope stability (http://www.newsroom.gov.bc.ca/2013/03/major-investments-to-improve-highway-97-at-south-taylor-hill.html). The project will go to tender in fall 2013, with construction starting in spring 2014 and scheduled for completion by fall 2015.

Based on available project figures, the South Taylor Hill widening is located more than 100 metres from the Peace River. It is anticipated that standard best management practices (BMP) established by the Ministry of Transportation would be implemented (http://www.th.gov.bc.ca/publications/eng_publications/environment/bestpractice.htm).

4. Chetwynd Forest Industries Biomass Project

On May 2, 2012, Pratt & Whitney Power Systems was awarded a contract to deliver a 13 MW biomass heat recovery power plant for West Fraser Timber Company in British Columbia, Canada. The state-of-the-art power plant will provide clean, carbon-neutral power to the company's Chetwynd Forest Industries plant utilizing two Turboden 65 HRS Organic Rankine Cycle (ORC) turbogenerators. The

installation of the ORC unit at West Fraser's Chetwynd facility is a part of efforts to improve operational efficiency.

West Fraser was selected by BC Hydro under the BC Hydro Bioenergy Phase II Call for Power program for two of their sites totaling 180 GWh/year from wood biomass. Through this program, BC Hydro awarded 20-year electricity purchase agreements to West Fraser. Two Turboden 65 HRS systems will be delivered to West Fraser by the end of 2013, with installation and commissioning expected in 2014. Commercial operation is planned by the second quarter of 2014 (http://www.canadianbiomassmagazine.ca/content/view/3329/57/). The plant will be built on an existing industrial property.

Reconsideration of the Cumulative Effects Assessment

A summary of the revised cumulative effects assessment after reconsideration of these 4 projects is provided in Table 3.

The cumulative effects of the Project consider the net emissions from the Project in the context of provincial and national emissions. The additional projects to be considered in the cumulative effects assessment would not change the context of provincial and national emission inventories identified in section 15.5.1 of the EIS, and would therefore not change the determination of significance of residual cumulative effects.

The population effects of other projects were included in the BC Stats population forecast, and it was adopted as the baseline. Otherwise, no cumulative effects analyses were completed for this section. The "new" projects do not change the consideration of cumulative effects.

The residual effect on health and social services in Community Services and Infrastructure is accounted for in the population forecast so the cumulative effect is embedded in the effects assessment for the project. Therefore, no cumulative effects re-analysis was undertaken.

Table 3. Summary of Revised Cumulative Effects Assessment

Valued Component	Sierra Yoyo Desan Road Upgrades	Highway 2/97N Improvements	Horn River Mainline Loop	Chetwynd Forest Industries Biomass Project	Reconsideration of Cumulative Effects Assessment Required
Fish and Fish Habitat	Project lies outside the RAA; no overlap in space	Project lies within the RAA; no residual effects expected	Project lies outside the RAA; no overlap in space	Project lies outside the RAA	Not required
Vegetation and Ecological Communities	Project lies outside the RAA; no overlap in space	Project lies within the RAA; residual effects expected	Project lies outside the RAA; no overlap in space	Project lies within the RAA; but it lies within the existing footprint and no residual effects expected	Project is already expected to contribute to residual adverse effects on vegetation and ecological

Valued Component	Sierra Yoyo Desan Road Upgrades	Highway 2/97N Improvements	Horn River Mainline Loop	Chetwynd Forest Industries Biomass Project	Reconsideration of Cumulative Effects Assessment Required
					communities. Inclusion of these projects does not change the cumulative effects assessment
Wildlife Resources	Project lies outside the RAA; no overlap in space	Project lies within the RAA; residual effects expected	Project lies outside the RAA; no overlap in space	Project lies within the RAA; but it lies within the existing footprint and no residual effects expected	Project is already expected to contribute to residual adverse effects on Wildlife Resources. Inclusion of these projects does not change the cumulative effects assessment
Current Use of Lands and Resources for Traditional Purposes	Project lies outside the RAA; no overlap in space	Project lies within the RAA; residual effects expected	Project lies outside the RAA; no overlap in space	Project lies within the RAA; but it lies within the existing footprint and no residual effects expected	Cumulative effect is likely but would not be significant
Agriculture	Project lies outside the RAA; no overlap in space	Project lies outside the RAA; no overlap in space	Project lies outside the RAA; no overlap in space	Project lies outside the RAA; no overlap in space	Not required
Harvest of Fish and Wildlife Resources	Project lies outside the RAA	Project lies within the RAA and LAA; not expected to result in adverse residual cumulative effects on harvest of fish and wildlife resources as the Highway improvements will be completed at the time of the Site C construction	Project lies outside the RAA	Project lies within the RAA; expected affect access to public hunting areas in the LAA	Project is already expected to contribute to residual adverse effects on hunting displacement from the LAA as a result of the Project. Inclusion of these projects does not change the cumulative effects assessment
Outdoor Recreation and Tourism	Project lies outside the	Project lies within the RAA; may	Project lies outside the	Project lies within the RAA;	Not required

Valued Component	Sierra Yoyo Desan Road Upgrades	Highway 2/97N Improvements	Horn River Mainline Loop	Chetwynd Forest Industries Biomass Project	Reconsideration of Cumulative Effects Assessment Required
	RAA	result in increased access in the LAA that may benefit outdoor recreation and tourism, not expected to result in adverse residual effects on outdoor recreation and tourism as the Highway improvements will be completed at the time of the Site C construction.	RAA	not expected to result in residual adverse effects on outdoor recreation infrastructure	
Navigation	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Not required
Visual Aesthetics	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Not required
Transportation	Project lies outside the RAA	Project lies within the RAA and LAA; not expected to result in adverse residual cumulative effects on transportation as the Project use of the road segment will be primarily limited to passenger vehicles in Project years 0 and 1 and based on demand, BC Hydro proposes to provide workforce shuttles for workers commuting from local	Project lies outside the RAA	Project lies within the RAA; not expected to result in residual adverse effects on transportation as long-term industrial growth trends were included in the base case traffic projections.	Project is already expected to contribute to residual adverse effects on traffic delays and road safety in the LAA. Inclusion of these projects does not change the cumulative effects assessment

Valued Component	Sierra Yoyo Desan Road Upgrades	Highway 2/97N Improvements	Horn River Mainline Loop	Chetwynd Forest Industries Biomass Project	Reconsideration of Cumulative Effects Assessment Required
		communities.			
Heritage	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Project lies outside the RAA	Not required

Related Comments / Information Requests:

This technical memo provides information related to the following Information Requests:

• Response to Peace Valley Environmental Association Standard Letters • Response to Sierra Club and Yellowstone to Yukon Conservation Initiative (Y2Y) Standard Letters		form_0004-002	gov_0002-003	gov_0004-002
gov_0005-038	gov_0005-039	gov_0007-003	gov_0008-044	gov_0010-072a
gov_0010-072b	gov_0010-073	gov_0010-236	gov_0010-255	gov_0010-331
gov_0010-367	gov_0010-519	gov_0010-624	gov_0010-627	gov_0011-001
gov_0013-014	gov_0013-016	gov_0013-031	gov_0013-078	gov_0015-001
gov_0015-005	gov_0015-010	gov_0016_002	gov_0018_067	gov_0018_068
pub_0478-011	pub_0088-001	pub_0229-001	pub_0234-003	pub_0255-008
pub_0293-001	pub_0326-001	pub_0376-001	pub_0380-003	pub_0448-011
pub_0448-ag-001	pub_0448-ag-008	pub_0448-ag-009	pub_0448-ag-108	pub_0448-ag-112
pub_0448-ag-113	pub_0448-ag-118	pub_0465-004	pub_0474-001	pub_0474-006
pub_0476-001	pub_0476-002	pub_0478-006	pub_0478-008	pub_0478-010
pub_0478-014	pub_0525-001	pub_0985-001	pub_0992-001	pub_1014-001
pub_0529-001	pub_0535-004	pub_0540-007	pub_0557-002	pub_0562-001
pub_0596-001	pub_0597-003	pub_0597-004	pub_0598-001	pub_0600-004
pub_0603-001	pub_0604-001	pub_0605-013	pub_0613-001	pub_0693-001
pub_0702-001	pub_0715-002	pub_0727-001	pub_0728-001	pub_0730-001
pub_0742-001	pub_0796-001	pub_0889-001	pub_0910-001	pub_0935-001
pub_0965-001	pub_0980-001	ab_0001-185	ab_0001-190	ab_0001-191
ab_0001-001	ab_0001-016	ab_0001-232	ab_0001-233	ab_0001-240
ab_0001-203	ab_0001-220	ab_0001-323	ab_0001-324	ab_0001-335
ab_0001-255	ab_0001-267	ab_0001-355	ab_0001-357	ab_0001-358
ab_0001-337	ab_0001-338	ab_0001-549	ab_0001-550	ab_0001-551
ab_0001-521	ab_0001-542	ab_0001-573	ab_0001-581	ab_0001-738
ab_0001-552	ab_0001-563	ab_0003-133	ab_0003-160	ab_0003-199
ab_0003-019	ab_0003-020	ab_0003-259	ab_0003-310	ab_0004-002

ab_0003-211	ab_0003-242	ab_0004-012	ab_0004-020	ab_0004-022
ab_0004-007	ab_0004-011	ab_0004-025	ab_0004-027	ab_0004-028
ab_0004-023	ab_0004-024	ab_0004-033	ab_0004-035	ab_0004-036
ab_0004-029	ab_0004-032	ab_0004-046	ab_0004-048	ab_0004-054
ab_0004-037	ab_0004-044	ab_0004-089	ab_0004-091	ab_0004-093
ab_0004-060	ab_0004-062	ab_0006-058	ab_0008-005	ab_0008-007
ab_0006-018	ab_0006-029	ab_0010-012	ab_0010-013	ab_0010-017
ab_0009-026	ab_0010-011	ab_0010-051	ab_0010-077	ab_0010-083
ab_0010-022	ab_0010-030	ab_0010-163	ab_0010-170	ab_0011-003
ab_0010-123	ab_0010-160	ab_0012-007	ab_0012-014	ab_0012-015
ab_0012-002	ab_0012-006	ab_0001-533	ab_0003-024	ab_0003-294
ab_0001-192	ab_0001-522	ab_0006-060		